Studies on Cyprinid Fishes of the Oriental Genus *Chela* Hamilton

BY

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(With two plates and six text-figures)

CONTENTS

INTRODUCTION

Recently having had occasion to consider the nomenclatorial status of certain genera and species of freshwater fishes from India, it was found that the generic status and composition of *Chela*, the first division named by Hamilton (1822)[1] under the composite genus *Cyprinus*, was in confusion. Smith (1945) made a partial attempt to straighten the tangle, but writers seem still to adhere to earlier systems of classification, partly on account of Smith's work not being accessible as ready reference. Since 1945 some more literature has come out on the taxonomy of these fishes, and the present revision is therefore undertaken in order to help to avoid continuance of improper usage and to give an up-to-date classification of the fishes belonging to Hamilton's division *Chela*, which is now recognised as a distinct genus of the subfamily Abramidinae of the family Cyprinidae.

HISTORICAL RÉSUMÉ

Under the division *Chela* of the genus *Cyprinus*, Hamilton described a heterogenous assemblage of seven species. The first named species,

[1] Also cited in earlier literature as Hamilton-Buchanan.

Cyprinus (*Chela*) *cachius* Hamilton was made the type of the genus *Chela* by Bleeker (1863, p. 215). The remaining six species, namely *Cyprinus* (*Chela*) *atpar*, *C.* (*Chela*) *laubuca*, *C.* (*Chela*) *phulo*, *C.* (*Chela*) *gora*, *C.* (*Chela*) *morar*, and *C.* (*Chela*) *bacaila*, are at present referable to at least three different genera. In view of Bleeker's restriction of *Cyprinus* (*Chela*) *cachius* as the type of *Chela*, the two species *C.* (*Chela*) *atpar* and *C.* (*Chela*) *laubuca* are also to be included under it. Of these two species, Hamilton's description conclusively shows that *C. atpar* represents adult specimens of *C. cachius*, which makes the former a synonym of the latter, as the specific name *cachius* has priority over *atpar*. That leaves two species, namely *cachius* and *laubuca*, from Hamilton's list of fishes that may be recognised as truly belonging to the genus *Chela*.

McClelland (1839) described a number of species, including Hamilton's species of *Chela* under the genus *Perilampus*, but did not indicate any type and this state of affairs lasted until Bleeker (1863, p. 258) designated *Perilampus devario* McClelland the type. The fact that *P. devario* McClelland is identical with *Cabdio devario* Hamilton, a species of the genus *Danio* Hamilton, makes *Perilampus* a synonym of *Danio*.

In describing a new genus *Laubuca*, Bleeker (1863) indicated McClelland's species *Perilampus guttatus* as the type ; but, the latter being a synonym of *Chela laubuca* Hamilton, *Laubuca* Bleeker automatically becomes a synonym of *Chela* Hamilton.

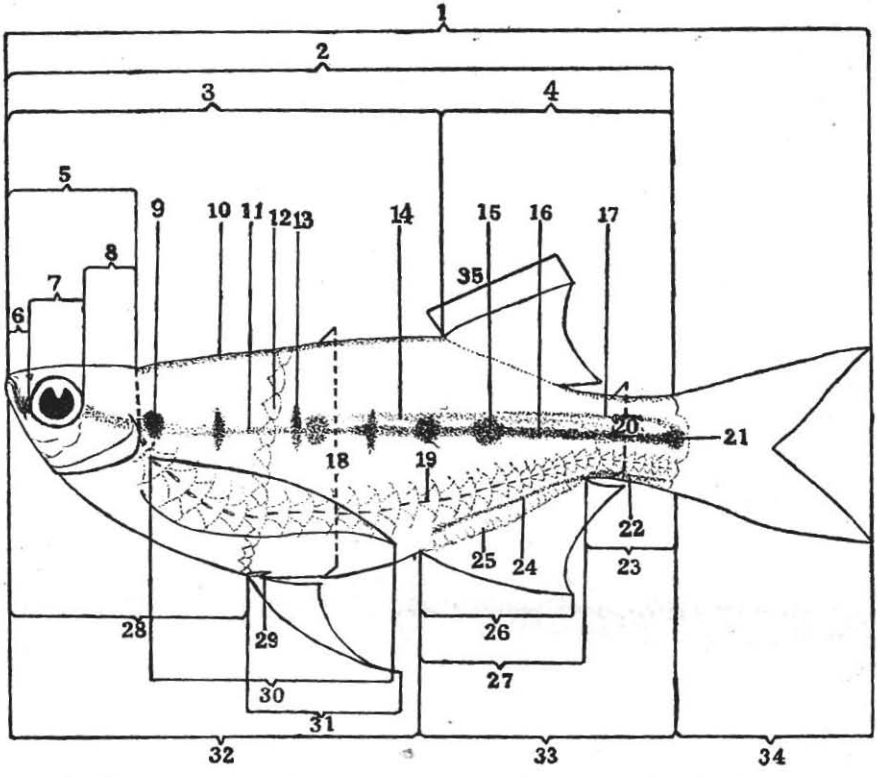
Günther (1868) described two new genera, the first *Eustira* with *Eustira ceylonensis* Günther as the type, and the second *Cachius* with *Chela atpar* Hamilton as the type. I have elsewhere (Silas, 1956) discussed reasons for considering *Eustira* Günther a synonym of *Danio* Hamilton. As already indicated, *Chela cachius* Hamilton replaces *Chela atpar* Hamilton, and this naturally makes *Cachius* Günther a synonym of *Chela* Hamilton.

Besides these, some of the species at present referable to the genus *Chela* Hamilton have been placed at one time or the other under the genera *Leuciscus*, *Paradanio*, etc. by Bleeker, Day, and other ichthyologists.

Material and Methods

i. Material :—The material examined includes both registered and unregistered specimens of the genus in the fish collection of the Zoological Survey of India, Calcutta ; five specimens of *Chela laubuca*, received on loan from the Colombo Museum, Ceylon ; the type and paratypes of *Laubuca siamensis* Fowler in the Academy of Natural Sciences, Philadelphia ; those in the collection of the U.S. National Museum, Washington D.C., and those collected by me from different parts of India, all being listed under the respective species.

ii. Methods :—Besides the standard measurements and counts generally adopted by ichthyologists, a few additional measurements and counts were made (Text-figure1). The predorsal distance is measured



Text-figure 1.—Schematic drawing of a hypothetical *Chela* showing salient characters of external morphology and colour pattern. 1—total length ; 2—standard length ; 3—predorsal distance ; 4—dorsal to base of caudal ; 5—length of head ; 6—length of snout ; 7—diameter of eye ; 8—post-orbital distance of head ; 9—shoulder spot ; 10—mid-dorsal stripe ; 11—anterior part of the dark mid-lateral stripe ; 12—transverse row of scales ; 13—dark vertical stripe ; 14—superficial lateral stripe ; 15—Circular spots (when present situated along the dark mid-lateral stripe from the angle of the gill opening to below the dorsal fin) ; 16—posterior part of the dark mid-lateral stripe ; 17—posterior part of the superficial lateral stripe ; 18—height of body ; 19—lateral line row of scales ; 20—least height of caudal peduncle ; 21—precaudal spot ; 22—subpeduncular stripe ; 23—Caudal peduncle ; 24—supra-anal streak ; 25—sheath of scales at base of anal fin ; 26—length of longest anal finray ; 27—length of base of anal fin ; 28—preventral distance ; 29—axillary scale ; 30—length of pectoral fin ; 31—length of pelvic fin ; 32—pre-anal distance ; 33—origin of anal fin to base of caudal fin ; 34—length of caudal fin ; 35—height of dorsal fin (length of longest ray).

from the tip of the snout to the insertion of the first dorsal ray. The post-dorsal and post-anal distances are measured from the point of insertion of the first rays of these fins to the posterior end of the caudal peduncle, to which point also the standard length is measured from the tip of the snout. In measuring the length of the fins, the length of the

longest ray from its base to the tip is taken. This is generally the last undivided ray of the dorsal and anal fins and the first ray of the pectoral and pelvic fins. The last branched dorsal and anal rays when divided to the base are also counted as single rays. The length of the caudal peduncle is measured from the posterior end of the base of the anal fin to the centre of the base of the caudal fin.

The predorsal scales are counted in a straight line between the occiput and the insertion of the first dorsal ray. In the enumeration of the number of lateral line scales, all the tube-bearing scales commencing from the upper angle of the gill-opening are counted. When the lateral line is absent or incomplete, the lateral linear scales are counted from the upper angle of the gill-opening to the base of the caudal fin in a straight line. The transverse line of scales are the number of scales in the oblique series between the mid-dorsal row and the origin of the pelvic fin and when expressed as follows: 7/1/3; 7-denotes the rows of scales above the lateral line, 1—the lateral line row, and 3—the scale rows between the lateral line and the origin of the pelvic fin.

iii. Terminology of colour pattern:—The importance of basic colour pattern in distinguishing species and subspecies among cyprinid fishes has been commented on in recent years by Hubbs and Raney (1947), Brittain (1954), and others. Forselius (1957) has drawn attention to the significance of colour markings and colour patterns in another group of freshwater fishes, the Anabantidae. The species of *Chela* when alive are more or less transparent but, when placed in formalin, they exhibit certain definite and characteristic colour patterns, an enumeration of which it is felt will be useful in such a revision. Besides individual variations, both juvenile and adult colour patterns differ to a certain extent, but the basic colour pattern in the adult form is more or less constant and hence may be used in specific and infraspecific distinctions. The golden and metallic blue reticulate colour markings in species of *Chela* seen on the sides of the anterior half of the body disappear shortly after the specimens are placed in the preservative and hence are not indicated in the accompanying figure. The basic colour patterns are indicated below and the terminology given will be used in the descriptions of the species.

a. Dark mid-lateral stripe (Figure 1 : 16) : This is a dark stripe found along the mid-lateral line of the body, but varying in extent and width in different species. In some it is confined only to the posterior part of the body, being more prominent on the caudal peduncle, while in others it extends in the form of a broad stripe up to the posterior margin of the orbit and from the anterior margin of the orbit to the angle of the mouth. In the live condition, this band appears to be superimposed

by a metallic silvery band, a 'marking' which is lost when the specimen is placed in the preservative.

b. Superficial lateral stripe (Figure 1:17) : When present, this is confined to the posterior half of the body and is situated above the dark mid-lateral stripe. It is better defined on the caudal peduncle.

c. Mid-dorsal stripe (Figure 1:10) : This represents the dark stripe running from the occiput to the origin of the dorsal fin in some of the species. Rarely, in a less pronounced nature, it may also extend along the mid-dorsal line from the posterior end of the base of the dorsal fin to the base of the caudal fin.

d. Shoulder spot (Figure 1:9) : This is a dark black spot, situated behind the angle of the operculum above the base of the pectoral fin.

e. Dark vertical stripes (Figure 1:13) : These may be present in the form of 4 to 5 short vertical blackish stripes on the sides of the body above the pectoral fins.

f. Circular spots (Figure 1:15) : When present they are found along the dark mid-lateral stripe on the side of the body anteriorly.

g. Precaudal spot (Figure 1:21) : This represents a dark blotch, often diffuse, at the base of the caudal fin on the caudal peduncle.

h. Sub-peduncular stripe (Figure 1:22) : This represents a dark stripe running from the posterior end of the base of the anal fin to the caudal fin along the mid-ventral line of the caudal peduncle.

i. Supra-anal streak (Figure 1:24) : This represents a row of black pigment spots which takes the form of a narrow streak running more or less parallel to the base of the anal fin below the lateral line.

Besides these, the fins are sometimes dusky or dirty white and in some species are also tipped with grey.

Synonyms of the Genus *CHELA* Hamilton

Chela Hamilton, 1822, Fish. Ganges, pp. 258, 383 (Type : *Cyprinus* (*Chela*) *cachius* Hamilton, as restricted by Bleeker).

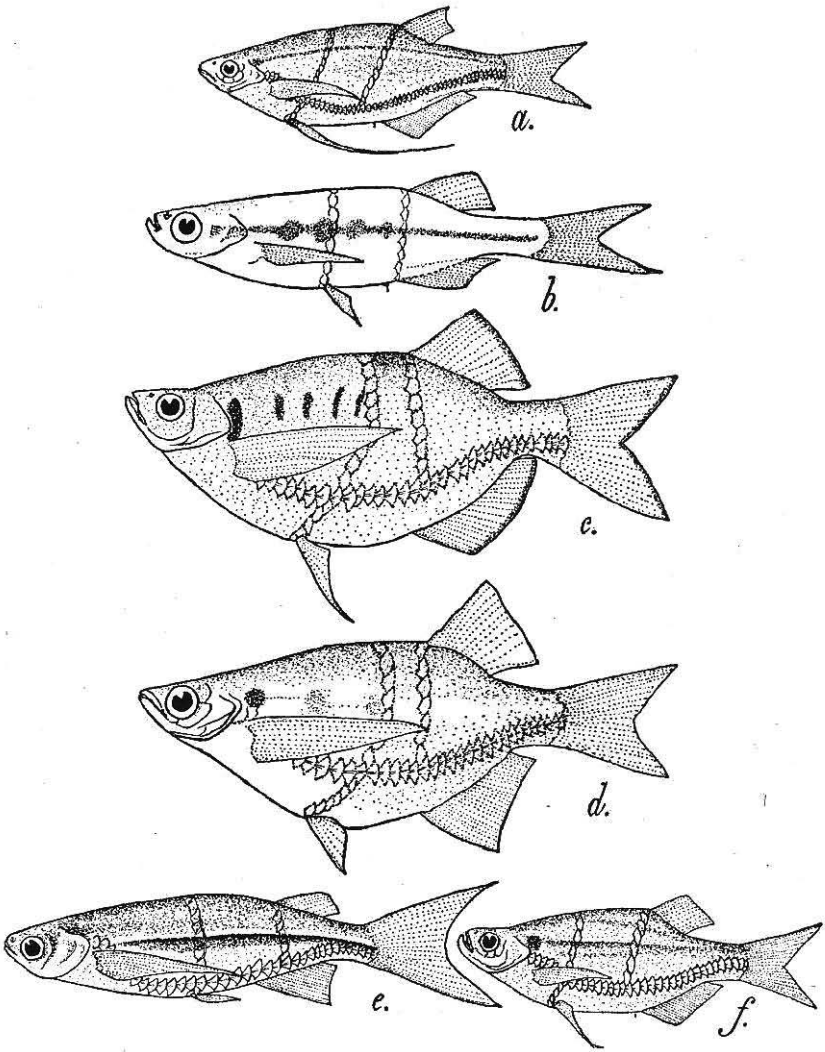
Laubuca Bleeker, 1860, *Ichth. Archipel. Indici, Prodr.*, **2**, *Cyprini.* (Type : *Perilampus guttatus* McClelland = *Cyprinus* (*Chela*) *laubuca* Hamilton).

