

A STUDY OF THE FRESHWATER AND ESTUARINE  
FISHES OF GOA

2. NOTES ON THE FISHES FOUND WITHIN THE  
TERRITORY OF GOA

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( With 2 Text-figures )

INTRODUCTION

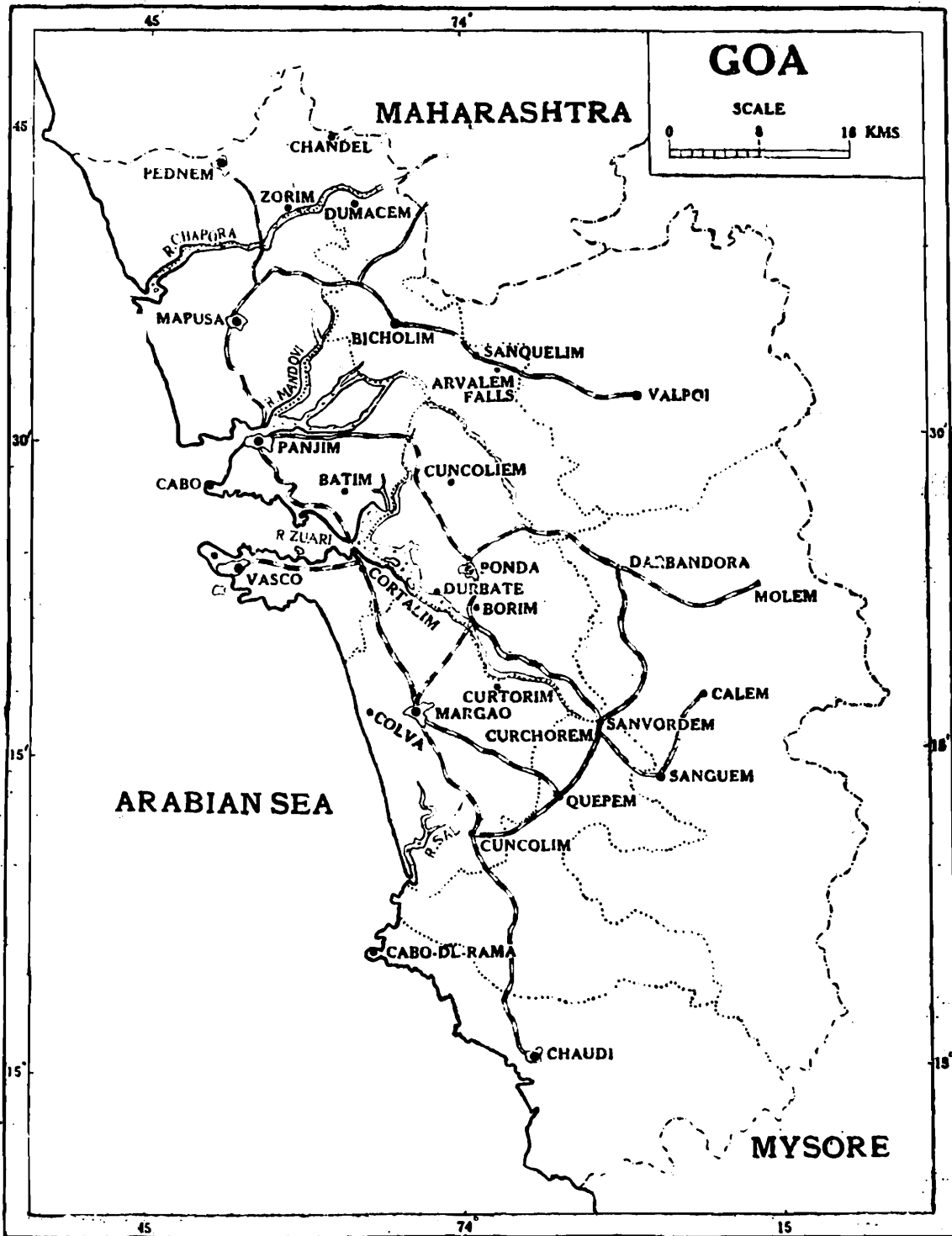
The fauna of Goa has not been surveyed in the past and no information is available. Recently, Zoological Survey of India, and Department of Zoology, Panjab University, Chandigarh have independently and almost simultaneously taken up the survey of the fauna of Goa: Department of Zoology, Panjab University, Chandigarh concentrating only on the marine fauna (Menon et al., 1967 ; Tandon et al., 1967) whereas Zoological Survey of India, Calcutta has made efforts to collect and study marine, freshwater and terrestrial animals.

Through extensive surveys during 1966-69, Zoological Survey of India, Calcutta has obtained a good collection of fishes from fresh- and estuarine waters of Goa and the same have been studied here in detail. There have been a few records of individual species of fishes from Goa : they have been mostly marine fishes (Cuvier, 1829 and Koumans, 1941). Tandon et al. (1967) have given a list of 53 species of marine fishes collected from the in-shore area of Goa. The only freshwater fish, so far recorded from Goa is *Silurus goae* Haig (Haig, 1950).

In the present paper, a record of 51 species from fresh- and estuarine waters of Goa has been made for the first time, thereby putting altogether 52 species on record from this area. A new species of a cobitid (Tilak, in press) and a new sub-species of a cyprinid have been described. The existence of the genus *Acanthopthalmus* in Goa establishes an interesting record of this genus from South-Western India. Many of the other species recorded are taxonomically important. The fish fauna of Goa is of zoogeographical important.

## SYSTEMATIC LIST

The fishes are arranged below according to the classification of teleostean fishes by Greenwood et al. (1966). The material of all these species has been studied by the author except that of *Silurus goae* Haig which is included in the list from literature.



Text-fig. 1. Map of Goa, showing important places and localities where collections have been made.

Superorder **ELOPOMORPHA**

Order : **ANGUILLIFORMES**

**Suborder : ANGUILLOIDEI****Family : OPHICHTHIDAE**

- (1) *Pisoodonophis boro* (Hamilton)

**Superorder CLUPEOMORPHA****Order : CLUPEIFORMES****Suborder : CLUPEOIDEI****Family : CLUPEIDAE**

- (2) *Hilsa (Hilsa) kelee* (Cuvier)  
 (3) *Anodontostoma chacunda* (Hamilton)  
 (4) *Nematolosa nasus* (Bloch)

**Family : ENGRAULIDAE**

- (5) *Thrissocles malabaricus* (Bloch)  
 (6) *Anchoviella tri* (Bleeker)

**Superorder OSTARIOPHYSI****Order : CYPRINIFORMES****Suborder : CYPRINOIDEI****Family : CYPRINIDAE**

- (7) *Garra mullya* (Sykes)  
 (8) *Tor putitora* (Hamilton)  
 (9) *Puntius filamentosus* (Valenciennes)  
 (10) *Puntius amphibius* (Valenciennes)  
 (11) *Puntius vittatus* Day  
 (12) *Puntius phutunio* Hamilton  
 (13) *Puntius sarana subnasutus* (Valenciennes)  
 (14) *Puntius sarana orphoides* (Valenciennes)  
 (15) *Puntius melanampyx pradhani*, sub. sp. nov.  
 (16) *Rasbora daniconius daniconius* (Hamilton)  
 (17) *Danio malabaricus* (Jerdon)  
 (18) *Oxygaster boopis* (Day)  
 (19) *Chela (Neochela) dadyburjori* (Menon)