Cachius Günther, 1868, *Catal. Fish. Brit. Mus.*, 7 : 339 (Type : *Cachius atpar* (Hamilton) = *Cyprinus* (*Chela*) *cachius* Hamilton).

Definition of the Genus *CHELA* Hamilton

In addition to the Indian and Thailand species of *Chela* that I have examined, the excellent descriptions of the Sumatran and Thailand species given by Weber and de Beaufort (1916) and Smith (1931, 1945) respectively have helped in drawing up the following redescription of the genus:

Fishes of the genus *Chela* Hamilton are small in size being less than about three inches in standard length and found frequenting streams, tanks, and ponds. The body is almost always strongly compressed,



Text-figure 2.—Outline drawings of six *Chela* species showing some diagnostic characters. (*a*) *Chela* (*Chela*) *cachius* Hamilton; (*b*) *Chela* (*Neochela*) *dadyburjori* (Menon); (*c*) *Chela* (*Chela*) *caeruleostigmata* (Smith); (*d*) *Chela* (*Chela*) *mouhoti* Smith; (*e*) *Chela* (*Allochela*) *maassi* (Weber & de Beaufort); (*f*) *Chela* (*Chela*) *laubuca* Hamilton. Figures *a* & *f* are after Day (1878); *b* after Menon (1952); *c* & *d* after Smith (1945) and *e* after Weber & de Beaufort (1916). Full scalation is not shown.

deep or moderately so, and the abdominal edge is partly or almost wholly cultrate. In some species the abdomen is cultrate only between and behind the pelvic fins and backwards up to the vent. The mouth is

small and is directed obliquely or almost vertically upwards. The cleft of the mouth reaches to a vertical below the anterior margin of the eye or is far removed from it, but never extends to beneath or behind the eye. The eyes are large and are placed more in the anterior half of the head. A symphysial knob or hook is absent in the lower jaw. The barbels are totally absent. The lateral line is either complete, incomplete, or absent; when complete, it curves more or less abruptly downwards towards the pectorals and runs along the lower half of the body, terminating in the lower half of the base of the caudal fin. The scales along it number 30 to 66. When incomplete, the lateral line pierces only a few of the anterior scales. The predorsal scales commence from the occiput, far behind the eyes. An anal sheath consisting of a row of scales is present. The dorsal fin is situated completely opposite the anal fin and its point of origin is never ahead of that of the latter. The dorsal fin is short, with 9 to 13 rays of which the first two or three rays are simple and unbranched, the last undivided ray being weak and articulated. The pectoral fins are long and pointed, the length of each fin being much greater than the length of the head. The pectorals generally extend considerably beyond the origin of the pelvic fins. The pectoral fin is provided with 9 to 13 rays, of which the outermost ray is undivided and elongate. In addition two or three short undivided rays may be present at the inner angle of the pectoral fin in certain species. The pelvic fin has 5 to 7 rays, of which the outer undivided ray is elongated and filamentous in some of the species. The anal fin is long or moderately so and possesses 13 to 26 rays of which the first two or three rays are undivided. The caudal fin is forked and has 17 to 19 complete rays; the caudal lobes are pointed and equal or slightly subequal in length. The gill-openings extend on the ventral surface to almost below a vertical from the eye. The pharyngeal teeth are arranged in three rows as 5, 4 or 3, 2 or 1/1 or 2, 3 or 4, 5, and are uncinate. Branchiostegeals number 3. The air-bladder is bipartate, the posterior chamber being the larger. The body coloration differs in the different species.

Distribution:—Ceylon, India, Pakistan, Burma, Thailand, Malaya, and Sumatra.

Affinities of the Genus *CHELA* Hamilton

Although this settles the question of the generic status and validity of Hamilton's division *Chela*, the fact that earlier workers (Günther 1868; Day 1878; Weber and de Beaufort 1916, and others) have erroneously included under it species which at present have to find a place elsewhere has necessitated further clarification. Smith (1945) favoured the use of the name *Oxygaster* van Hasselt as being valid for the species

other than *Chela* included by the above mentioned authors under the latter. In 1951 I gave a list of the Indian species of the genus *Chela* (= *Oxygaster* van Hasselt), but it is now evident that all the Indian species mentioned therein cannot be included under *Oxygaster*, as that genus is restricted at present. However, for the time being it is proposed to retain those species under *Oxygaster*, until a revision of them, which is very badly needed, is undertaken. In *Oxygaster* s. str., as in *Chela* Hamilton, the body is greatly compressed and the abdomen is cultrate, but the following characters help to distinguish the two genera :

Predorsal scales extending to interorbital space ; lateral line gently curved downwards above pectorals ; a symphysial knob in lower jaw fitting into a corresponding emargination of upper jaw present .. .. *Oxygaster*

Predorsal scales not extending to interorbital space ; lateral line curved more or less abruptly downwards above pectorals ; a symphysial knob or hook absent in lower jaw .. *Chela*

In addition to these, at least 24 genera of the subfamily Abramidinae are recognised at present from south-east Asia, although the status of some of them as well as those proposed by earlier workers and at present relegated as synonyms needs elucidation. The relationships of *Chela* to the different genera recognised at present are discussed here.

The absence of predorsal scales in the interorbital space and a symphysial knob or hook in the lower jaw help in distinguishing *Chela* from *Macrochirichthys* Bleeker, a genus closely allied to *Oxygaster* van Hasselt. In the absence of barbels, *Chela* differs from *Nematabramis* Boulenger, a genus characterised by the presence of a pair of long maxillary barbles and at present known from the East Indian Archipelago. Although, as in *Chela*, the dorsal fin in the Thailand and Bornean genus *Parachela* Steindachner is placed opposite the anal fin, the absence of pelvic fins in the latter serves to distinguish it from the former. In this connection it may be mentioned that the presence or absence of pelvic fins as constituting a character of generic importance has been questioned by some workers in other groups of fishes (e.g. Cyprinodontiformes and Ophicephaliformes). Even if this character were to be dropped, *Parachela* may still have to be kept apart as a separate genus on account of (i) the symphysial knob it possesses and (ii) the very long anal fin it has with 30 to 35 branched rays.

The position of the dorsal fin in *Chela* (opposite and never ahead of the anal fin) and the absence of a symphysial knob in the lower jaw help in separating it from the genera *Longiculter* Fowler from Thailand, *Paralaubuca* Bleeker from Thailand and the Malaya Archipelago, *Cultrops* Smith from Thailand, and *Rasborichthys* Bleeker from Malaya

Archipelago and Indo-China. *Longiculter* Fowler also differs from *Chela* in the possession of biserial instead of triserial pharyngeal teeth.

The situation of the dorsal fin opposite the interspace between the pelvic and anal fins and rarely extending over the anal fin serves as a diagnostic character in separating the Chinese genera *Hemiculter* Bleeker, *Cultriculus* Oshima, *Anabarilius* Cockerell (= ? *Ischikauia* Jordan and Snyder), *Metzia* Jordan and Thompson, *Rohanus* Chu, *Parapelucus* Günther, *Pseudolaubuca* Bleeker, *Toxabramis* Günther, *Hemiculterella* Warpachowski, *Chanodichthys* Bleeker, *Culter* Basilewasky, *Parabramis* Bleeker, *Megalobrama* Dybowski, *Luciobrama* Bleeker, *Nicholsiculter* Rendahl, etc. from *Chela*, where the origin of the dorsal fin is never in advance of that of the anal fin. Other equally important characters, such as the biserial instead of the triserial pharyngeal teeth (e.g. *Toxabramis* Günther, *Hemicultrella* Warpachowski), the terminal or subterminal instead of the obliquely vertical or almost vertical mouth (e.g. *Parabramis* Bleeker), the dorsal fin with the first one or two rays spinous instead of non-osseous, weak, undivided, and articulated (e.g. *Culter* Basilewasky, *Hemiculter* Bleeker, and *Toxabramis* Günther, where the dorsal spine is serrated in two rows), etc., help in separating the Chinese genera from *Chela*.

It may be mentioned here that the Asiatic genera at present placed under the subfamily Abramidinae exhibit such diverse affinities that it would seem that the grouping is one more of convenience than a natural assemblage. Some of the genera show considerable affinities to the Leuciscinae and the Rasborinae, while the systematic position of certain others needs clarification. However, it is interesting to note that *Chela* is more akin to the other Abramidinae found in Thailand and the Malayan Sub-Region, than to those found in China. In fact, the differences between the Chinese and the remaining south-east Asiatic genera of Abramidinae appear to be rather very well marked.

Subdivisions of the Genus *CHELA* Hamilton

Attempts have been made in the past to subdivide the genus *Chela* into two or more groups or subgenera. In 1916, Weber and de Beaufort recognised *Eustira* Günther as a subgenus of *Laubuca* Bleeker (= *Chela* Hamilton) and remarked :

> 'We do not think that the genus *Eustira* Günther is generically distinct from *Laubuca* ; we therefore give it only the value of a subgenus ; containing *Eustira ceylonensis* Gthr. and our *Eustira maassi*'.

Eustira was distinguished from *Laubuca* on the nature of the lateral line ; it being gently curved downwards in *Laubuca* s. str., and abruptly curved downwards in the former. I have elsewhere shown that *Eustira* Günther is a synonym of *Danio* Hamilton (Silas, 1957) and the subgenus

of *Laubuca* to which Weber and de Beaufort assigned the name *Eustira* is thus left without a valid name.

In this connection, I have looked into the desirability of subdividing the genus and find that the species may be more conveniently grouped under three subgenera, two of which are proposed here as new.

Attention may be drawn to the fact that the character chosen earlier for subdividing the genus, namely whether the lateral line is gently curved down or abruptly curved down, may not be of primary importance, for, when compared to certain genera of the subfamily Abramidinae, such as *Oxygaster*, *Macrochirichthys*, *Rasborichthys*, *Chanodichthys*, *Culter*, etc., the lateral line in *Chela*, *Cultriculus*, and certain other cultrid genera is definitely more sharply curved downwards from above the pectoral fin. This appears to be the condition in all the species of *Chela* with complete lateral line like those I have examined ; at the same time, the distance between the lateral line and the mid-ventral line or the origin of the pelvic fin, when expressed as number of rows of scales, differs in the different species, which definitely fall into two natural groups. Hence, this is considered here as one of the characters for subdividing the genus.

In distinguishing genera and subgenera of the subfamilies Abramidinae and Rasborinae, due consideration is given to whether the lateral line is complete, incomplete, or absent. There is only one species of *Chela* in which the lateral line is incomplete or absent, and in this respect it occupies a unique position, on account of which it is relegated under a separate subgenus. In addition to the importance of the nature of the squamation in recognising natural groups in the genus *Chela*, the greatest depth of the body and the number of anal fin rays are additional characters for separating the species which fall into three subgenera as follows :

I. *Chela* (sensu stricto): Lateral line complete; $2\frac{1}{2}$ (generally 3+) to 6 rows of scales between lateral line and base of pelvic fin ; 11 to 17 rows of scales in a transverse series from the mid-dorsal row to the base of the pelvic fin occurring as : 6-12/1/$2\frac{1}{2}$-6 ; anal fin with 19 to 26 rays of which the first two or three rays are simple and undivided; (the greatest height of the body is contained 2.15 to 4.1 in the standard length).

Two species groups of *Chela* s. str., are recognised here as follows :

1. *Cachius*-group

Scales smaller, much more numerous on the body ; lateral line with 51 to 66 scales ; scale rows above lateral line 9 to 12; predorsal scales 23 to 29.

The genotype, *Chela* (*Chela*) *cachius* Hamilton, belongs to this species-group.

2. *Laubuca*-group

Scales relatively larger; lateral line with 31 to 37 scales; scale rows above lateral line 6 to 9 ; predorsal scales 15 to 21.

The following three species belong to this species-group :

Chela (*Chela*) *laubuca* Hamilton
Chela (*Chela*) *caeruleostigmata* (Smith)
Chela (*Chela*) *mouhoti* Smith

II. *Allochela* (New subgenus) : Lateral line complete ; not more than two rows of scales between lateral line and base of pelvic fin ; 9 to 10 rows of scales in a transverse series from the mid-dorsal row to base of pelvic fin occurring as 6-7/1/1-2 ; anal with 13 to 18 rays of which the first three rays are simple and undivided ; (the greatest height of the body is contained 3.3 to 4.3 in the standard length).

Chela (*Allochela*) *fasciatus* subgen. et sp. nov. (Designated as the type of the new subgenus)
Chela (*Allochela*) *maassi* (Weber and de Beaufort)

III. *Neochela* (New subgenus) : Lateral line incomplete or absent ; 7 or 8 rows of scales in a transverse series from the mid-dorsal row to the base of the pelvic fin ; anal with 14 to 15 rays of which the first three rays are simple and undivided ; (the greatest height of the body is contained 4.0 to 5.16 in the standard length).

Chela (*Neochela*) *dadyburjori* (Menon)
(Designated as the type of the new subgenus)

SYNOPSIS TO THE IDENTIFICATION OF THE SUBGENERA AND SPECIES OF THE GENUS *CHELA* HAMILTON

I. Lateral line complete.

A. 11 to 17 rows of scales in a transverse series from mid-dorsal row to base of pelvic fin occurring as 6-12/1/2½-6 ; anal fin with 19 to 26 rays of which the first two or three rays are simple and undivided (*Chela* s.str.)

1. Scales in lateral line 51 to 66 ; scale rows above lateral line 9 to 12 ; predorsal scales 23 to 29.. *Chela* (*Chela*) *cachius* Hamilton

2. Scales in lateral line 31 to 37 ; scale rows above lateral line 6 to 9 ; predorsal scales 15 to 21.

a. Greatest height of body 2.8 to 3.6 in standard length ; anal rays 2/17-18 (a dark shoulder spot and precaudal spot, both connected by

the narrow dark lateral stripe, sometimes not so clearly defined in the anterior half of the body. .. .. .. *Chela* (*Chela*) *laubuca* Hamilton

b. Greatest height of body 2.15 to 2.25 in standard length ; anal rays 2/22-23.. ..

i. Scales in lateral line 34 to 35 ; 8 to 9 rows of scales above lateral line and 3 to 5 rows between it and base of pelvic fin ; 12 to 13 rows of scales round caudal peduncle ; shoulder spot blackish green ; 4 to 5 short dark vertical stripes above pectoral fins on sides of body. .. .. .. *Chela* (*Chela*) *caeruleostigmata* (Smith)

ii. Scales in lateral line 31 ; 7 rows of scales above lateral line and 5 rows between it and base of pelvic fin ; 14 rows of scales round caudal peduncle ; conspicuous round blackish shoulder spot ; no dark vertical stripes. .. .. .. *Chela* (*Chela*) *mouhoti* Smith

B. 9 to 10 rows of scales in a transverse series from mid-dorsal row to base of pelvic fin occurring as 6-7/1/1-2 ; anal fin with 13 to 18 rays of which the first 3 rays are simple and undivided (*Allochela* subgen. nov.).

1. Anal fin-rays 3/14-15 ; predorsal scales 18 ; (peninsular India) .. .. .. *Chela* (*Allochela*) *fasciata* sp. nov.

2. Anal fin-rays 3/10 ; predorsal scales 20 ; (Sumatra) .. .. *Chela* (*Allochela*) *maassi* Weber and de Beaufort

II. Lateral line incomplete or absent (*Neochela* subgen. nov.).

(Lateral line absent or when present piercing only a few anterior scales) .. .. .. *Chela* (*Neochela*) *dadyburjori* (Menon)

Systematic Account

As this revision is aimed at indicating the precise specific limits of the different species, opportunity is also taken to draw attention to variations that may be expected to occur within species limits or certain characters of those species of which material is available. It has been possible to carry out a detailed study of *Chela* (*Chela*) *laubuca* from samples from different geographical areas along its range of distribution and the results point to a certain amount of correlation between the variations observed in the body proportions, fin ray and scale counts, and the geographical location, in some cases of sufficient magnitude to recognise geographical races or subspecies. These trends are indicated here.

Genus **Chela** Hamilton

Subgenus CHELA *s. str.*

Cachius-group

Chela (Chela) cachius Hamilton

(Text-figure 2, *a*)

Cyprinus (*Chela*) *cachius* Hamilton (Buchanan), Fish. Ganges, pp. 258, 384 (1822). Type locality : River Ganges, about the commencement of the Delta. Type not preserved.

Cyprinus (*Chela*) *atpar* Hamilton (Buchanan), Fish. Ganges, pp. 259, 384 (1822). Type locality : Branches of the Ganges, the Jumna, and the Brahmaputra rivers. Type not preserved.

Chela atpar Gray, Ill. Indian Zool., pl. xcvi, fig. 2 (1834).

Perilampus psilopteromus McClelland, *Asiat. Res.* **19,** pp. 289, 396 (1839). Based on Hamilton's description of *Cyprinus atpar* and MS. drawing of *Cyprinus loyukula.* Locality : Bengal.

Perilampus cachius McClelland, *Asiat. Res.* **19,** pp. 290, 396, pl. xlvi, fig. 4 (1839). From Hamilton's MSS.

Chela anastoma Swainson *Nat. Hist. Fish. etc.* **2,** p. 258 (1839). After the drawing of *C. atpar* given by Gray, from Hamilton's collection.

Cyprinus atpar Valenciennes, *Hist. Nat. Poiss.* **16,** p. 454 (1842).

Cyprinus kachius Valenciennes, *Hist. Nat. Poiss.* **16,** p. 453 (1842). After Hamilton's *C. cachius.*

Perilampus macropodus Jerdon, *Madras Journ. Litt. & Sci.* **15,** p. 325 (1849). Type locality : Cauvery River near its source in Coorg, south India.

Leuciscus cachius Bleeker, *Verh. Batav. Genootsch.* **25,** p. 66 (1853).

Leuciscus atpar Bleeker, *Verh. Batav. Genootsch.* **25,** p. 66 (1853).

Paradanio elegans Day, *Proc. Zool. Soc. London,* p. 297 (1867). Type locality : Bowany river (Tributary of the Cauvery river), south India.

Cachius atpar Günther, *Catal, Fish. Brit. Mus.* **7,** p. 339 (1868).

Perilampus atpar Day, Fish. India **2,** p. 598, pl. cli, fig. 6 (1878) ; *Fauna Brit. India, Fish,* p. 359 (1889) ; Fowler, *Proc. Acad. Nat. Sci. Philadelphia* **76,** p. 73 (1924).

Perilampus cachius Raj, *Rec. Indian Mus.* **12,** p. 261, (1916).

D. 2/7-8 ; P. 1/8-11 ; V. 1/4-5 ; A. 2-3/19-23 ; L.l. 51-66 ; L. tr. 9-12/ 1/3-5

Description : The head is contained 4.44 to 5.77 in the total and 3.5 to 4.44 in the standard length. The height of the body is about 4.0 to 5.83 in the total and 3.25 to 4.6 in the standard length. The width of the body is contained about 9.75 to 12.75 in the total and 7.66 to 10.0 in the standard length. The mouth is slightly oblique, the cleft not extending to below the anterior margin of the eye. The height of the head at occiput is contained 1.3 to 2.0 ; the width of the head 1.57 to 2.33

and the length of the snout 3.2 to 5.5 in the head length. The eye is situated much closer to the tip of the snout than to the posterior margin of the head and its diameter is contained 2.75 to 4.00 in the head length ; 0.66 to 1.0 in the snout length and 1.16 to 2.0 in the interorbital distance. The last said is contained about 1.75 to 2.57 in the head length, which in turn is contained 0.83 to 1.27 in the greatest height of the body. The height of the body is proportionately greater in larger examples. The caudal peduncle is longer than deep, its least height being contained 1.2 to 1.75 in its length.

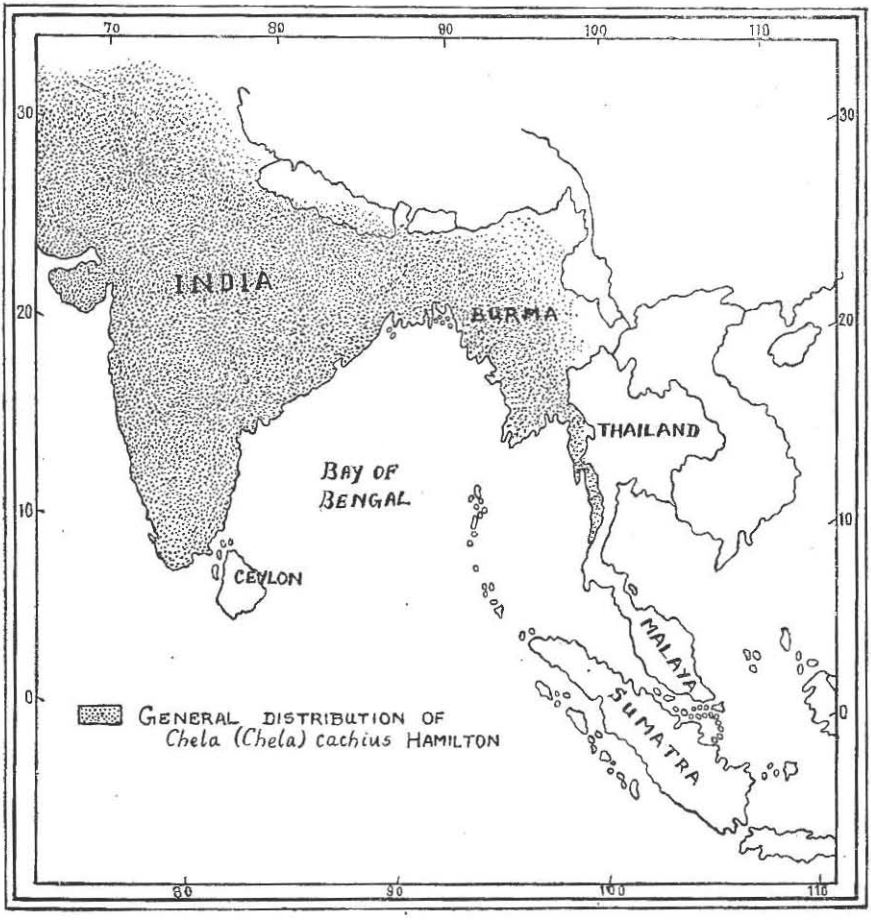
The distance from the tip of the snout to the origin of the dorsal fin is contained 1.35 to 1.62 ; the origin of the dorsal to the base of the caudal fin 2.34 to 3.1 ; the tip of the snout to the origin of the anal fin 1.35 to 1.8 ; the origin of the anal fin to the base of the caudal fin 1.8 to 2.85 ; the tip of the snout to the origin of the pelvic fin 2.58 to 3.37, and the distance from the origin of the pelvic fin to the base of the caudal fin 1.29 to 1.54 in the standard length. The distance from the tip of the snout to the origin of the dorsal fin is 1.47 to 2.0 times the distance from the origin of the dorsal fin to the base of the caudal fin ; the tip of the snout to the origin of the anal fin 1.21 to 1.71 times the origin of the anal fin to the base of the caudal fin and the origin of the pelvic fin to the base of the caudal fin 1.8 to 2.71 times the distance from the tip of the snout to the origin of the pelvic fin.

The height of the dorsal fin is contained about 1.1 to 1.9 in the greatest height of the body. The paired fins are much longer than the head and the pectoral extends considerably beyond the origin of the pelvic fin. The pectoral fin is 1.1 to 1.5 times and the pelvic fin is 1.14 to 2.1 times longer than the head. The outer pelvic fin ray is elongated into a filamentous process, which reaches usually as far back as the posterior third of the anal fin. The longest anal fin ray is slightly shorter than the length of the head. The caudal fin is a little longer than the head, its length being contained 4.0 to 5.4 in the total and 2.87 to 4.44 in the standard length. The abdomen is keeled only between and behind the pelvic fins. The pelvic fin in *cachius* is situated considerably forward than in the other species.

The lateral line scales range from 51 to 66, while the predorsal scales number 23 to 29. There are 15 to 17 rows of scales round the narrowest part of the caudal peduncle. 3 to 5 rows of scales are present between the lateral line and the origin of the pelvic fin in an oblique series and 9 to 12 rows between the lateral line and the mid-dorsal row along the deepest part of the body.

No conspicuous colour markings are present in this species. When alive the specimens are more or less transparent. Formalin-preserved specimens show the following characteristics. The dark lateral stripe

is greatly reduced to a narrow black streak running from the upper angle of the gill-opening and extending to about four scales away from the base of the caudal fin. A conspicuous shoulder spot is absent, but a few black pigment spots occur about the base of the pectoral fin. The superficial lateral stripe is represented as a narrow pigmented lighter band above the dark lateral streak. It is more or less clear up to a vertical above the middle of the pectoral fin, but anteriorly it becomes very light. The mid-dorsal stripe is narrow, greyish brown, and runs from the occiput to the base of the caudal fin. The supra-anal streak is present, though not



Text-figure 3.—Map showing the general distribution of *Chela* (*Chela*) *cachius* Hamilton.

very pronounced. Dark minute pigment spots are present in all the fins giving them a light greyish colour. The scales on the upper half of the

body are edged dark greyish brown while those on the lower half of the body are silvery. The supra and infra orbital margins are coloured black.

Distribution: India, Nepal, Pakistan, and Burma.

General Remarks: The redescription of *cachius* given above is based on material examined by me from India. There appears to be an increase in the fin ray counts, lateral line scales, etc. in specimens from north India when compared to those from peninsular India. Correlation in these and other morphometric characters in relation to the latitude in which the species is found may eventually lead to the recognition of geographical races or subspecies. That being the case, in addition to the discussion on the synonyms, it is not out of place to consider here the availability of names already in existence which are now placed in the synonymy of the species for future subspecific designation.

That *cachius* and *atpar* are one and the same is now clear from Hamilton's description and drawings of the species and also from the material before me. Gray (1834) published a drawing of *atpar* from Hamilton's collection (pl. xcvi, fig. 2 of *Ill. Indian Zool.*, 2) and this was designated later by Swainson (1839) as *Chela anastoma*. *Perilampus psilopteromus* McClelland is based on Hamilton's description and figure of *C. atpar*. McClelland mentions one other name, *C. loyukula*, from Hamilton's collection in the synonymy of *psilopteromus* and there is no mention of *loyukula* in subsequent works. There are discrepancies in the descriptions and Hamilton's drawing of *atpar*, and this is specially so in the depiction of the scalation, which may lead one to confuse the drawing of *atpar* with that of *laubuca*! There are numerous instances in Hamilton's work, where such differences between the description and the drawing can be pointed out, and in this case *atpar* is shown as possessing lesser number of scales on the body. But the absence of the characteristic shoulder spot of *laubuca*, the considerably elongate pelvic fin, and the more forward insertion of the latter should easily help in distinguishing Hamilton's drawing of *atpar* (=*cachius*) from that of *laubuca*.

Perilampus macropodus Jerdon, from the headwaters of the Cauvery river near Coorg, is no doubt referable to the synonymy of *cachius*, although Günther (1868) placed it as a doubtful species under the genus *Danio* Hamilton. Jerdon's description of *macropodus* is brief, but the following characters namely, ' Pectoral fin long ; ventral fin with the 1st ray longer than pectoral ; green above, silvery beneath, fins yellowish .....' help in separating it from *laubuca* which also occurs in the Cauvery. In 1867, Day described a new species, *Paradanio elegans* from the Bowany river, a tributary of the Cauvery, but later (1872) rightly relegated it to the synonymy of *atpar*. Jerdon's *macropodus*

and Day's *elegans* are from the same watershed and are identical. In view of this, as already noted, if any subspecies of *cachius* is recognised from the Cauvery watershed, the availability of the name *macropodus* which has priority over *elegans* is pointed out here.