**Family : COBITIDAE**

- (20) *Lepidocephalus thermalis* (Valenciennes)  
 (21) *Lepidocephalis guntea* (Hamilton)  
 (22) *Acanthophthalmus goensis* Tilak  
 (23) *Noemacheilus botia* (Hamilton)

**Order : SILURIFORMES****Family : SILURIDAE**

- (24) *Ompok bimaculatus* (Bloch)  
 (25) *Silurus goae* Haig

Family : BAGRIDAE

(26) *Mystus malabaricus* (Jerdon)

### Superorder AATHERINOMORPHA

Order : AATHERINIFORMES

Suborder : EXOCOETOIDEI

Family : EXOCOETIDAE

(27) *Zenarchopterus striga* (Blyth)

Family : BELONIDAE

(28) *Belone cancila* (Hamilton)

Family : CYPRINODONTIDAE

(29) *Aplocheilus blocki* (Arnold)

(30) *Aplocheilus lineatum* (Valenciennes)

### Superorder ACANTHOPTERYGII

Order : CHANNIFORMES

Family : CHANNIDAE

(31) *Channa orientalis* (Bloch & Schneider)

(32) *Channa punctatus* (Bloch)

Order : PERCIFORMES

Suborder : PERCOIDEI

Family : CENTROPOMIDAE

(33) *Chanda interrupta* (Bleeker)

(34) *Chanda gymnocephalus* (Lacépède)

(35) *Chanda thomassi* (Day)

Family : CICHLIDAE

(36) *Etroplus suratensis* (Bloch)

(37) *Etroplus maculatus* (Bloch)

Family : SCATOPHAGIDAE

(38) *Scatophagus argus* (Linnaeus)

Family : SCIANIDAE

(39) *Johnius belengerii* (Cuvier)

Family : LUTJANIDAE

(40) *Lutjanus johnii* (Bloch)

(41) *Pomadasys hasta* (Bloch)

Suborder : MUGILOIDEI

Family : MUGILIDAE

(42) *Mugil parsia* Hamilton

Suborder : BLENNIOIDEI

Family : BLENNIIDAE

(43) *Petroscirtes bipunctatus* Day

(44) *Petroscirtes punctatus* (Valenciennes)

Suborder : **GOBIOIDEI**Family : **GOBIIDAE**

- (45) *Glossogobius giuris* (Hamilton)
- (46) *Awaous grammepomus* (Bleeker)
- (47) *Bathygobius fuscus* (Rüppell)
- (48) *Periophthalmus dipus* Bleeker
- (49) *Periophthalmus variabilis* Eggert
- (50) *Eleotris andamensis* Herre

Suborder : **ANABANTOIDEI**Family : **OSPHRONEMIDAE**

- (51) *Macropodus cupanus* (Valenciennes)

Suborder : **MASTACEMBELOIDEI**Family : **MASTACEMBELIDAE**

- (52) *Mastacembelus armatus* (Lacépède)

## SYSTEMATIC NOTES

(1) **Pisoodonophis boro** (Hamilton)

1822. *Ophisurus boro* Hamilton, *Fishes of Ganges*: 20, 363. (Type-locality: estuaries near Calcutta.)

1878. *Ophichthys boro*, Day, *Fishes of India*: 664.

*Material*.—(i) 2 exs. (283-315 mm. total length), Zuari river, 5 Kms. from Ponda, Durbate, Goa, 17.iv.1966, K. S. Pradhan, Coll.

*Distribution*.—Marine and estuarine waters of India and Malaya Archipelago, South Africa, Siam, Formosa, China, Philippines, Melanesia etc.

(2) **Hilsa (Hilsa) kelee** (Cuvier)

1829. *Clupea kelee* Cuvier, *Regne Animal*, Ed. 2, 2: 320 (Type-locality: Vizagapatam.)

1965. *Hilsa (Hilsa) kelee*, Whitehead, *Bull. Brit. Mus.*, (N.H.), zool., 12(4): 129.

*Material*.—(i) 20 exs. (78-88 mm. total length) River Mandovi, near ferry jetty, Betim, Goa (purchased), 29.iii.1966. (ii) 1 ex. (107 mm. total length) Zuari river, near Berim bridge, Goa, 1.iv.1966, all K. S. Pradhan, Coll.

*Remarks*.—The material agrees with the generic description of *Hilsa* but differs with the subgenus *Hilsa* in the following points.

(i) The gill rakers on the outer hemibranch of the first arch are more than half the length of those on the inner hemibranch.

(ii) The lateral blotches or a humeral spot are absent.

(iii) The unbranched rays of the dorsal fin bear a black blotch at the base and the upper half of the fin is dusky black. The tip of the caudal fin is also stained black.

(iv) The length of the maxilla is smaller than the preorbital length.

*Distribution*.—Coasts of India, Burma, Siam, Natal, east African coast, Gulf of Aden etc.

### (3) *Anodontostoma chacunda* (Hamilton)

1822. *Clupanodon chacunda* Hamilton, *Fishes of Ganges*: 246, 383 (Type-locality: Gangetic estuary.)

1878. *Chatoessus chacunda*, Day, *Fishes of India*: 632.

*Material*.—(i) 1 ex. (77 mm. total length), Zuari river, near Barim bridge, Goa, 1.iv.1966, K. S. Pradhan, Coll.

*Distribution*.—Estuaries of Ganges and coasts of India, Andaman, Burma, Malaya Archipelago, Siam, Philippines, Melanesia etc.

### (4) *Nematalosa nasus* (Bloch)

1795. *Clupes nasus* Bloch, *Naturg. Ausland. Fische.*, 9: 116 (Type-locality: Malabar.)

1917. *Nematalosa nasus*, Regan, *Ann. Mag. nat. Hist.*, (8) 19: 312.

*Material*.—(i) 1 ex. (112 mm. total length), Zuari river at Cortalim, Goa, 12.iv.1966, K. S. Pradhan Coll.

*Distribution*.—Estuaries and seas of India, Burma, Ceylon, Iraq, Philippines etc.

### (5) *Thrissocles malabaricus* (Bloch)

1795. *Clupea malabaricus* Bloch, *Naturg. Ausland. Fische.*, 9: 155 (Type-locality: Tranquebar.)

1878. *Engraulis malabaricus*, Day, *Fishes of India*: 625, pl. CLVII, fig. 5.

*Material*.—(i) 1 ex. (135 mm. total length), Zuari river, Goa, 11.iv.1966, K. S. Pradhan Coll.

*Distribution*.—Coasts and estuaries of Pakistan and India, Celebes etc.

### (6) *Anchoviella tri* (Bleeker)

1852. *Engraulis tri* Bleeker, *Verh. Bat. Gen.*, 24: 40 (Type-locality: Batavia.)

1878. *Engraulis tri*, Day, *Fishes of India*: 630, pl. CLVII, fig. 6.

*Material*.—(i) 1 ex. (120 mm. total length), Zuari river, Cortalim, Goa, 11.iv.1966, K. S. Pradhan Coll.