Material examined:[1] 222 specimens from the Bhavani River, tributary of the Cauvery River, south India, collected by S. Rajan ; 2 specimens from a stream on the Sagar-Shimoga Road, Shimoga Dt., Mysore (Z.S.I. No. F. 12374/1) ; 1 specimen from Tunga River at Shimoga, Mysore (Z.S.I. No. F. 12375/1) ; 41 specimens from the Bhadra River at Bhadravati, Shimoga Dt., Mysore (Z.S.I. No. F. 12376/1) ; 4 specimens from the Tunga River at Shimoga, Mysore (Z.S.I. No. F. 12377/1) ; 11 specimens from Mahanadi River before its junction with the Balka Nallah about 3 miles from Sihawa, Orissa, collected on 14-12-1939 (Z.S.I. No. F. 13144/1) ; 12 specimens from Balka Nallah about 3 miles from Sihawa, Orissa, collected on 14-12-1939 (Z.S.I. No. F. 13145/1) ; 1 specimen from Mahanadi irrigation canal, Rudri, Orissa (Z.S.I. No. F. 13146/1) ; 1 specimen from Dr. F. Day's collection from Orissa (Z.S.I. Cat. No. 914) ; 1 specimen from Goalpara, collected by H. S. Higston (Z.S.I. Cat. No. 912) ; 1 specimen from Dr. F. Day's Collection from Sind (Z.S.I. Cat. No. 2478) ; 2 specimens collected by C. Pavia from Shalimar Gardens, Lahore, W. Panjab (Z.S.I. No. F. 9603-4/1) ; 1 specimen collected by F. M. Bailey from Tribani, Nepal (Z.S.I. No. F. 12266/1) ; 2 specimens from Nulla Katiar, Karachi District, Pakistan (B.N.H.S. No. 446-2 : the specimens are badly damaged) ; 1 specimen collected by Maj. N. Murphy from Jati, Karachi Dt., Pakistan (B.N.H.S. No. 446-3 : specimen badly damaged).

Vernacular Names: Kachhi (Bengali) after which the species name *cachius* was coined by Hamilton ; Day (1872) mentions that in Oriya the species is known as *Bonkuaso* and in Burmese as *Nga-man-dan* or *Ya-paw-nga* or *Nga-phyin-gyan.*

Laubuca-group

Chela (Chela) laubuca Hamilton

Cyprinus (Chela) laubuca Hamilton (Buchanan), Fish. Ganges, pp. 260, 384 (1822). Type locality : Ponds in northern parts of Bengal.

Perilampus guttatus McClelland, *Asiat. Res.* **19**, pp. 289, 394, pl. xlv, fig. 4 (1839) (erroneously marked pl. lvi, fig. 10 ; from Hamilton's MSS.).

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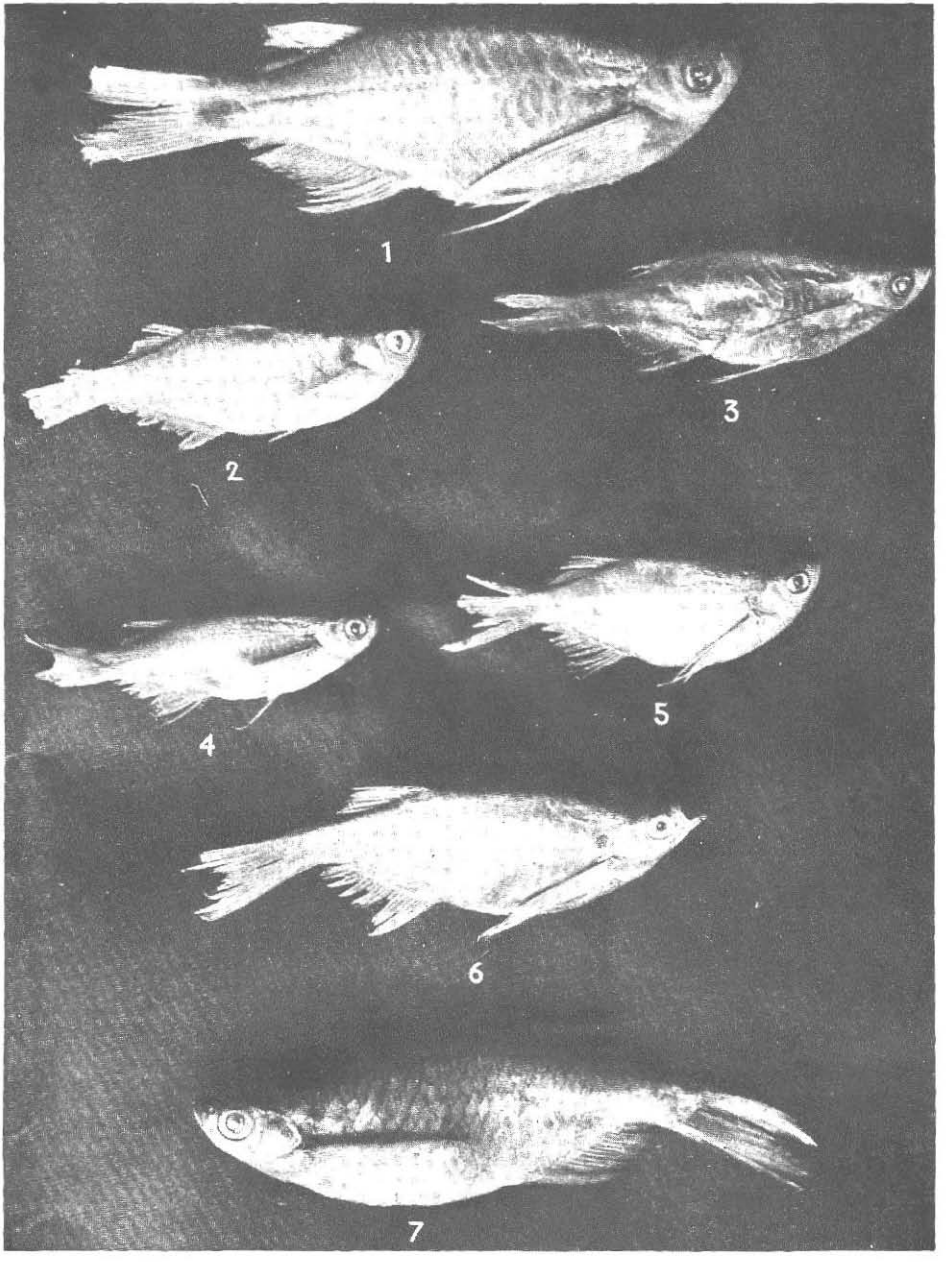
[1]Under ' Material examined ' the undermentioned abbreviations stand for :

Z.S.I.	=	Zoological Survey of India, Calcutta.
B.N.H.S.	=	Bombay Natural History Society, Bombay.
U.S.N.M.	=	United States National Museum, Washington D.C.
A.N.S.P.	=	Academy of Natural Sciences, Philadelphia.
C.M.	=	Colombo Museum, Ceylon.



Chela (Chela) laubuca Hamilton

Specimens from 1. Kelantan, Malaya, 63 mm., 2. Barrackpore, NE. India, 41 mm., 3. Sittang River, Burma, 44 mm., 4. Cauvery River, peninsular India, 37 mm., 5. Hazaribagh, NE. India, 33·5 mm., 6. Kambala Talao, Kathiawar Peninsula, western India, 50 mm., 7. Matungama, Ceylon, 58·5 mm. (The measurements in mm. denote the standard length of the specimens.)

Cyprinus laubuca Valenciennes, *Hist. Nat. Poiss.* **16**, p. 456 (1842).
Leuciscus laubuca Bleeker, *Verh. Bat. Genootsch* **25**, p. 138 (1853).
Perilampus fulvescens Blyth, *Journ. Asiatic Soc. Bengal*, p. 163 (1860). Type locality : Tennasserim, Burma ; Day, F., *Proc. Zool. Soc. London*, p. 559 (1869).
Laubuca guttatus Bleeker, *Atl. Ichthyol.*, p. 33 (1863).
Chela laubuca Günther, *Catal. Brit. Mus., Fish.* 7, p. 335 (1868) ; Smith, *Bull. U.S. Nat. Mus.* **188**, p. 81 (1945) ; Deraniyagala, *Colour. Atlas Ceylon Vert.* **I**, *Fishes*, p. 25 (1952).
Perilampus laubuca Day, *Proc. Zool. Soc. London*, pp. 380, 614 (1869) ; *Journ. Asiatic Soc. Bengal* **41**(2), p. 20 (1872) ; Fish. India, p, 598, pl. cli, fig. 5 (1878) ; *Fauna Brit. India, Fish*, p. 360, fig. 112 (1889) ; Pillay, *JBNHS* **33**, p. 357 (1929) ; John, *JBNHS* **38**, p. 713 (1936).
Laubuca (Laubuca) laubuca Deraniyagala, *Spol. Zeylan.* **16**, p. 34 (1930).
Laubuca laubuca Shaw & Shebbeare, *Journ. Roy. Asiatic Soc. Bengal* **3**, p. 20, fig. 12, pl. ii, fig. 16 (1938) ; Das, *Rec. Indian Mus.* **41**, p. 439 fig. 1 (1939).
Laubuca siamensis Fowler, *Proc. Acad. Nat. Sci. Philadelphia* **91**, p. 64, fig. 14 (1939). Type locality: Waterfall stream near Trang, Thailand.

D.2/8-10 ; P. 1/8-11 ; V.1/6 ; A. 2/17-22 (19-24) ; C.19 ; L. 1.31-37 ; L. tr. 6-7/1/2½-4

The detailed morphometric analysis of this species (Tables I—VII), based on material examined from Ceylon, peninsular India, Kathiawar Peninsula, north-eastern India, Burma, Thailand, and the Malay Peninsula, is given mainly with a view to indicate the range of variations to be expected in the species and also draw attention to any correlations that exist between the geographical location of the species and these variations. The samples from Ceylon, Burma, and Malaya are limited but, when compared to the typical form from the Gangetic watershed (north-eastern India), they seem to evince certain peculiarities in character, which might be interpreted as being of at least subspecific significance. In this revision, these variations are indicated, with the hope that later investigators, with larger samples to work on, will find it much easier to proceed.

As Hamilton's type of *Cyprinus laubuca* came from the Gangetic watershed, the sample examined here from north-eastern India from this watershed is considered as being typical and comparisions are made with this (Plate I, figs. 2, 5). The standard length of the specimens examined from this area ranges from 19 to 52 mm.

1. *Malay Peninsula* :—The specimens examined from Malay Peninsula are comparatively larger in size, being 53 to 61 mm. in standard length (Plate I fig. 1). The dark mid-lateral stripe is present, being more conspicuous in the posterior part of the body ending at the base of the

caudal fin as a precaudal spot. The shoulder spot is markedly distinct. The mid-dorsal stripe is narrow and the supra anal streak is faintly visible in the preserved specimens. The reticulated markings on the sides of the body above the pectorals are present, though indistinct.

In addition to these, the Malayan form has a much deeper body, longer caudal fin, shorter head, a comparatively shorter dorsal fin, longer pectoral and pelvic fins, a less deep caudal peduncle, a relatively higher count in the lateral line and predorsal scales, and, finally, the origin of the pelvic fin is in a more anterior position than seen in specimens from north-eastern India. In the remaining characters, they more or less agree with the latter.

It is likely, the variations encountered in the Malayan specimens might eventually prove to be of even greater significance than mere subspecific variation. These specimens, although agreeing in general with the description of *Laubuca* (*Laubuca*) *laubuca* of Sumatra, as given by Weber & de Beaufort (1916), show variations in the following details : the anal fin rays are 22 *versus* 21 in the Sumatran forms ; lateral line scales 34 to 36 *versus* 32 to 34 ; scales between lateral line and pelvic fin 2½ to 4 *versus* 5 ; diameter of eye in head length 3.12 to 3.75 *versus* nearly 3 ; diameter of eye in interorbital distance 1.5 to 1.8 *versus* less than 1.0 ; and predorsal scales 18 to 21 *versus* 18 or 19. Some of these differences may be accounted for as being due to differences in the size of the specimens (Malayan specimens 67 to 84 mm. in total length and the Sumatran specimens slightly over 60 mm.) and on account of the smaller samples studied. The problem is worthy of a more detailed investigation.

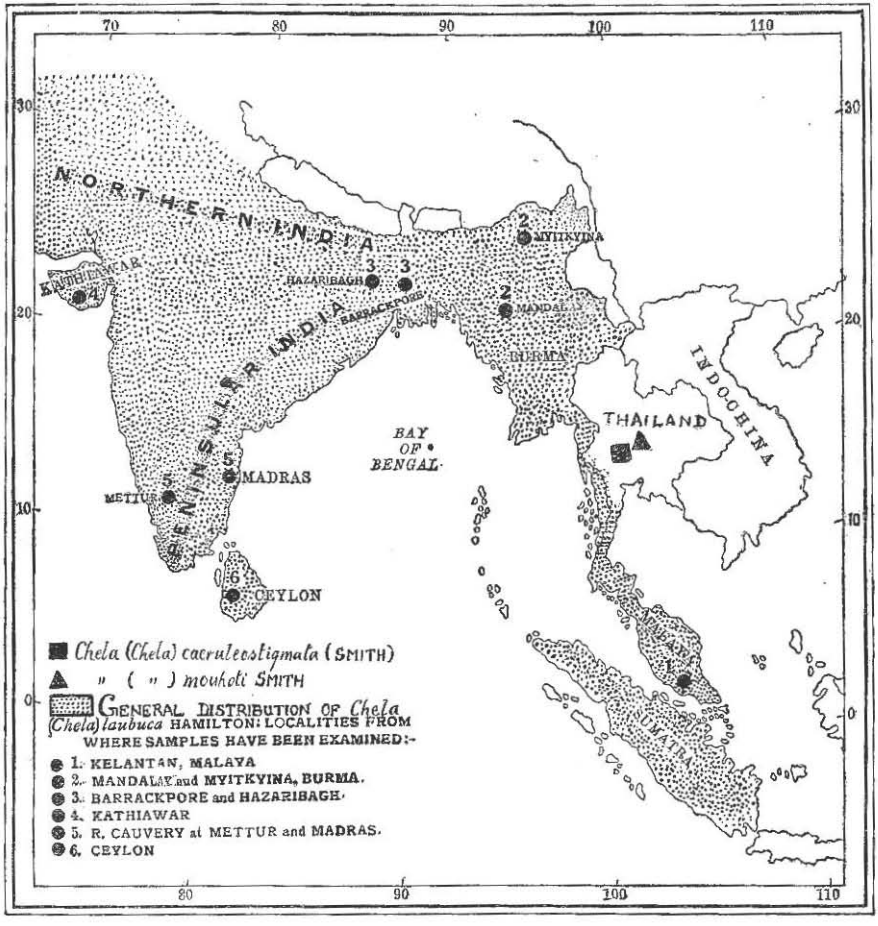
2. *Thailand*:—I had the opportunity of examining the type material of *Laubuca siamensis* Fowler while recently visiting the Academy of Natural Sciences, Philadelphia, and confirm the late Dr. H. M. Smith's view that *L. siamensis* is conspecific with *C. laubuca* Hamilton, for there seems to be no difference worthy of mention to separate it as a distinct species from the typical form.