*Distribution*.—Seas and estuaries of India, Pakistan, Malaya Peninsula, Malaya Archipelago, Philippines etc.

### (7) *Garra mullya* (Sykes)

1839. *Chondrostoma mullya* Sykes, *Trans. zool. Soc. London*, 2: 359. (Type-locality: Beema river at Dounde.)

1964. *Garra mullya* Menon, *Mem. Indian Mus.*, 14: 212.

*Material*.—(i) 1 ex. (96 mm. total length), Chandi village, 64 kms. off Ponda, 24.ix.1969, R. C. Sharma Coll. (ii) 1 ex. (37 mm. total length) Cabo-de-Rama, 17.xi.1967, K. S. Pradhan Coll.

*Distribution*.—Throughout India except Himalaya.

### (8) *Tor putitora* (Hamilton)

1822. *Cyprinus putitors* Hamilton, *Fishes of Ganges*: 303, 388. (Type-locality: Eastern parts of Bengal.)

1878. *Barbus tor* (in part), Day, *Fishes of India*: 564.

*Material*.—(i) 1 ex. (124 mm. total length), Khardeper river, Valpoi, September, 1969, J. Rangel Coll.

*Remarks*.—The fish is rare in the area and is occasionally captured from rivers. It is characterised by the presence of a continuous labial fold below the chin, large scales on the body, four barbels, last undivided ray of the dorsal strong and smooth and the length of the head more than the height of the body. It is an important commercial fish.

*Distribution*.—Freshwaters of Punjab. Uttar Pradesh, Himalaya. Bengal. Goa, Pakistan etc.

### (9) *Puntius filamentosus* (Valenciennes)

1844. *Leuciscus filamentosus* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, 17: 96. (Type-locality: Alleppey.)

1844. *Leuciscus mahecola* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, 17: 305, pl. 502.

1868. *Barbus mahecola*, Day, *Fishes of India*: 575, pl. CXL, fig. 5.

1878. *Barbus filamentosus*, Day, *Fishes of India*: 582.

*Material*.—(i) 24 exs. (69-102 mm. total length), a tributary of Chapora river, near Kansarverman Forest Nursery in Chandel village, Pernem, Goa, 22.xi.1967, K. S. Pradhan & party Coll. (ii) 1 ex. (98 mm. total length), Valus river, 17.ix.1969, R. C. Sharma Coll. (iii) 4 exs. (70-92 mm. total

length), Arvalem water falls, Goa, 28.xi.1967, K. S. Pradhan & party Coll.

*Remarks.*—Hora (1937) and Hora and Law (1941) have clearly shown that in *Puntius filamentosus* there is marked sexual dimorphism. The males have a few anterior dorsal rays elongated and the snout bears tubercles while these are absent in the females. They have further mentioned that the presence or absence of barbels has no importance. Munro (1955) and Misra (1959) have considered *filamentosus* and *mahecola* synonymous.

Regarding the identity of *P. mahecola* and *P. filamentosus* Day (1878) mentioned 'It is remarkable how very similar the *Barbus Mahicola*, C. V which has 2 barbels, is to the *B. filamentosus*, C. V with none. If a number of examples are examined it will be found that in some these appendages are very minute, the barbels being, as a rule, smallest in specimens obtained further from the hills. In South Canara, the Wynaad, and base of the Neilgherries, where the barbels are large, the *B. Mahicola* abounds : towards Cochin and up the Coromandel coast as far as Madras they are small or absent, and the *B. filamentosus* is the type. Here, undoubtedly, the question must force itself on one's notice, are we dealing with two distinct species, or one in a state of transition ? If the latter, which is the original form ?' In the present material there are specimens with maxillary barbels of different sizes as well as those with only rudiments of these barbels. The last undivided ray of the dorsal fin is weak and jointed. The lateral line is complete. The colouration is very characteristic of the species. The present material contains only female examples.

*Distribution.*—Freshwaters of Madras, Travancore-Cochin, Mysore, Goa, Ceylon.

#### (10) *Puntius amphibius* (Valenciennes)

1842. *Capoeta amphibia* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, 16 : 282 (Type-locality : Bombay.)

1878. *Barbus amphibius*, Day, *Fishes of India* : 574, pl. CXLII, fig. 8.

*Material.*—(i) 3 exs. (37-40 mm. total length), a pool in paddy fields, 2 Kms. North-west of Ponda, 14.xi.1967, K. S. Pradhan & party Coll. (ii) 1 ex. (67 mm. total length), Colva road, in a shallow pool of water. Goa, 14.iv.1966, K. S. Pradhan Coll.

*Remarks.*—This fish is found in abundance in majority of

waters. It is characterised by the presence of two maxillary barbels, the last undivided ray of the dorsal fin weak and articulated and with a dark mark at the base of the caudal fin.

*Distribution.*—Freshwaters of whole of India (except Himalaya), Ceylon.

### (11) *Puntius vittatus* Day

1865. *Puntius vittatus* Day, *Proc. zool. Soc. London*: 303. (Type-locality: Malabar.)

1878. *Barbus vittatus*, Day, *Fishes of India*: 582, pl. CXLIV, fig. 2.

*Material.*—(i) 5 exs. (35-45 mm. total length), Colva road, Goa, 14.iv.1966, K. S. Pradhan Coll. (ii) 5 exs. (24-29 mm. total length), Cabo-de-Rama, Goa, 17.xi.1967, K. S. Pradhan & Party Coll. (iii) 8 exs. (27-32 mm. total length), Margao, Goa, 25.iii.1968, K. C. Pradhan & Party Coll. (iv) 1 ex. (10 mm. total length), a pond in paddy field, near Colva, Goa, 10.xi.1967, K. S. Pradhan & Party Coll. (v) 35 exs. (21-38 mm. total length), a stagnant pool, South-west of Govt. Rest House, Margao, 23.iii.1966, K. S. Pradhan Coll.

*Remarks.*—There are only two small examples of this species from Shimoga in the collections of Zoological Survey of India, Calcutta and they are in a bad state of preservation and do not serve a good comparative material. Day (1865, 1878) has not described a dark spot at the anal aperture. Moreover, dark spots anterior to the dorsal fin, below its posterior margin and at the base of the anal are not found in any of the specimens studied in the present collection. The material studied here shows the following characters which require mention. (i) There is a silvery band extending from the operculum to the base of the caudal (ii) There is a dark spot at the base of the dorsal fin in some specimens. (iii) A dark vertical band arises from the base of the 7th dorsal ray and ascends to the top of the anterior dorsal undivided ray. (iv) There is a dark spot at the base of the caudal fin and another at the anus. (v) There is a pair of rudimentary maxillary barbels in some specimens.

*Distribution.*—Mysore, Wynaad, Madras, Goa, Cutch, Malabar, Ceylon.

### (12) *Puntius phutunio* Hamilton

1822. *Cyprinus phutunio* Hamilton, *Fishes of Ganges*: 319, 390. (Type-locality: Ponds of North-east Bengal.)

1878. *Barbus phutunio*, Day, *Fishes of India*: 578, pl. CXLI, fig. 6.

*Material*.—(i) 2 exs. (26-27 mm. total length), a stream, 1.5 Kms. South-east of Colem Rly. Station, 3.iv.1966, K. S. Pradhan Coll.

*Remarks*.—The height of the body lies from 2.9-3.5 times in total length. The eye diameter lies 2.4 times in head, nearly half of the snout and equal to the interorbital width. There are 4 vertical bands on the body; the first runs from the back to near the middle of the pectoral fin, the second from the end of the dorsal to the middle of the body, the third from the back to above the end of anal and the fourth a faint one at the base of the caudal. The fins bear no markings.

*Distribution*.—Orissa, Assam, Bengal, Goa, and Burma.

### (13) *Puntius sarana subnasutus* (Valenciennes)

1842. *Barbus subnasutus* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, 16: 154. (Type-locality: Pondichery.)

1963. *Puntius sarana subnasutus*, Menon, *Spol. zeyl.*, 30: 69.

*Material*.—(i) 4 exs. (80-96 mm. total length), Arvalem water falls, Goa, 28.xi.1967, K. S. Pradhan & party Coll.

*Remarks*.—In the material studied, there is a dark spot before the caudal fin, the spot being deep coloured and prominent. There is a small black spot at the base of the undivided rays of the dorsal. There are 7-8 dark longitudinal rows of spots on the sides. The pharyngeal teeth are crooked at the tips and number 5-3-2/2-3-5.

*Distribution*.—Peninsular India, Goa etc.

### (14) *Puntius sarana orphoides* (Valenciennes)

1842. *Barbus orphoides* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, 16: 193. (Type-locality: Java.)

1963. *Puntius sarana orphoides*, Menon, *Spol. zeyl.*, 30: 69.

*Material*.—(i) 1 ex. (111 mm. total length), Valus river, 8 Kms. east of Forest Rest House, Valpoi, Goa, 16.ix.1969. (ii) 4 exs. (78-107 mm. T.L.), Valus R., Goa. 17.9.1969, all R. C. Sharma Coll.

*Remarks*.—The species *P. caudomarginatus*, *P. sewelii* and *P. myitkyinae* are synonymous with this species. The specimens under study have 26 scales in the lateral line, the spine of the dorsal fin is finely serrated posteriorly in 2/3rd of its upper part, a black spot is present at the base of the caudal, the tips of the anal, dorsal and caudal fins are black and there are 6/6

scales in the transverse series. The presence of this species in Goa is of zoogeographical importance.

*Distribution.*—Manipur, Goa, Burma, Java, Borneo and Siam.

(15) ***Puntius melanampyx pradhani***, subsp. n.

(Text-figs. 2-4)

B III, D 3/8, P 1/13-14, V 1/8, A 3/5, C 19

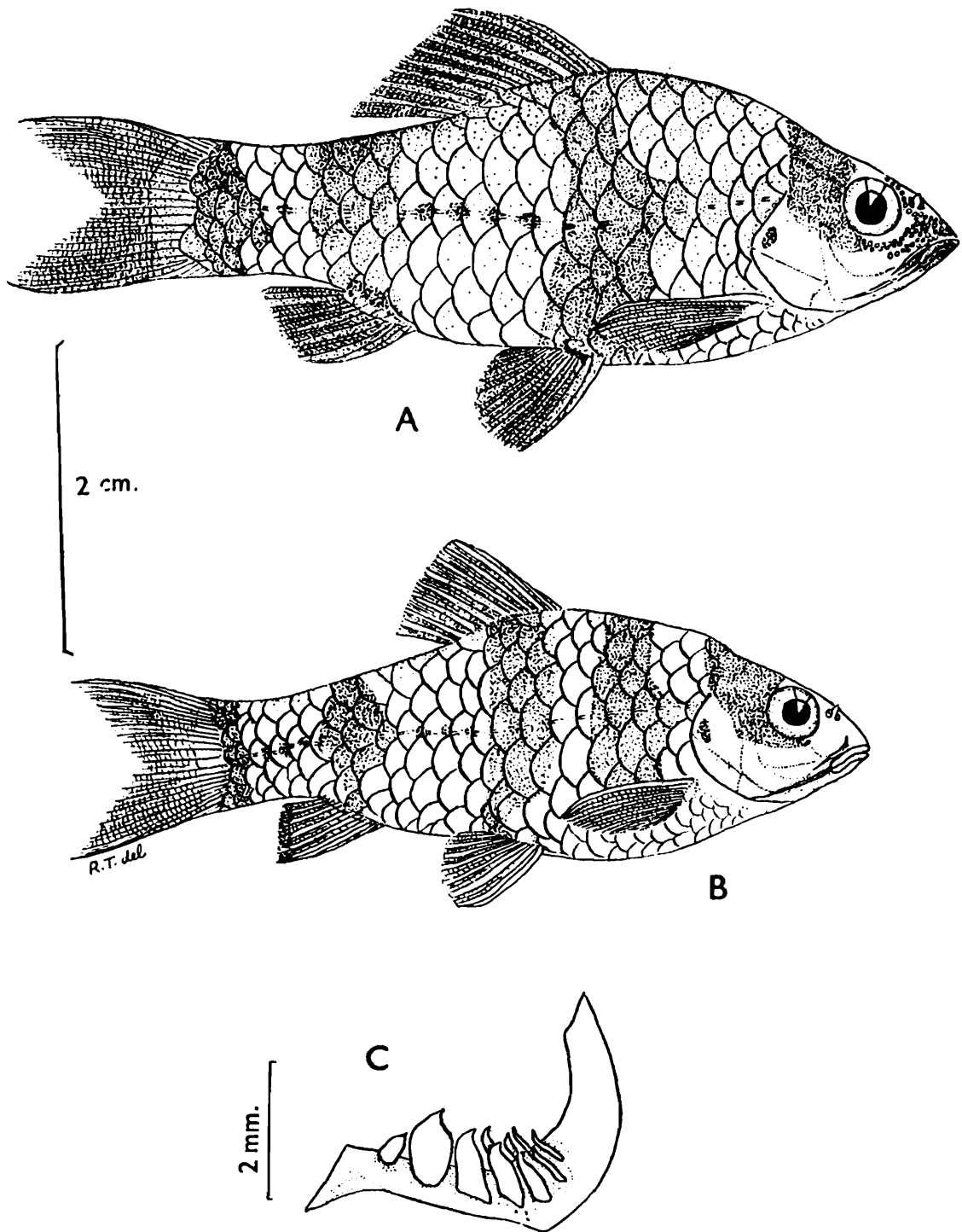
Lat. Line scales : 19-20

Lat. tr. scales : 4/3

Pharyngeal teeth : 5-3-2/2-3-5

The body is laterally compressed with the dorsal profile more arched than the ventral. Behind the head, the profile abruptly rises up to the base of the dorsal fin and thereafter it gradually falls till the base of the caudal fin. The length of head lies 4.1-4.58 times in the total length and 3.2-3.58 times in the standard length. The diameter of the eye lies 2.83-3.42 times in the length of head. The snout is pointed; its length lies 2.43-2.87 times in the length of the head. The snout is shorter than or equal to the eye diameter in younger examples (being 0.83-1.08 times of eye diameter) and longer than eye diameter in mature examples (being 1.12-1.14 times of eye). In the male example there are numerous small tubercles on the snout; the rows of tubercles extend back around the front margin of eye as well as below it upto its middle. The female examples are devoid of these tubercles. The interorbital space is almost flat and is 1.14-1.28 times of the eye diameter. The height of the body lies 3.2-3.66 times in the total length and 2.5-2.86 times in standard length. There are two pairs of barbels; the rostral barbels are shorter while the maxillary ones are nearly 1.5 times longer than the eye. The height of the dorsal fin and the length of its base are almost equal and lie 5.0-6.5 times in the total length and 4.6-5.0 times in the standard length. The origin of the dorsal fin lies opposite that of the ventrals and is placed nearer the snout tip than the base of the caudal. The labial fold is interrupted. The last undivided ray of the dorsal fin is weak and articulated. The paired and median fins look more developed and sturdy in the male than in the female. The pectoral fin is equal to the length of head excluding the snout in the female and a somewhat

longei in the male. The pectoral does not reach the base of the ventral in the female but it just does so in the male. The caudal is deeply forked with both the lobes equal.