3. *Burma*:—The specimens measure 27 to 55 mm. in standard length and as they have been in preservative over a long period much of the colour has been lost (Plate I fig. 3). The dark lateral stripe is faintly visible.

The body of the Burmese examples is much deeper and more compressed ; the dorsal and anal fins are relatively more posteriorly situated and have a higher predorsal count than in the typical form.

Perilampus fulvescens Blyth from Tennasserim, Burma, is very imperfectly characterised, and the description shows no difference from the characters of the Burmese examples both from the Irrawady and the Salween drainages presented here (Tables I-VII). As in the case of

L. siamensis Fowler from Thailand, I do not consider the minor differences noted in the Burmese specimens as being of sufficient importance to consider it a distinct species.



Text-figure 4.—Map showing the general distribution of *Chela* (*Chela*) *laubuca* Hamilton and the localities from where samples have been examined for the present study. The distribution of the Thailand species *caeruleostigmata* and *mouhoti* is also indicated.

4. *Kathiawar Peninsula, western India*:— Specimens measuring 26 to 50 mm. in standard length were collected by me from close to Porbandar (Plate I fig. 6). The coloration is as in those from NE. India; the dark lateral stripe being present in the form of a well-developed narrow stripe in the posterior three-fourths of the body; the shoulder spot well-developed; the precaudal spot more or less distinct in all the specimens; the mid-dorsal stripe less pronounced and the supra

TABLE I

Frequency distribution of the number of dorsal fin rays in *Chela (Chela) laubuca* Hamilton

Locality	Number of fin rays			No. of specimens	Range	Average	Percentage		
	10	11	12				10	11	12
1. Malaya	—	6	—	6	11	11.00	—	100	—
2. Burma	—	8	—	8	11	11.00	—	100	—
3. NE. India	1	20	1	22	10-12	11.00	4.54	90.90	4.54
4. Kathiawar	1	34	1	36	10-12	11.00	2.77	94.44	2.77
5. Peninsular India ..	18	1	—	19	10-11	10.05	94.73	5.26	—
6. Ceylon	—	4	—	4	11	11.00	—	100	—
Total	20	73	2	95	10-12	10.80	21.05	76.84	2.10

TABLE II

Frequency distribution of the number of pectoral fin rays in *Chela* (*Chela*) *laubuca* Hamilton

Locality	Number of fin rays				No. of specimens	Range	Average	Percentage	
	9	10	11	12				9-10	11-12
1. Malaya	—	—	2	4	6	11-12	11.66	—	100
2. Burma	—	—	1	7	8	11-12	11.87	—	100
3. NE. India	—	—	8	14	22	11-12	11.63	—	100
4. Kathiawar	1	6	19	10	36	9-12	11. 05	19.44	80.55
5. Peninsular India ..	—	—	6	12	18	11-12	11.66	—	100
6. Ceylon	—	—	3	1	4	11-12	11.25	—	100
Total	1	6	39	48	94	9-12	11.51	7.44	92.55

TABLE III

Frequency distribution of the number of anal fin rays in *Chela* (*Chela*) *laubuca* Hamilton

Locality	Number of fin rays						No. of specimens	Range	Average	Percentage	
	19	20	21	22	23	24				19-21	22-24
1. Malaya	—	—	—	6	—	—	6	22	22.00	—	100
2. Burma	5	1	1	1	—	—	8	19-22	19.75	87.5	12.50
3. NE. India	1	2	4	7	6	3	23	19-24	22.04	30.43	69.56
4. Kathiawar	3	15	15	1	—	—	34	19-22	20-41	97.05	2.94
5. Peninsular India ..	—	—	5	6	8	—	19	21-23	22.57	26.31	73.68
6. Ceylon	1	—	—	2	1	—	4	19-23	21.50	25.00	75.00
Total	10	18	25	23	15	3	94	19-24	21.37	56.38	43.61

TABLE IV

Frequency distribution of the number of lateral line scales in *Chela (Chela) laubuca* Hamilton

Locality	Number of Scales							No. of specimens	Range	Average	Percentage	
	31	32	33	34	35	36	37				31-34	35-37
1. Malaya ..	—	—	—	3	2	1	—	6	34-36	34.66	50.00	50.00
2. Burma ..	—	1	2	1	4	—	—	8	32-35	34.00	50.00	50.00
3. NE. India ..	1	2	6	7	4	—	—	20	31-35	33.65	80.00	20.00
4. Kathiawar ..	—	2	10	14	4	2	1	33	32-37	33.90	78.78	21.21
5. Peninsular India ..	—	3	5	2	5	—	—	15	32-35	33.60	66.66	33.33
6. Ceylon ..	—	—	1	1	1	1	—	4	33-36	34.50	50.00	50.00
Total ..	1	8	24	28	20	4	1	86	31-37	33.82	70.93	29.07

TABLE V

Frequency distribution of the number of predorsal scales in *Chela (Chela) laubuca* Hamilton

Locality	Number of Scales							No. of specimens	Range	Average	Percentage		
	15	16	17	18	19	20	21				15-16	17-19	20-21
1. Malaya	—	—	—	3	2	—	1	6	18-21	18.83	—	83.33	16.66
2. Burma	—	—	2	4	—	1	—	7	17-20	18.00	—	85.71	14.29
3. NE. India ..	—	8	9	2	—	—	—	19	16-18	16.68	42.10	57.90	—
4. Kathiawar ..	3	15	15	1	—	—	—	34	15-17	16.41	52.94	47.05	—
5. Peninsular India ..	—	2	7	5	2	—	—	16	16-19	17.43	12.50	87.50	—
6. Ceylon	—	—	1	2	—	1	—	4	17-20	18.25	—	75.00	25.00
Total ..	3	25	34	17	4	2	1	86	15-21	16.97	32.55	63.95	3.48

TABLE VI

Frequency distribution of the number of scales between the lateral line and the pelvic fin in *Chela* (*Chela*) *laubuca* Hamilton

Locality	Number of scales			No. of specimens	Range	Average	Percentage		
	$2\frac{1}{2}$	3	4				$2\frac{1}{2}$	3	4
1. Malaya	1	3	1	5	$2\frac{1}{2}$-4	3.10	25.00	50.00	25.00
2. Burma	1	7	—	8	$2\frac{1}{2}$-3	2.93	12.50	87.50	—
3. NE. India	—	17	—	17	3	3.00	—	100.00	—
4. Kathiawar	—	30	5	35	3-4	3.28	—	85.71	14.28
5. Peninsular India ..	1	10	—	11	$2\frac{1}{2}$-3	2.95	9.09	90.90	—
6. Ceylon	2	2	—	4	$2\frac{1}{2}$-3	2.75	50.00	50.00	—
Total	5	69	6	80	$2\frac{1}{2}$-4	3.04	6.25	86.25	7.50

TABLE

Table giving the range of morphometric characters of the samples (The number of specimens is given first, followed by the

Characters	Malaya	Burma	NE. India
Total length/Standard length ..	6 : 1.24—1.32 (1.30)	1 : 1.31 (1.31)	4 : 1.22—1.25 (1.23)
Total length/Length of head ..	6 : 5.53—5.84 (5.68)	1 : 5.11 (5.11)	4 : 4.83—5.00 (4.95)
Total length/Height of body ..	6 : 3.90—4.61 (4.10)	1 : 3.68 (3.68)	4 : 4.64—5.50 (4.91)
Total length/Width of body	6 : 9.22—12.16 (10.55)	1 : 11.50 (11.50)	4 : 9.66—10.00 (9.91)
Total length/Length of caudal fin ..	6 : 4.05—4.78 (4.29)	1 : 4.18 (4.18)	4 : 5.00—5.45 (5.29)
Standard length/Length of head ..	6 : 4.20—4.80 (4.35)	3 : 3.70—4.15 (3.91)	23 : 3.57—4.08 (3.82)
Standard length/Height of body ..	6 : 3.02—3.11 (3.14)	3 : 2.80—3.22 (2.95)	23 : 2.60—4.08 (3.29)
Standard length/Width of body	6 : 7.00—9.33 (8.09)	3 : 7.69-9.00 (8.48)	22 : 7.33—9.33 (7.99)
Standard length/Tip of snout to origin of dorsal fin	6 : 1.40—1.45 (1.43)	3 : 1.51—1.55 (1.53)	23 : 1.32—1.60 (1.49)
Standard length/Origin of dorsal to base of caudal fin	6 : 2.80—2.94 (2.86)	3 : 2.59—2.70 (2.64)	23 : 2.53—3.18 (2.82)
Standard length/Tip of snout to origin of anal fin	6 : 1.43—1.51 (1.47)	3 : 1.40—1.47 (1.44)	23 : 1.40—2.30 (1.59)
Standard length/Origin of anal to base of caudal..	6 : 2.52—2.70 (2.59)	3 : 2.38—2.84 (2.60)	23 : 2.25—3.06 (2.56)
Standard length/Tip of snout to origin of pelvic fin	5 : 2.20—2.65 (2.32)	3 : 2.05—2.17 (2.10)	23 : 2.05—2.35 (2.21)
Standard length/Origin of pelvic fin to base of caudal fin ..	5 : 1.39—1.56 (1.50)	3 : 1.38—1.68 (1.53)	23 : 1.56—1.80 (1.69)
Standard length/Length of caudal fin	6 : 3.06—3.78 (3.29)	1 : 3.18 (3.18)	4 : 4.00—4.45 (4.29)
Tip of snout to origin of dorsal fin/Origin of dorsal fin to base of caudal fin	6 : 1.95—2.05 (1.99)	3 : 1.66—1.75 (1.71)	23 : 1.68—2.19 (1.88)

VII

of *Chela* (*Chela*) *laubuca* examined, expressed here as ratios.
range, below which the mean is given in parenthesis)

Kathiawar	Peninsular India	Ceylon	Total No. of specimens	Total Range (Mean)
33 : 1.18—1.40 (1.29)	17 : 1.24—1.40 (1.31)	3 : 1.28—1.31 (1.29)	64	1.18—1.40 (1.29)
33 : 4.47—6.10 (5.37)	17 : 4.50—5.50 (4.99)	3 : 4.81—5.70 (5.30)	64	4.47—6.10 (5.27)
33 : 3.41—4.31 (3.81)	17 : 4.12—5.00 (4.50)	3 : 3.85—4.15 (4.02)	64	3.41—5.50 (4.10)
10 : 9.28—12.00 (10.92)	17 : 9.42—12.00 (10.66)	3 : 11.00—13.25 (12.08)	41	9.22—13.25 (10.75)
33 : 3.68—6.33 (4.44)	17 : 3.45—5.07 (4.24)	3 : 4.16—4.40 (4.35)	64	3.45—6.33 (4.17)
36 : 3.37—4.87 (4.14)	19 : 3.50—4.41 (3.38)	4 : 3.72—4.33 (4.14)	91	3.37—4.87 (4.00)
36 : 2.50—3.47 (2.95)	19 : 2.86—3.81 (3.38)	4 : 2.92—3.58 (3.22)	91	2.50—4.08 (3.15)
12 : 7.14—9.60 (8.50)	19 : 7.00—9.20 (8.19)	4 : 8.35—10.25 (9.13)	66	7.00—10.25 (8.24)
36 : 1.46—1.69 (1.55)	19 : 1.38—1.61 (1.48)	4 : 1.44—1.50 (1.48)	91	1.32—1.69 (1.51)
36 : 2.36—3.12 (2.67)	19 : 2.54—3.13 (2.79)	4 : 2.65—3.15 (2.82)	91	2.36—3.18 (2.75)
36 : 1.33—1.65 (1.45)	18 : 1.46—1.64 (1.54)	4 : 1.42—1.56 (1.48)	90	1.33—2.30 (1.57)
36 : 2.16—2.90 (2.56)	18 : 2.30—2.70 (2.47)	4 : 2.48—2.78 (2.58)	90	2.16—3.06 (2.54)
36 : 1.91—2.23 (2.05)	18 : 2.00—2.45 (2.25)	4 : 2.25—2.45 (2.36)	89	1.91—2.65 (2.14)
36 : 1.41—1.72 (1.55)	18 : 1.53—1.75 (1.61)	4 : 1.50—1.61 (1.57)	89	1.38—1.88 (1.59)
33 : 2.88—4.10 (3.42)	17 : 2.45—4.07 (3.24)	3 : 3.16—3.50 (3.35)	64	2.45—4.45 (3.41)
33 : 1.46—2.12 (1.86)	19 : 1.63—2.09 (1.87)	4 : 1.77—2.11 (1.91)	88	1.46—2.19 (1.87)

TABLE

Characters	Malaya	Burma	NE. India
Tip of snout to origin of dorsal fin/Origin of anal fin to base of caudal fin ..	6 : 1.68—1.83 (1.75)	3 : 1.61—1.94 (1.80)	23 : 1.31—1.94 (1.63)
Origin of pelvic fin to base of caudal fin/Tip of snout to origin of pelvic fin ..	5 : 1.44—1.69 (1.54)	3 : 1.23—1.56 (1.38)	23 : 1.21—1.43 (1.30)
Length of head/Width of head	6 : 1.64—2.14 (1.80)	3 : 1.80—1.85 (1.81)	19 : 1.77—2.33 (1.94)
Length of head/Height of occiput	6 : 1.40—1.64 (1.50)	3 : 1.50—1.58 (1.54)	19 : 1.33—1.87 (1.52)
Length of head/Length of snout	6 : 2.77—3.75 (3.25)	3 : 3.00—3.85 (3.36)	19 : 3.00—4.25 (3.50)
Length of head/Diameter of eye	6 : 3.12—3.75 (3.37)	3 : 3.00—3.85 (3.36)	19 : 3.00—4.00 (3.25)
Length of head/Interorbital distance	6 : 1.75—2.08 (1.90)	3 : 1.80—2.07 (1.95)	20 : 1.60—2.85 (1.96)
Interorbital distance/Diameter of eye ..	6 : 1.50—1.87 (1.77)	3 : 1.62—1.85 (1.71)	19 : 1.50—1.83 (1.70)
Length of snout/Diameter of eye	6 : 0.84—1.25 (1.05)	3 : 1.00 (1.00)	19 : 0.80—1.25 (0.93)
Height of body/Height of dorsal fin	5 : 1.50—1.79 (1.68)	2 : 1.56—1.58 (1.57)	12 : 1.00—2.00 (1.36)
Length of Pectoral fin/Length of head ..	6 : 1.60—1.66 (1.62)	2 : 1.55—1.61 (1.58)	14 : 1.33—1.55 (1.41)
Length of pelvic fin/Length of head	5 : 0.85—1.28 (1.08)	3 : 0.88—1.00 (0.93)	11 : 0.53—0.75 (0.70)
Length of head/Longest anal ray	6 : 0.89—1.20 (1.00)	3 : 1.11—1.35 (1.25)	8 : 1.20—1.50 (1.27)
Height of body/Length of head	6 : 1.20—1.40 (1.39)	3 : 1.14—1.46 (1.33)	23 : 0.90—1.42 (1.12)
Length of caudal peduncle/Least height of caudal peduncle	6 : 1.00—1.60 (1.24)	3 : 1.16—1.50 (1.27)	19 : 1.18—1.50 (1.31)