Text-fig. 2. A. *Puntius melanampyx pradhani*, subsp. n.—Male. B. *Puntius melanampyx pradhani*, subsp. n.—Female. C. *Puntius melanampyx pradhani*, subsp. n.—Pharyngeal teeth and bone.

The pharyngeal teeth are arranged in 3 rows and have pointed and curved tips. The lateral line is complete and pierces through 19-20 scales. The last scale of the longitudinal series lies at the base of the caudal rays. There are 7 scales in

front of the dorsal fin and 12 around the caudal peduncle. There are 3 scales between the lateral line and base of the ventral fin. The height of the caudal peduncle lies 1.00-1.14 times in its length.

Colour : There is a marked sexual dimorphism in this species in colouration as well as in other characters.

The female.—There are five colour bands on the body. The first deeply dark band runs across the nape and, on each side, runs along the posterior margin of the eye. The second band starts from the back nearly 2 scales in front of the base of the dorsal and runs downwards to the middle of the pectoral fin. The third band originates from the base of the anterior four divided rays of the dorsal fin and runs down to behind the base of the pelvic and joins its counterpart of the other side on the ventral side, thus encircling the body completely. The fourth band starts from the back, nearly 2 scales behind the end of the base of the dorsal fin and runs down to the base of the posterior part of the anal fin. The fifth band lies at the base of the caudal fin and its width is equal to the last two scales. In addition to the bands, there are dark spots at the bases of the scales, particularly those along the lateral line, giving the appearance of a row of dark spots. There is a black spot on the operculum. The anterior rays of the dorsal fin are dusky while the tips of both dorsal and anal fins are black. The ventral side of the body is yellowish except a dark band behind the origin of the ventrals.

The male.—The colouration of the male differs from that of the female in the following points.

The tip of the snout, the upper and the lower jaws are darkened stained. The second and the third bands of the body have almost fused with one another. The band at the base of the caudal is broader, covering 3 last scales. The dorsal, the ventrals and the anal fins are uniformly dark with their tips deeply stained. The pectoral and the caudal fins are dusky. The third band extends to the ventral side of the body and covers the area one scale in front and one scale behind the base of the ventral fins.

*Material*.—Holotype : female (51 mm. total length), Regd. No. Z.S.I.F 6164/2; Locality : A stream at Molem, 2 Kms. north-east of Forest Rest House, Goa; Collector : K. S. Pradhan & party, 21.xi.1967

Paratype : (i) 1 example (59 mm. total length), male,

Regd. No. Z.S.I.F. 6165/2 : Locality : A stream at Molem, 2 Kms. north-east of Forest Rest House, Goa ; Collector : K. S. Pradhan & party, 21.xi.1967.

(ii) 12 examples (35-55 mm. total length), females, Regd. No. Z.S.I.F. 6166/2 ; Locality : Arvalem water falls, Goa ; Collector : K. S. Pradhan, 28.iii.1966.

(iii) 2 examples (25-32 mm. total length), females, Regd. No. Z.S.I.F. 6167/2 ; Locality : a river, uphill, south-west of market at Sanguem, Goa ; Collector : K. S. Pradhan & party, 19.xi.1967

*Relationships.*—In colouration and shape of the body, the present fish resembles *Puntius pentazona* (Boulenger) but differs in meristic and morphometric characters. Moreover, the last undivided ray of the dorsal fin in *P. pentazona* is strong and posteriorly serrated while that of the present fish is weak and unserrated. The present species has an apparent resemblance with *Puntius nigrofasciatus* (Günther) and *Puntius tetrazona* (Bleeker), although they differ in many important respects. It appears doubtful whether *Puntius singhala* (Duncker) is a Ceylonese subspecies of *melanampyx* because the former lacks barbels while the latter has two well developed pairs.

Chromatic dimorphism has been reported in *Puntius melanampyx* (Day) by Misra (1938) and the same has been confirmed by Hora and Law (1941) and Menon (1961). Hora and Law (1941) reported certain variations in the colouration of the species. The colouration of this species, described by Day (1878), is of the female specimen according to Misra (1959) and Menon (1961) ; Day (1878) has, however, described pores on snout of this fish which indicates that he had male examples also.

The present subspecies differs from *Puntius melanampyx melanampyx* (Day) in the following characters.

(1) The diameter of eye lies 1.14-1.28 times in the inter-orbital width in *pradhani* whereas they are equal in *melanampyx*.

(2) The length of the base of and the height of the dorsal fin in *pradhani* lie 5.9 times in the total length and 4.6 times in the standard length respectively in the male and 6.00-6.5 times in total length and 4.7-5.2 times in standard length respectively in the female examples. On the contrary, in *P. melanampyx melanampyx*, according to Menon (1961), the

length of the dorsal fin lies 3.5-3.75 times in the total length in males and 4.0-4.5 times in the females.

In addition to the above differences, *pradhani* differs from *melanampyx* in colouration.

(1) In the females, there is an additional dark band in front of the dorsal fin. The same is absent in *melanampyx*.

(2) In the male, the two bands, one in front and the other below the dorsal fin, merge into a single wide band whereas the bands on the nape, behind the dorsal and at the base of the caudal fin remain separate. In *melanampyx*, on the other hand, the band below the dorsal fin and above the anal fin merge with one another and only the one on the nape and the other one on the caudal are free.

#### (16) *Rasbora daniconius daniconius* (Hamilton)

1822. *Cyprinus daniconius* Hamilton, *Fishes of Ganges*: 327, 391.  
(Type-locality: rivers of southern Bengal.)

1954. *Rasbora daniconius daniconius*, Brittan, *Monogr. Inst. Sci. & Tech.*, 3: 135.

*Material*.—(i) 1 example (76 mm. T.L.), a stream 2 Kms. north-east of Forest Rest House, Molem, Goa, 21.xi.67, K. S. Pradhan & party Coll. (ii) 1 example (47 mm. T.L.), a shallow pond, 1 Km. west of Kanservernem Forest Nursery, Pernem, Goa, 22.xi.67, K. S. Pradhan & party Coll. (iii) 1 ex. (46 mm. T.L.), Colem R. near Bridge, Goa, 23.xi.1967, K. S. Pradhan & party Coll. (iv) 5 exs. (31-41 mm. T.L.), a pool in paddy fields, 3 Kms. west of Ponda, Goa, 14.xi.1967, K. S. Pradhan & party Coll. (v) 2 exs. (57-71 mm. T.L.), a shallow pond at Colva road, Goa, 14.xi.1966, K. S. Pradhan Coll. (vi) 3 exs. (44-45 mm. T.L.), an uphill stream, Cabode-Rama, Goa, 17.xi.1967, K. S. Pradhan & party Coll. (vii) 1 ex. (42 mm. T.L.), a river at Bicholim, Goa, 12.iv.1966, K. S. Pradhan Coll. (viii) 2 ex. (42 mm. T.L.), Arvalem water falls, Goa, 28.iii.1966, K. S. Pradhan Coll. (ix) 1 ex. (46 mm T.L.), 3 Kms. east of Rest House at Margao, Goa, 25.iv.1966, K. S. Pradhan Coll. (x) 1 ex. (98 mm. T.L.), Chandi village, 64 Kms. off Ponda, 24.ix.1969, R. C. Sharma Coll. (xi) 2 exs. (58-75 mm. T.L.), Valus river, Goa, 17.ix.1969, R. C. Sharma Coll.

*Remarks*.—The species is characterised by the presence of a symphyisial knob in the lower jaw fitting into a notch in the upper jaw, a dark lateral band on the body and the lower lip

without lateral extensions. It is an important larvivorous fish and is found in majority of the ponds and nullas.

*Distribution.*—Freshwaters throughout India, Pakistan, Ceylon. Burma. Malaya etc.

(17) **Danio malabaricus** (Jerdon)

1849. *Perilampus malabaricus* Jerdon, *Madras J. Litt. & Sci.*, **15**: 325 (Type-locality: Madras.)

1878. *Danio malabaricus*, Day, *Fishes of India*: 595, pl. CL, fig. 7.

*Material.*—(i) 23 exs. (51-82 mm. total length), a tributary of river Chapora, Pernem, Goa, 22.xi.1967, K. S. Pradhan Coll. (ii) 1 ex. (75 mm. total length), Arvalem water falls, Goa, 28.xi.1967, K. S. Pradhan & party Coll. (iii) 32 exs. (56-70 mm. total length), a river flowing along a hill near market at Sanguem, Goa, 19.xi.1967, K. S. Pradhan & party Coll. (iv) 6 exs. (54-92 mm. total length), Chandi village, 64 Kms. off Ponda, 24.ix.1969, R. C. Sharma Coll. (v) 1 ex. (80 mm. total length), Valus river, Goa, 17.ix.1969, R. C. Sharma Coll.

*Remarks.*—There are 11-13 branched rays in the dorsal fin and 15-17 in the anal. In a specimen from Sanguem, the anal fin has 18 branched rays, a number not known to be present in any of the Indian forms of the genus. The pectoral fins are almost equal to the length of head. The curved pharyngeal bone bears 3 rows of conical teeth (5-4-2) on each side although Day (1878) recorded 5-3-2 for this genus. The barbels are small and the lateral line is complete.

*Distribution.*—Peninsular India and Ceylon.

(18) **Oxygaster boopis** (Day)

1873. *Chela boopis* Day, *Proc. zool. Soc. London*: 708. (Type-locality: South Canara.)

1878. *Chela boopis*, Day, *Fishes of India*: 602, pl. CLII, fig. 4.

*Material.*—(i) 4 exs. (35-71 mm. total length), a tributary of river Chapora, Pernem, Goa, 22.xi.1967, K. S. Pradhan & party Coll.

*Remarks.*—The material resembles the description of this species by Day (1878) but differs in having the height of the body less than the length of the head, being 5.46-5.54 times in total length (Vs/ 5.0-5.25 times in total length). The pharyngeal teeth are conical and arranged in three rows (5-4-2/2-4-5).

*Distribution.*—South Canara, Mysore, Goa etc.

(19) **Chela (Neochela) dadyburjori** (Menon)

1951. *Laubuca dadyburjori* Menon, *Rec. Indian Mus.*, **49**(1): 1. (Type-locality: Cochin.)  
 1958. *Chela (Neochela) dadyburjori*, Silas, *J. Bombay nat. Hist. Soc.*, **55**: 54.

*Material.*—(i) 1 ex. (27 mm. total length), from a pond in paddy field, Colva road, Goa, 14.iv.1966, K. S. Pradhan Coll. (ii) 1 ex. (29 mm. total length), from a pool of water, Concalim, Goa, K. S. Pradhan Coll. (iii) 4 exs. (29-33 mm. total length), a pond at Colva road, Goa, 14.iv.1966, K. S. Pradhan Coll. (iv) 3 exs. (25-30 mm. total length), a pond 3.5 Kms. south-east of Rest House at Margao, 25.iv.1966, K. S. Pradhan Coll. (v) 1 ex. (29 mm. total length), about 5 Kms., south-west of Govt. Rest House, Margao (from a stagnant pond), Goa, 23.iii.1966, K. S. Pradhan Coll.

*Remarks.*—The material studied here resembles the description of *C. (N.) dadyburjori* (Menon) but shows differences. In many of the specimens there are no spots, probably they have all merged with one another and formed a straight band extending from the posterior margin of the operculum to the base of the caudal. Those examples which have spots, have only two. The colouration of species is variable to a great extent as is seen in the present material. The length of head lies 4.18-4.5 times in total length (Vs. 3.4-4.0 times), the eye diameter lies 2.25-2.72 times (Vs. 3.0-3.5 times) in head length and height of the body lies 3.94-5.5 times in total length (Vs. 4.1-4.4 times).

*Distribution.*—Streams, tanks and pools of Cochin, Travandrum, Kerala and Goa.

(20) **Lepidocephalus thermalis** (Valenciennes)

1846. *Cobitis thermalis* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, **18**: 78. (Type-locality: Ceylon.)  
 1968. *Lepidocephalus thermalis*, Banarescu & Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.*, **65**: 346.

*Material.*—(i) 1 ex. (47 mm. total length), from a pond in paddy field, 3 Kms. north-west of Ponda, 14.xi.1967, K. S. Pradhan & party Coll.

*Remarks.*—The material examined here resembles the description of the species given by Day (1878) and Banarescu & Nalbant (1968). The length of head lies 6 times in total length.

*Distribution.*—Peninsular India, Goa.

(21) *Lepidocephalus guntea* (Hamilton)

1822. *Cobitis guntea* Hamilton, *Fishes of Ganges*: 353, 394. (Type-locality: Ponds and freshwater rivers of Bengal.)

1968. *Lepidocephalus guntea*, Banarescu & Nalbant, *Mitt. Hamburg Zool. Mus. Inst.*, **65**: 343.

*Material*.—(i) 2 exs. (57-64 mm. total length), a pool of water, 13 Kms. south of Margao, 6.iv.1966. (ii) 2 exs. (63-72 mm. total length), a pool at Colva road, Goa, 14.iv.1966. (iii) 2 exs. (63-64 mm. total length), 3.5 Kms. south-east of Rest House at Margao, Goa, 12.iv.1966. all K. S. Pradhan Coll.

*Remarks*.—There is a marked sexual dimorphism in this species; the male is armed with a flat osseous spine, which is a modification of the inner rays of the pectoral fin. The fish lives in decaying leaves and debris at the bottom of water.