VII—*Continued*

Kathiawar	Peninsular India	Ceylon	Total No. of specimens	Total Range (Mean)
36 : 1.50—2.00 (1.76)	18 : 1.41—1.81 (1.60)	4 : 1.61—1.95 (1.74)	90	1.31—2.00 (1.69)
36 : 1.20—1.60 (1.32)	18 : 1.20—1.54 (1.40)	4 : 1.44—1.54 (1.50)	89	1.20—1.69 (1.36)
12 : 1.57—2.20 (1.81)	13 : 1.60—2.00 (1.76)	4 : 1.68—2.00 (1.87)	57	1.57—2.33 (1.84)
12 : 1.22—1.57 (1.40)	13 : 1.40—1.71 (1.60)	4 : 1.42—1.69 (1.51)	57	1.22—1.87 (1.51)
12 : 2.75—4.40 (3.64)	13 : 3.00—4.00 (3.53)	4 : 3.33—3.66 (3.42)	57	2.75—4.40 (3.50)
12 : 2.75—3.66 (3.18)	13 : 2.66—3.33 (3.25)	4 : 3.33—3.66 (3.42)	57	2.66—4.00 (3.27)
12 : 1.77—2.44 (2.06)	13 : 1.66—2.15 (1.90)	3 : 1.81—2.20 (1.98)	57	1.60—2.87 (1.99)
16 : 1.28—2.00 (1.62)	13 : 1.33—2.00 (1.72)	4 : 1.66—1.83 (1.72)	61	1.28—2.00 (1.69)
12 : 0.62—1.14 (0.89)	13 : 0.72—1.00 (0.94)	4 : 1.00 (1.00)	57	0.62—1.25 (0.95)
12 : 1.46—1.88 (1.69)	13 : 1.20—1.64 (1.39)	4 : 1.41—1.90 (1.69)	48	1.00—2.00 (1.52)
12 : 1.44—1.81 (1.56)	13 : 1.38—1.71 (1.54)	4 : 1.36—1.60 (1.52)	51	1.33—1.81 (1.52)
36 : 0.64—0.80 (0.78)	13 : 0.76—1.12 (0.95)	3 : 1.11—1.40 (1.25)	71	0.53—1.40 (0.84)
12 : 1.10—1.37 (1.21)	13 : 0.92—1.33 (1.01)	4 : 1.00—1.22 (1.09)	46	0.89—1.50 (1.13)
36 : 1.11—1.60 (1.39)	19 : 0.91—1.50 (1.12)	4 : 1.18—1.48 (1.29)	91	0.90—1.60 (1.26)
20 : 1.16—1.66 (1.30)	11 : 1.14—1.40 (1.29)	4 : 1.25—1.60 (1.42)	63	1.00—1.66 (1.30)

anal streak and the subpeduncular stripe etc. absent. A few golden and steel-blue vertical markings are seen on the sides of the body during life. In formalin-preserved specimens they take the shape of a few grey broad vertical patches, more clearly discernible in the anterior half of the body. The fins are generally yellowish.

The specimens differ from those from NE. India in having a more compressed and slightly deeper body ; shorter head, more posteriorly situated pelvic fins, and a lower anal fin ray count, none of which appear to be significant enough to consider them as being specifically distinct.

5. *Peninsular India* :—(Plate I, fig. 4) The specimens that I have examined are from the Cauvery River and are mostly immature, ranging from 14 to 34 mm. in standard length. They have a relatively longer caudal fin, a more elongated body which is less deep, more anteriorly situated pelvic fin, and a lower dorsal fin ray count than in the typical form.

6. *Ceylon* :—(Plate I, fig. 7). The specimens examined from Ceylon range from 41 to 58.5 mm. in standard length. When compared to the typical forms, the Ceylon specimens have a relatively shorter head, a much deeper body, a longer caudal fin, more anteriorly situated pelvic fins which are much longer ; smaller eyes, a longer caudal peduncle, a more posteriorly situated anal fin, and a higher lateral line and predorsal scale count.

General Remarks :—Characters such as the length of the head, the origin of the pelvic fin and its length, the number of lateral line scales, predorsal scales, and transverse row of scales on the body and the dorsal and anal fin rays seem to be more dependable for a study of geographical variations in this species as variations in these characters are found to have some consistency and correlation with the geographical location of the species. Although the height of the body may depend on the size of the specimens, the relatively deeper body of the Malayan and Ceylonese specimens indicates something more than mere individual variation. This study points to the fact that like *cachius* the species *laubuca* is also polytypic.

Distribution :—Ceylon, India, Pakistan, Burma, peninsular Thailand, Malay Peninsula, and Sumatra.

Material Examined :—(*a*) *Malay Peninsula.* 5 specimens from River Kondar, Kelantan, Malay Peninsula (Unregistered collection at the Z.S.I. received from the Raffles Museum) ; 1 specimen from Kaki Bukti, Perlis, Malay Peninsula (Unregistered collection at the Z.S.I. received from the Raffles Museum). (*b*) *Thailand.* 3 specimens, being the type and 2 paratypes of *Laubuca siamensis* Fowler collected by

the R.M.de Schauensee Siamese Expedition from a waterfall stream at Trang, Thailand, on 13 October 1936 (A.N.S.P. Cat. No. 68496 Type ; Cat. No. 68497-68498 Paratypes). (*c*) *Burma.* 1 specimen from Moulmein, Burma, from Day's collection (Z.S.I. Cat No. 906) ; 4 specimens from Sittang River, Burma, from Day's collection (Z.S.I. Cat. No. 908) ; 1 specimen from Mandalay, Burma, from Day's collection (Z.S.I. Cat. No. 913) ; and 2 specimens from the north end of Indawgyi Lake near Ngaungbin Village, Myitkyinea Dt., Upper Burma (Z.S.I. No. F. 10960/1). (*d*) *Kathiawar Peninsula, western India.* 26 specimens collected by me from Ranavikra and Sukala Talao, close to Porbandar; 10 specimens collected by me from Kambala Talaos, 23 miles off Porbandar; [2 specimens from Saidabad, Karachi Dt., Pakistan (B.N.H.S. No. 447-1) are very badly damaged]. (*e*) *Peninsular India.* 19 specimens from the Cauvery River at Hogaikanal Falls (Mettur Survey) opposite Dak Bungalow (Unregistered collection : Z.S.I.) ; (*f*) *Ceylon.* 1 specimen from Kallarouya, Cheddikulum, Ceylon ; 1 specimen from Matungama, Ceylon ; 2 specimens from Manampitiya, Ceylon—all received on loan from the Colombo Museum, Ceylon.

Vernacular Names:—Day (1872) mentions the following vernacular names for this species : *Layubuka* and *Dankena*, Bengali ; *Dannahrah*, Hindi ; *Bankoe*, Oriya ; and *Nga-me-loung*, Burmese.

Chela (Chela) caeruleostigmata (Smith)

(Text-Figure 2, *c*)

Laubuca caeruleostigmata Smith, *Proc. U.S. Nat. Mus.* **79**, p. 5, fig. 3 (1931). Type locality : Menam Chao river and its tributaries, central Thailand.

Chela caeruleostigmata Smith, *Bull. U.S. Nat. Mus.* **188**, p. 79, fig. 3 (1945).

D.2/11 ; P.1/10 ; V.1/5 ; A.2/22 ; C.19 ; L.1.34-35 ; L. tr. 8½-9/1/4½-5.

The head is contained about 5.2 in the total and 3.9. to 4.2 in the standard length. The height of the body is about 2.8 in the total and 2.05 to 2.25 in the standard length. The width of the body is contained about 7.16 in the standard length. The mouth is almost vertically directed upwards, the cleft not extending below the anterior margin of the eye. The height of the head at occiput is contained about 1.37, width of head about 1.57, and length of snout about 3.14 in the length of the head. The diameter of the eye is contained 3.5 to 3.66 in the head length, 1.5 to 2.16 in the interorbital distance, and about 1.17 in the length

of the snout. The interorbital distance is about 1.7 times contained in the length of the head, while the latter is about 1.91 times contained in the height of the body. The caudal peduncle is much deeper than long, its least height being 0.58 of its length and contained about 1.83 to 2.0 times in the length of the head.

The distance from the tip of the snout to the origin of the dorsal fin is contained 1.53, origin of the dorsal fin to base of the caudal fin about 2.7, tip of snout to origin of the anal fin about 1.4, origin of the anal fin to base of caudal fin about 2.32, tip of snout to origin of pelvic fin about 1.79, and distance from origin of pelvic fin to base of caudal fin about 1.48 in the standard length. The distance from the tip of the snout to the origin of the dorsal fin is 1.75 times the distance from the origin of the dorsal fin to the base of the caudal fin ; tip of snout to the origin of the anal fin about 1.67 times that of the distance from the origin of the anal fin to the base of the caudal fin, and the origin of the pelvic fin to the base of the caudal fin is about 1.2 times the distance from the tip of the snout to the origin of the pelvic fin.

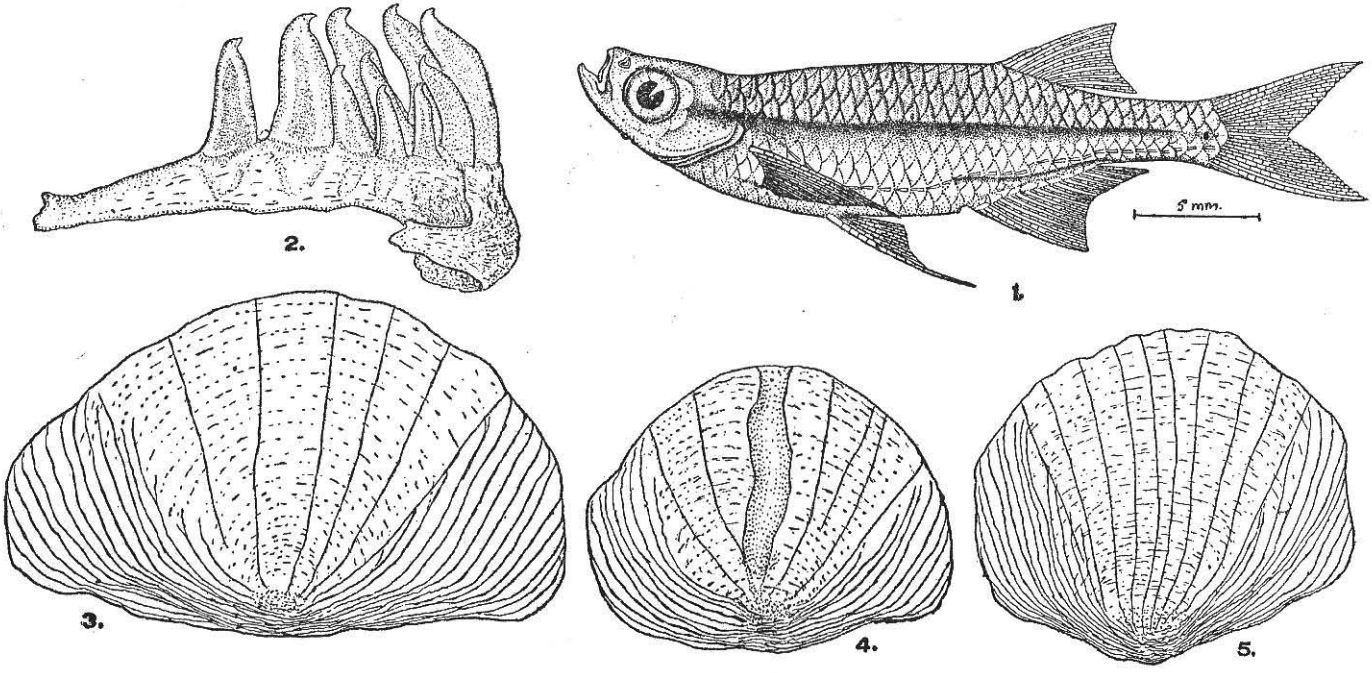
The height of the dorsal fin is contained about 1.29 in the length of the head and about 2.47 in the greatest height of the body. Pectoral fin is 1.75 to 2.0 times longer than the head. The pelvic fin is more than half the length of the pectoral fin and its outer ray is filamentous and about 1.04 times the length of the head. The length of the longest anal ray is contained about 1.29 to 1.5 times in the head length. The caudal fin is longer than the head and is deeply forked.

The lateral line scales number 34 to 35 and there are 17 to 19 predorsal scales. The scales round the narrowest part of the caudal peduncle number 12 or 13 rows. At least $4\frac{1}{2}$ or 5 rows of scales are present between the lateral line and the origin of the pelvic fin in an oblique series, and about 8 to 9 rows between the lateral line and the point of origin of the dorsal fin. Anteriorly, the keeled abdominal surface extends to almost a vertical below the anterior origin of the pectoral fin.

The characteristic coloration of this species is given in the synopsis to the species on page 65.

Distribution: Menam Chao River and its tributaries, central Thailand.

Material examined: In August 1956, I had occasion to examine the type and paratypes of this species in the collection of the U.S. National Museum, Washington D.C. Besides these, one paratype (Z.S.I. No. F. 11163/1) from Menam Chao Phye, below Nakon Sawan, central Thailand, has been examined for drawing up the above redescription.



Chela (*Allochela*) *fasciata* subgen. et sp. nov.