*Distribution*.—Streams and ponds throughout India except Mysore, Malabar and down.

(22) *Acanthophthalmus goaensis* Tilak

*Acanthophthalmus goaensis* Tilak, *J. Inland Fish. Soc India* (in press). (Type-locality: Colem river, Goa.)

*Material*.—(i) 1 ex. (36.5 mm. total length), Colem river, Goa, 16.iv.1966, K. S. Pradhan Coll. It is the holotype material, having Regd. No. Z.S.I.F 6150/2.

*Remarks*.—Pending publication of the paper (cited above), it should be important to mention a few salient features of the species.

B. III D. 2/6, P. 1/6, V 1/4, A. 2/5, C. 17

There is a bifid spine below the eye. The two nostrils are separate and the anterior is with a tube. The scales are embedded in skin and are minute. There is a dark lateral stripe, running from the eye to the base of the caudal. There are three dark thin bands running from behind the head to the origin of the dorsal and then behind the dorsal, only two of them extend upto the upper edge of the caudal fin. The base of the dorsal fin is 2.66 times in its length and lies in advance of the anal. The height of the dorsal is equal to the depth of the body below it. The distance between the origin of pelvics and the base of caudal fin, when carried anterior to the pelvic base, falls near the end of the pectoral fin. The present species has many differences with the only other species of this genus known from eastern India, i.e. *A. pangia* (Ham.) The record of

this genus from Goa is zoogeographically important (Tilak, in press).

*Distribution.*—Goa.

### (23) *Noemacheilus botia* (Hamilton)

1822. *Cobitis botia* Hamilton, *Fishes of Ganges*: 350, 394. (Type-locality: rivers of northern parts of Bengal.)

1968. *Noemacheilus* (*Acanthocobitis*) *botia*, Banarescu and Nalbant, *Mitt. Hamburg. Zool. Inst.*, 65: 332.

*Material.*—(i) 2 exs. (38-39 mm. total length), a nala in forest, 2 Kms. west of Molem, Rest House, Colva, 7.i.1969, V C. Agarwal Coll.

*Remarks.*—The material agrees with the description of this species by Rendahl (1948). There are 10 branched rays in the dorsal fin. The lateral line is complete. The colouration is characteristic of the species.

*Distribution.*—Freshwaters of Panjab, Uttar Pradesh, Jammu & Kashmir, Himalaya, Assam, West Bengal, Bihar, Madhya Pradesh, Maharashtra, North Canara, Goa.

### (24) *Ompok bimaculatus* (Bloch)

1797. *Silurus bimaculatus* Bloch, *Ichth. Hist. Nat. Poiss.*, 2: 17. (Type-locality: Malabar.)

1950. *Ompok bimaculatus*, Haig, *Rec. Indian Mus.*, 48: 103.

*Material.*—(i) 1 ex. (259 mm. total length), Valus river, Goa, 20.ix.1969, (ii) 2 exs. (235 mm. total length), Valus river, 18.ix.1969, all R. C. Sharma Coll.

*Remarks.*—There are 68-72 rays in the anal fin. The whole body, instead of being silvery, is uniformly darkened, so much so that the black spot on the shoulder has been obliterated.

*Distribution.*—Freshwaters throughout India, Ceylon and Burma.

### (25) *Silurus goae* Haig

1950. *Silurus goae* Haig, *Rec. Indian Mus.*, 48: 77, 100 (Type-locality: Goa and Trivandrum.)

*Material and remarks.*—No material of this species has been studied here. The type material has been deposited at Natural History Museum, Stanford University, Stanford (California, U.S.A.). This species has been included here from

literature because this is the only species earlier recorded from Goa. The description of the species is available in the paper by Haig (1950).

*Distribution.*—Trivandrum, Goa etc.

### (26) *Mystus malabaricus* (Jerdon)

1849. *Bagrus malabaricus* Jerdon, *Madras J. Litt. & Sci.*, **15**: 338. (Type-locality: mountain streams of Malabar.)

1954. *Mystus (Mystus) malabaricus*, Jayaram, *Rec. Indian Mus.*, **51**: 544.

*Material.*—(i) 3 exs. (113-152 mm. total length), Valus river, Goa, 20.ix.1969, (ii) 3 exs. (95-100 mm. total length), Valus river, Goa, 18.ix.1969, (iii) 2 exs. (89-92 mm. total length), Valus river, 17.ix.1969, all *R. C. Sharma* Coll.

*Remarks.*—The species is characterised by the presence of a very small supraoccipital process which remains embedded in skin. The posterior fontanelle on the head extends behind the posterior edge of the eye. The maxillary barbels reach upto the pelvic fins.

*Distribution.*—Maharashtra, Goa, Malabar coast, hill ranges of Travancore and Wynaad hills.

### (27) *Zenarchopterus striga* (Blyth)

1859. *Hemiramphus striga* Blyth, *J. Asiat. Soc. Bengal*, **27**: 288. (Type-locality: Sandheads, near Calcutta and coast of Ceylon.)

1926. *Zenarchopterus beauforti* Mohr, *Zool. Jahrb.*, **52**: 259. (Type-locality: Muar river, Selangor, Malaya Peninsula.)

*Material.*—(i) 3 exs. (40.5-58.5 mm. total length), Zuari river, 5 Kms. from Ponda, Durbate, Goa, 17.iv.1966, *K. S. Pradhan* Coll.

*Remarks.*—The present material agrees with the description of *Zenarchopterus beauforti* Mohr and *Z. striga* (Blyth) and is hence named as the latter species according to the law of priority. A discussion on this point has been included in an other paper (Tilak, in press). The existence of *Z. striga* (Blyth) from Goa, extends the range of distribution of this species to west coast of India.

*Distribution.*—Eastern coast of India, Goa, Malaya Peninsula.

(28) ***Belone cancila*** (Hamilton)

1822. *Esox cancila* Hamilton, *Fishes of Ganges*: 213, 380, pl. 27, fig. 70.  
(Type-locality: ponds and small rivers of Gangetic provinces.)  
1878. *Belone cancila*, Day, *Fishes of India*: 511, pl. CXVIII, fig. 5.  
1962. *Belone cancila*, Mees, *Zool. Verh.*, No. 54: 20.

*Material*.—(i) 1 ex. (200 mm. total length), Zuari river, near Borim bridge, Goa, 1.iv.1966, K. S. Pradhan Coll. (ii) 1 ex. (164 mm. total length), uphill, a river near market, Sanguem, Goa, 19.xi.1967, K. S. Pradhan & party Coll.

*Remarks*.—Mees (1962) does not recognise the genus *Xenentodon* Regan which is based on difference in the pharyngeals. There is only one species under the genus *Xenentodon* i.e. *X. cancila*. Mees (1962) has not made any anatomical analysis of the species; probably the status of the genus *Xenentodon* Regan remains undecided. Myers (1960) has pointed out that *Esox hindustancus* Falconer is a synonym of *cancila*.

*Distribution*.—Freshwaters throughout India, Ceylon, Burma, Pakistan, Siam, Malaya.