1. Lateral view of the Holotype 25 mm. in standard length ; 2. Pharyngeal bone and its teeth from a paratype. × 23½ ; 3. scale from side of body from above and ahead of pelvic fin × 40 ; 4. Scale from lateral line in front of pelvic fin × 40 ; 5. Scale from side of caudal peduncle above lateral line. × 40.

Chela (Chela) mouhoti Smith

(Text-Figure 2, *d*)

Chela mouhoti Smith, *Bull. U.S. Nat. Mus.* **188**, p. 81, fig. 4 (1945). Type locality : Pasak River at Pechabun, central Thailand.

A brief diagnosis of this species after Smith (1945) is given below to facilitate reference :

D. 3/10 ; A.3/23 ; L.1.31 ; L.tr. 7/1/5-6

Head 5.3 in total (from figure) and about 4.0 in standard length. Height of body 3.2 in total (from figure) and 2.25 in standard length. Mouth oblique, cleft extending to vertical below anterior margin of eye. Diameter of eye 3.0 in head length, 1.0 in interorbital width and slightly more than length of snout. Predorsal scales 20, and scales round caudal peduncle 14. Dorsal shorter than length of head, pectoral 1.75 times longer than head and equalling height of body, and pelvics more than half the length of head. Longest anal ray equals height of dorsal fin. Caudal deeply forked. Height of caudal peduncle at its narrowest part equals its length and is also equal to half the head length. In addition to the well-developed shoulder spot, the species has ' a faint median dark stripe on back from head half way to dorsal fin (predorsal stripe) ; back at base of dorsal and on upper part of caudal peduncle dark, dorsal and pectoral with blackish dots distally, caudal lobes dusky'.

Distribution: Pasak River at Pechabun, central Thailand. The species is known from only the type specimen at present in the collection of the U.S.National Museum (U.S.N.M. No. 107959) which I had occasion to examine in August 1956.

Subgenus ALLOCHELA *nov.*

The diagnostic characters of the subgenus are given on page 64. A description of the subgenotype is given below.

Subgenotype :—Chela (Allochela) fasciata sp. nov.

Chela (Allochela) fasciata *sp. nov.*[1]

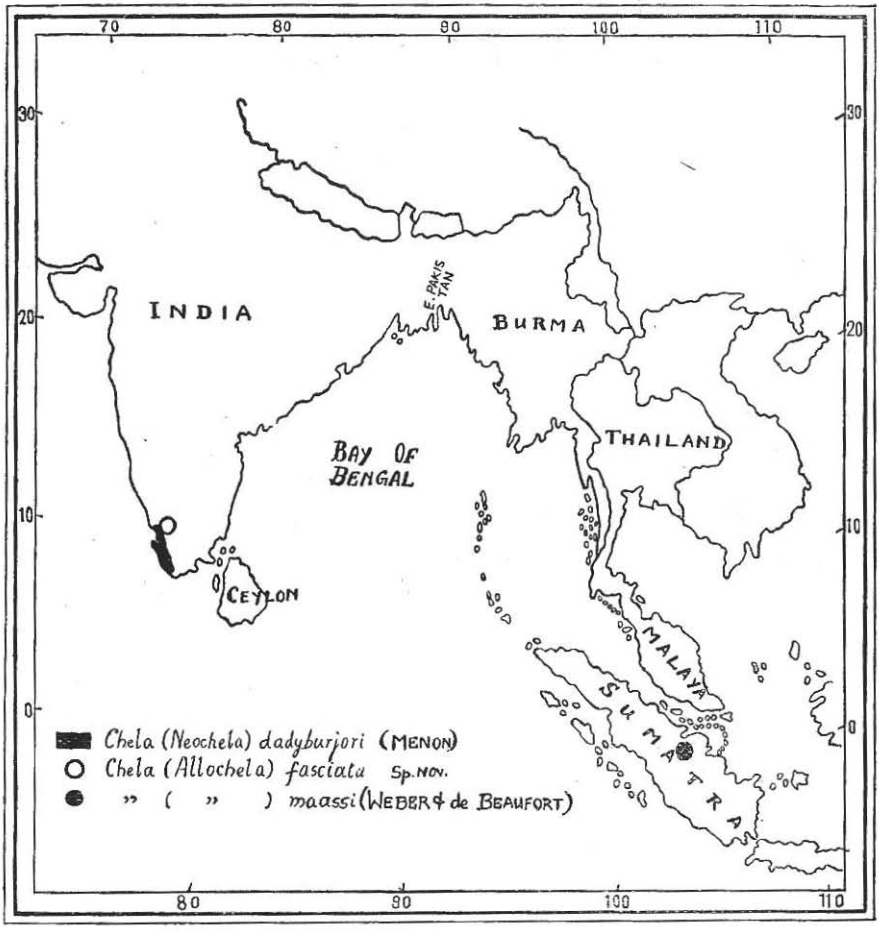
(Pate II, figs. 1–5)

D. 2/7 ; P. 1/9 (1/8-9); V. 1/6 (1/5-6) ; A. 3/15 (3/14-15) ; C. 19 ; L. 1.34 (33-34) ; L. tr. $6/1/1\frac{1}{2}$ ($1-1\frac{1}{2}$)

Chela (Allochela) fasciata is a small species in which the body is slightly elongate and the head is slightly turned upwards. The dorsal

[1] In the description of the new species, the scales, the number of fin rays, and measurements of the Holotype measuring 25 mm. in standard length is given. This is followed in parenthesis by the range of variations, if any, shown by all the specimens (Holotype plus the 2 Paratypes).

profile is almost straight from the occiput to the origin of the dorsal fin from whence it slopes down gently to the base of the caudal fin. The ventral profile is slightly arched. The length of the head is contained 5.16 in the total and 4.16 (3.83-4.16) in the standard length. The width of the head is contained 1.71 (1.71-1.92), and the height of the head at



Text-figure 5.—Map showing the distribution of *Chela* (*Allochela*) *fasciata* sp. nov., *Chela* (*Allochela*) *maassi*, and *Chela* (*Neochela*) *dadyburjori*.

occiput 1.5 (1.5-1.71) in its length. The snout is very short, its length being contained 6.0 times (5.2-6.0) in the length of the head. The mouth is small and is obliquely directed upwards. The cleft of the mouth does not extend to below the anterior margin of the orbit. The eyes are large and are situated more in the anterior half of the head. The diameter of the eye is contained 3.0 (3.0-3.37) in the head length and 1.37 (1.37-1.5)

in the interorbital width. It is 0.5 (0.5-0.62) times the length of the snout. The interorbital space is almost flattened.

The greatest height of the body equals almost the length of the head and is 5.16 in the total and 4.16 (3.83-4.33) in the standard length. The width of the body is contained about 2.0 times in its height. The caudal peduncle is narrower and its least height is contained 1.77 (1.6-2.0) in its length and 2.66 (2.66-3.0) in the length of the head.

The dorsal fin is situated in the posterior third of the body (without the caudal fin) and its origin is opposite the second branched ray of the anal fin. The height of the dorsal fin is equal to or slightly shorter than the greatest height of the body, it being contained 1.2 (1.0-1.2) in the latter. The last undivided dorsal ray is weak, non-osseous, and articulated. The pectorals are long, being 1.33 (1.33-1.38) times longer than the head. They extend considerably beyond the commencement of the pelvic fins. The pelvic fin is longer than the head, its length being at least 1.16 times that of the latter. The outer pelvic ray is greatly elongated and when adpressed extends beyond the commencement of the anal fin. The anal fin is moderately elongated and its outer margin is slightly concave. The third to the eighth anterior anal rays are longer than the rest and the longest ray equals the height of the dorsal fin, but is slightly less than the head length. The caudal fin is forked and the lobes are pointed and of equal length. The length of the caudal fin is contained 5.16 in the total and 4.16 in the standard length.

The distance from the tip of the snout to the origin of the dorsal fin is 1.94 (1.87-1.94) times longer than the distance between the origin of the dorsal fin and the base of the caudal fin.

The scales are moderately large, well developed, and are longer in the dorso-ventral axis than in the cephalo-caudal axis. The lateral line is complete and strongly curved down from above the pectoral fin. The lateral line scales number 34 (33-34). There are also 34 (33-34) scales in a longitudinal series from the upper angle of the gill-opening to the middle of the base of the caudal fin. 6 rows of scales are present above the lateral line to the mid-dorsal row (exclusive), and $1\frac{1}{2}$ ($1-1\frac{1}{2}$) rows between the lateral line and the base of the pelvic fin. The predorsal scales number 18. There are 9 (9–10) rows of scales round the narrowest part of the caudal peduncle. A sheath-like row of scales are present along the base of the anal fin. Three scales, one from the side of the body (Plate II, fig. 3), a second from the lateral line (Plate II, fig. 4), and a third from the side of the caudal peduncle (Plate II, fig. 5), are figured here from among several others examined to note their structural variations. Fundamentally all agree in being devoid of basal and lateral radii, and the circuli in the apical part of the scales are indistinct or ' degenerate '. The nucleus is basal in

position. A progressive increase in the number of apical radii and basal and lateral circuli is to be seen in the scales from the anterior part of the body.

TABLE VIII

Table giving the range, average, etc. of body proportions and scale counts of *Chela* (*Allochela*) *fasciata* sp. nov., the former expressed as ratios.

Characters	*No.*	*Holotype*	*Range*	*Average*
1. Total length/length of head.	1	5.16	5.16	5.16
2. Total length/length of caudal fin.	1	5.16	5.16	5.16
3. Total length/height of body	1	5.16	5.16	5.16
4. Standard length/length of head.	3	4.16	3.83—4.16	3.95
5. Standard length/length of caudal fin.	1	4.16	4.16	4.16
6. Standard length/height of body.	3	4.16	3.83—4.33	4.16
7. Length of head/width of head.	3	1.71	1.71—1.92	1.82
8. Length of head/height at occiput.	3	1.50	1.50—1.71	1.63
9. Length of head/length of snout.	3	6.00	5.20—6.00	5.73
10. Length of head/diameter of eye.	3	3.00	3.00—3.37	3.12
11. Length of snout/diameter of eye.	3	0.50	0.50—0.62	0.54
12. Interorbital distance/diameter of eye.	3	1.37	1.37—1.50	1.41
13. Height of body/width of body.	3	0.50	0.50	0.50
14. Length of caudal peduncle/its least height.	3	1.77	1.60—2.00	1.79
15. Height of body/height of dorsal fin.	3	1.20	1.09—1.20	1.16
16. Length of head/length of pectoral fin.	3	1.33	1.33—1.38	1.34
17. Length of head/length of pelvic fin.	2	1.16	1.16	1.16
18. Tip of snout to origin of dorsal/origin of dorsal to base of caudal fin.	3	1.94	1.87—1.94	1.89
19. Tip of snout to origin of anal/origin of anal to base of caudal fin.	3	1.60	1.57—1.60	1.58
20. Origin of pelvic fin to base of caudal fin/tip of snout to origin of pelvic fin.	3	1.40	1.40—1.55	1.47
21. Standard length/tip of snout to origin of dorsal fin.	3	1.51	1.51—1.53	1.52
22. Standard length/origin of dorsal fin to base of caudal fin.	3	2.94	2.77—2.94	2.86
23. Standard length/tip of snout to origin of anal fin.	3	1.56	1.53—1.57	1.55
24. Standard length/origin of anal fin to base of caudal fin.	3	2.50	2.42—2.50	2.46
25. Standard length/tip of snout to origin of pelvic fin.	3	2.27	2.26—2.30	2.27
26. Standard length/origin of pelvic fin to base of caudal fin	3	1.61	1.48—1.61	1.54
27. Number of lateral line scales.	3	33	33—34	33.33

The pharyngeal bone is about 5 times as wide as long. Its anterior edentulous process is fairly long and the pitted surface is narrow. The

teeth are compressed and hooked and are placed in three rows, the formula being, 5.3.2.—2.3.5.

The coloration of the species is very characteristic. The upper half of the body is greyish and the scales on the upper half of the body have dark edges. The dark lateral stripe is broad, commences just behind the eye and runs along the middle of the body to almost the base of the caudal fin. A very well defined black supra-anal streak is present ; and so also the subpeduncular stripe. The mid-dorsal stripe running from the occiput to the origin of the dorsal fin is about one scale broad at its commencement. The fins are dirty white in colour. The margins of the upper and lower jaws are pigmented dark. The lower half of the body and the abdomen are lighter in colour.

Type specimens :—The Holotype 25 mm. in standard length (Z.S.I. No. 744/2) and the paratypes 23 and 26 mm. in standard length (Z.S.I. No. 745/2) have been deposited in the collection of the Zoological Survey of India, Calcutta.

Type locality :—Annamalai River at the base of the Annamalai Hills at a place called Vannathurai in Chittur Taluk, Malabar, peninsular India.

Chela (Allochela) maassi (Weber & de Beaufort)

(Text-figure 2, *e*)

Eustira maassi, Weber and de Beaufort, *In Maass : ' Durch Zentral Sumatra, Bd.* **2**, *Fishe*, p.531 (1912). Type locality : Gunung Sahilan on river Kamper, Sumatra.

Laubuca (*Eustira*) *maassi* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.* **3**, p. 49, fig. 21 (1916).

A brief diagnosis of this species after Weber & de Beaufort (1916) is given below to facilitate reference :

D.2/7 ; A.3/10 ; P.1/11 ; V.1/6 ; L.1.34 ; L. tr. $6\frac{1}{2}/1/1$-2

Head about 5.6 in total length (in figure) and 3.75 (about 4.1 in figure) in standard length. Height of body about 5.0 in total (in figure) and 3.3 in standard length. Diameter of eye contained 3.5 in head length, slightly more than one diameter of interorbital space and 1.3 times longer than snout. Mouth oblique, cleft reaching to about vertical below anterior margin of orbit. Predorsal scales number 20. Height of dorsal more than length of head ; longest anal ray equals half height of body ; pectorals 1.3 times longer than head, extending beyond pelvic origin ; pelvic fins half as long as height of body. Caudal fin long, more than

0.25 in total length. Least height of caudal peduncle contained about 2.0 times (in figure) in its length.

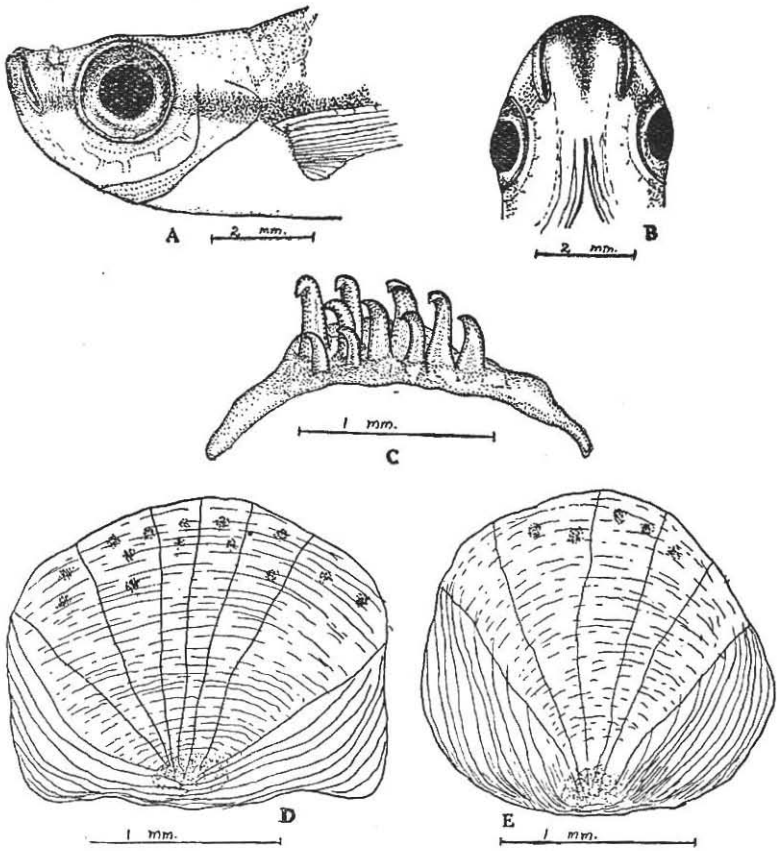
The colour of the species is said to be ' brown, back darker, a dark longitudinal band running from operculum to middle of base of caudal (dark lateral stripe), where it ends in a dark patch (precaudal spot). Fins hyaline. A dark median band along the back (middorsal stripe).'

Distribution:—Gunung Sahilan on river Kampar, Sumatra.

Subgenus NEOCHELA *nov.*

A diagnosis of this new subgenus is given on page 64.

Subgenotype:—*Laubuca dadidurjori* Menon [= *Chela* (*Neochela*) *dadyburjori* (Menon)].



Text-figure 6.—*Chela* (*Neochela*) *dadyburjori* (Menon). 1. Lateral view of head ; 2. Ventral view of anterior part of head; 3. Pharyngeal bone and the teeth arranged in three rows ; 4. Scale from side of body in front of dorsal origin ; 5. Scale from side of caudal peduncle.

Chela (Neochela) dadyburjori[1] (Menon)

(Text figure 2, *b* and 6, A-E.)

Laubuca dadidurjori Menon, *Rec. Indian Mus.* **49**, pp. 1-4 (1952). Type locality : Cochin, India.

Laubuca dadyburjori Dadyburjor, *Bull. Bombay Aquar. Soc.* **3**, (Nos. 1-2), pp. 12-13 (1955).

The type specimens of this species were not traceable in the fish collection of the Zoological Survey of India when required by me for reference early in 1955. However, I have recently received a small sample of this species from Trivandrum, Kerala State. In view of the several discrepancies and inaccuracies in the description of the type material and the table of measurements given for the same (Menon, 1952), a detailed analysis based on the present sample is given below :

D.2/7 ; A.3/11-12 ; P.1/7-9+2-3 ; V.1/5 ; C.17-18 ; L. tr. 7-8

In the accompanying tables the ratios of body proportions and the frequency distribution of the number of fin rays and scales are given. Clarifications on a few points which appear misleading in the descriptions of the types (Menon, *op. cit.*) are given below :

1. The eyes are situated more in the anterior half of the head and not ' entirely in the anterior half of the head '.

2. The first two rays of the dorsal fin and the first three rays of the anal fin are soft rays which are non-osseous, undivided, and the longest of these in each fin is articulated towards its tip and not ' The dorsal fin .... contains 2 spines and 7 branched rays .... the anal fin .... contains 3 spines and 11 branched rays '. In fact, ' spines ' are alien to fishes of the genus *Chela*.

3. The lateral line is absent in five of the ten specimens and when present it is seen as 2, 3, or 4 perforated scales just below the pectoral fin, near its base.

4. That ' The body is greatly compressed from side to side with a sharply cutting abdominal edge ' as given in the description of the types does not appear to be correct. In *dadyburjori*, the body is not greatly compressed as in species of *Chela* s. str., but is as in *Rasbora*, and the keeled nature of the abdomen is only very faintly indicated from the posterior third of the abdomen to the vent.

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[1] Three different spellings have been used to denote the species, namely *dadidurjori* and *dadiburjori* by Menon and *dadyburjori* by Sam Dadyburjor. The correct rendition of the species name appears to be that given by Dadyburjor and this amended spelling (*dadyburjori*) is used here.

5. The pectoral fin has got 2 or 3 minute, short, undivided rays at the inner (lower) angle of its base, in addition to the first undivided and 7 to 9 branched rays.

6. The caudal fin is subequal, the lower lobe being slightly the longer.

Other additional characters are as follows :

The branchiostegels are three in number. The pharyngeal teeth are triserial, the formula being 5-3-2/2-3-5 (Text-figure 6, C). The teeth are uncinate. The air-bladder is bipartate, the posterior chamber being the longer as is typical of the Cyprinidae.

The caudal fin has 15 or 16 branched rays. The pelvic fin does not extend beyond the origin of the anal fin and in a few examples reaches only up to the vent. The scales, one from the side of the body above the pectoral fin (Text-figure 6, D) and another from the side of the caudal peduncle (Text-figure 6, E), are figured here showing the details. There are nine rows of scales round the narrowest part of the caudal peduncle.

The colour of the species is very characteristic. When the specimens preserved in about 7% formalin were received from Trivandrum, some of the original colour markings were still present. In the larger examples the sides of the body above and near the base of the pectoral fins were tinged lemon-yellow with the dark pigment spots on the scales showing clearly. The dorsal and caudal fins were also tinged lemon-yellow with transparent margins, while the anal fin was light orange tipped with grey. The pectoral and pelvic fins were colourless except for the dark minute pigment spots on the outer rays of the pectorals. Within a week of receiving the specimens, most of these colour markings had disappeared. As regards the basic colour pattern, the dark mid-lateral stripe extends anteriorly to the posterior margin of the orbit and is continued again from the anterior margin of the orbit to the angle of the mouth (Text-figure 6, A). The margin of the lips is pigmented black and on the lower jaw from the symphysis running backwards to about a line between the angles of the mouth is a conical patch of black pigment spots (Text-figure 6, B). The posterior border of the scales on the back in front of the dorsal fin is bordered by a row of black pigment spots and the scales in the upper half of the body are minutely pigmented to give the appearance of a greyish tinge to the upper half of the body. The abdomen is whitish, with a few black pigment spots distributed along the sides. The vent in all the specimens is surrounded by a row of prominent pigment spots.

The dark mid-lateral stripe has on it 2 to 5 black circular spots from below the dorsal to the angle of the gill-opening more or less evenly spaced. The mid-dorsal stripe is more pronounced in the predorsal region than posteriorly. The subpeduncular and the supra anal streaks are present.

Distribution:—In streams, tanks, and pools in Cochin and Trivandrum, Kerala State, peninsular India.

Material examined:—10 specimens ranging from 15.5 to 21 mm. in standard length (19 to 28 mm. in total length) collected from small pools near the aerodrome, Trivandrum, by Mr. C. T. Samuel on 5-1-1958. (B.N.H.S.No. F.1/1).

Remarks:—The collection of this species from Trivandrum extends its distribution by well over a hundred miles to the south from Cochin, the type locality.

TABLE IX

Table showing the range, average, etc. of body proportions in *Chela (Neochela) dadyburjori*, expressed as ratios.

Characters	No. of specimens	Range	Average
1. Total length/standard length	10	1.21—1.35	1.27
2. Total length/length of head	10	4·44—5.60	4.90
3. Total length/height of body	10	5.33—6.33	5.75
4. Total length/width of body	10	8.80—11.20	10.95
5. Total length/length of caudal fin	10	3.81—5.57	4.67
6. Standard length/length of head	10	3.44—4.20	3.84
7. Standard length/height of body	10	4.00—5.16	4.50
8. Standard length/width of body	10	6.80—8.62	7.90
9. Standard length/tip of snout to origin of dorsal fin	10	1.48—1.68	1·55
10. Standard length/origin of dorsal to base of caudal fin	10	2.50—3.00	2.78
11. Standard length/tip of snout to origin of anal fin	10	1.50—1.68	1.61
12. Standard length/origin of anal to base of caudal fin	10	2.41—2.83	2.62
13. Standard length/tip of snout to origin of pelvic fin	10	2.06—2.30	2.15
14. Standard length/origin of pelvic to base of caudal fin	10	1.77—1.93	1.83
15. Standard length/length of caudal fin	10	2.81—4.57	3.72
16. Tip of snout to origin of dorsal/origin of dorsal to base of caudal fin	10	1.58—1.90	1.77
17. Tip of snout to origin of anal/origin of anal to base of caudal fin	10	1.46—1.75	1.62
18. Origin of pelvic to base of caudal/ tip of snout to origin of pelvic fin	10	1.06—1.28	1.16
19. Length of caudal peduncle/least height of caudal peduncle	10	1.62—2.40	2.02
20. Length of head/width of head	10	1.60—2.11	1.81
21. Height of body/length of head	10	0.75—1.05	0.85
22. Length of head/height at occiput	10	1.53—2.00	1.74
23. Length of head/longest anal ray	10	1.20—1.80	1.34
24. Length of head/length of snout	10	3.33—5.73	4.32
25. Length of pelvic fin/length of head	10	0.34—0.70	0.48
26. Length of head/diameter of eye	10	2.50—3.21	2.93
27. Length of pectoral/length of head	10	1.15—1.70	1.30
28. Length of head/interorbital distance	10	1.73—2.28	2.05
29. Height of body/height of dorsal fin	10	1.00—1.53	1.26
30. Interorbital distance/diameter of eye	10	1.25—1.73	1.43
31. Length of snout/diameter of eye	10	0.53—0.86	0.68

TABLE X

Frequency distribution of the number of fin rays and scales in *Chela (Neochela) dadyburjori* based on a sample from Trivandrum, Kerala State

(N = Number of specimens ; R = Range ; M = Mean)

	Pectoral fin rays[1]					Anal fin rays		Caudal fin rays	
Fin rays ..	1/7+2 (=10)	1/8+2 (=11)	1/8+3 (=12)	1/9+2 (=12)	1/9+3 (=13)	3/11 (=14)	3/12 (=15)	1+15+1 (=17)	1+16+1 (=18)
No. of specimens ..	1	2	7	8	2	6	4	7	3
Percentage ..	5%	10%	35%	40%	10%	60%	40%	70%	30%
	N = 20 fins ; R = 10–13 ; M = 11.9					N = 10 ; R = 14–15 ; M = 14.4		N = 10 ; R = 17–18; M = 17.3	

[1] This includes the fin-ray counts of both the pectoral fins (left and right) in each specimen.

	Predorsal scales			Scales between origin of dorsal and anal fins			Scales from mid-dorsal row (exclusive) to origin of pelvic fin			
No. of scales ..	17	18	19	6	7	8	6	7	8	9
No. of specimens ..	1	5	4	1	8	1	—	3	7	—
Percentage ..	10%	50%	40%	10%	80%	10%	—	30%	70%	—
	N = 10 ; R=17–19 ; M = 18.3			N = 10 ; R = 6–8 ; M = 7			N = 10 ; R = 7–8 ; M = 7.7			

Lateral linear scales

No. of scales ..	30	31	32	33	34	35	36
No. of specimens ..	—	—	1	3	4	2	—
Percentage ..	—	—	10%	30%	40%	20%	—

N = 10 ; R = 32–35 ; M = 33.7

Economic Importance

1. *As larvicidal fishes:* The larvicidal propensity of *Chela* (=*Laubuca*) was commented on by Chaudhuri (1911), Southwell (1920), and Hora and Mukerji (1938). Although not comparable to the Cyprinodonts in this respect, *Chela* may be considered as a useful substitute and is of fair quality for larvicidal work. The two Indian species, *laubuca* and *cachius*, breed freely in ponds, tanks, and small streams, and in these habitats whenever they occur they are found in large numbers. Their easy availability on account of their wide distribution stands in their favour of being used as larvicidal fish.

2. *As aquarium fishes:* Ichthyological literature is studded with numerous instances of new species, especially from among the smaller carps, minnows, and loaches having been brought to light through the help of aquarium hobbyists. The dainty little species, *Chela* (*Neochela*) *dadyburjori*, is one such instance. The small size, colour, and hardiness of some of the species of *Chela* are the main reasons why they have found a place in the list of desirable tropical aquarium fishes. In India, the species *laubuca*, *cachius*, and *dadyburjori* are reared as aquarium fishes.

3. *Other uses:* The species *laubuca* and *cachius* are in many places used as bait for Mahseer, *Channa*, and other larger carnivorous fish. In many parts of the country villagers take these two species of *Chela* in large numbers along with species of *Rasbora*, *Oxygaster*, etc. and, when cooked or fried in numbers, they make a palatable dish. It is also likely that they may turn out to be good forage fishes.

Discussion

The diversity in characters exhibited by the species has made it necessary to group them as given here (p. 63). Taking the species of *Chela* s. str., we find that two of them, namely *cachius* and *laubuca*, have a very wide distribution and evidence is adduced here to show that they are highly polytypic. The two central Thailand species of the *laubuca*-group, namely, *caeruleostigmata* and *mouhoti*, evince considerable affinities to *laubuca* which also occurs in peninsular Thailand. The two

species of the subgenus *Allochela*, are discontinuously distributed, *fasciata* occurring in peninsular India and *maassi* known only from Sumatra. In the absence of a lateral line or only the presence of an incomplete lateral line *dadyburjori* occupies a peculiar position in the hierarchy of the genus.

As regards the distribution, one other interesting point to note is the absence of the widely distributed *cachius* from Ceylon. This revision should facilitate further detailed study of the species, especially *cachius* and *laubuca*, throughout their ranges of distribution with particular reference to infraspecific levels of differentiations. More detailed faunistic surveys are bound to add to our knowledge of the distribution of the various species and the taxonomy of the genus.

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