(29) ***Aplocheilus blocki*** (Arnold)

1911. *Hapsocheilus panchax* var. *blocki* Arnold, *Wschr. Aquar. u. Terrar.*, 8: 672. (Type-locality: Madras.)  
1916. *Panchax parvus* Raj, *Rec. Indian Mus.*, 12: 268. (Type-locality: Tanks and Reservoirs in and around Madras city.)  
1959. *Aplocheilus blochii*, Misra, *Rec. Indian Mus.*, 57: 204.

*Material*.—(i) 2 exs. (27-31 mm. total length), a pond at Kavlem, 2.5 Kms. south of Ponda, 8.iv.1966, (ii) 2 exs. (28-31 mm. total length), 1.5 Kms. south-west of Rest House, Margao, Goa, 11.iv.1966, (iii) 4 exs. (22-32 mm. total length), a shallow pond, 5 Kms. south-west of Rest House, Margao, 23.iv.1966, (iv) 6 exs. (16-28 mm. total length), 1 Km. south-west of Railway station, 7.iv.1966; (v) 1 ex. (31 mm.), Cabo-de-Rama, hill stream, Goa, 17.xi.1967, (vi) 15 exs. (15-33 mm. total length), a pond at Colva road, Goa, 14.iv.1966, (vii) 12 exs. (20-26 mm. total length), a river at Bicholim, Goa, 10.iv.1966, (viii) 1 ex. (27 mm.), a pool 13 Kms. south of Margao, 6.iv.1966, (ix) 7 exs. (21-26 mm. total length), brakish water pond near beach, Colva, Goa, 10.xi.1967, (x) 2 exs. (25-26 mm. total length), a pool in paddy field, near Colva, Goa, 10.xi.1967, (xi) 3 exs. (13-24 mm. total length), Arvalem water falls, Goa, 28.iii.1966, (xii) 5 exs. (28-32 mm. total length), a pool at

Durbate, Goa, 17.iv.1966, (xiii) 21 exs. (13-31 mm. total length), a pool, 3.5 Kms. south-east of Rest House, Margao, 25.iv.1966, all *K. S. Pradhan* Coll.

*Remarks.*—The species has been named after Capt. Block. It is an important larvivorous as well as aquarium fish. There is sex dimorphism in the species, the males having the fins more pointed than the females. This is the smallest of the Asiatic species of the genus *Aplocheilus*. Rachow (1927) and Misra (1959) have considered *Aplocheilus parvus* (Raj) as a synonym of *A. blocki* (Arnold). The type material of *A. parvus* has been examined and compared with the present material of *A. blocki* from Goa. The present author is of the opinion that *A. parvus* should fall in the synonymy of *A. blocki*, an earlier name. In the material of both the species, a tuft of teeth is present on the prevomer. The two species resemble each other in majority of the characters.

*Distribution.*—Fresh- and brackish waters of Madras, Cutch, Gujarat, Goa, Sind, Ceylon etc.

### (30) *Aplocheilus lineatum* (Valenciennes)

1846. *Panchax lineatum* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss*, 18: 381. (Type-locality: Bombay.)

1959. *Aplocheilus lineatum*, Misra, *Rec. Indian Mus.*, 57: 204.

*Material.*—(i) 3 exs. (27-28 mm. total length), a pond, 1.5 Kms. south-west of Ponda, Goa, 8.iv.1966, (ii) 10 exs. (37-52 mm. total length), a shallow pool, 1.5 Kms. south-west of Rest House, Margao, Goa, 11.iv.1966, (iii) 1 ex. (46 mm. total length), a pool in paddy field, 3 Kms. west of Ponda, Goa, 14.xi.1967, (iv) 4 exs. (55-56 mm. total length), a shallow pool, colva road, Goa, 17.xi.1966, (v) 4 exs. (25-54 mm. total length), a hill-stream, Cabo-de-Rama, Goa, 17.xi.1967, (vi) 1 ex. (32 mm. total length), Arvalem water falls, Goa, 28.xi.1967, all *K. S. Pradhan* Coll.

*Remarks.*—The material is characterised by the following features. The origin of the dorsal fin lies in the caudal region. The cleft of the mouth is wide and the upper jaw is protractile. The teeth in jaws are in bands. There is a transverse fold across the snout. The gill membranes are free, anal rays 15-18 and the third outer ray of the pelvic fin is prolonged.

*Distribution.*—Fresh- and brackish waters along the coast

of Bombay, Wynaad, Malabar. Travancore-Cochin, Madras. Coromandel, Goa. Ceylon etc.

### (31) *Channa orientalis* Bloch & Schneider

1801. *Channa orientalis* Bloch and Schneider, *Syst. Ichthyol.*, 496. (Type-locality: India Orientale, Type-specimen probably in Berlin).

1960. *Channa orientalis*, DeWitt, *Stanford Ichth. Bull.*, 7: 81.

*Material.*—(i) 1 ex. (71 mm. total length), a stream, 2 Kms. north east of Forest Rest House, Molem, Goa, 21.xi.1967, K. S. Pradhan Coll.

*Distribution.*—Freshwaters throughout India, Andamans, Pakistan, Burma, Ceylon, Afghanistan, Baluchistan, Malaya, Malaya Archipelago, Thailand, Laos, North and South Vietnams, Yunnan, Hainan, etc.

### (32) *Channa punctatus* (Bloch)

1793. *Ophiocephalus punctatus* Bloch, *Naturg. Ausland. Fische.*, 1: 139, pl. 358. (Type-locality: Malabar coast.)

1876. *Ophiocephalus punctatus*, Day, *Fishes of India*: 367, pl. LXXVIII, fig. 1.

*Material.*—(i) 1 ex. (78 mm. total length), a pool of water, nearly 13 Kms. south of Margao, Goa, 6.iv.1966, K. S. Pradhan Coll.

*Distribution.*—Freshwaters throughout India, Pakistan, Burma, Ceylon, Malaya, China, Polynesia etc.

### (33) *Chanda interrupta* (Bleeker)

1852. *Ambassis interrupta* Bleeker, *Nat. Tijdschr. Ned-Indie*, 2: 696. (Type-locality: Wakai, Ceram and Batavia, Java).

1875. *Ambassis interrupta*, Day, *Fishes of India*, p. 53, pl. XV, fig. 5.

*Material.*—(i) 1 ex. (25 mm. total length), Zuari river, Courtalim, Goa, 15.xi.1967, K. S. Pradhan & party Coll.

*Remarks.*—The diagnostic features of the species are the interrupted lateral line, double lower edge of preoperculum serrated, the angle of interoperculum bearing a few denticulations and the preorbital being serrated. There are 11 branched rays in the dorsal and 10 in the anal.

*Distribution.*—Andamans to Malaya Archipelago. The record of this species from the estuary of Zuari river, Goa, extends the range of distribution of this species further westwards.

(34) **Chanda gymnocephalus** (Lacépède)

1802. *Lutjanus gymnocephalus* Lacépède, *Hist. Nat. Poiss.*, 3: pl. 23, fig. 3. (Type-locality: Sumatra.)

1945. *Chanda gymnocephalus*, Smith, *Bull. U.S. Nat. Mus.*, 188: 483.

*Material*.—(i) 54 exs. (48-80 mm. total length), Zuari river, near Barim bridge, Goa, 1.iv.1966, K. S. Pradhan Coll.

*Remarks*.—The length of the 2nd and the 3rd spines of the dorsal fin is variable in relation to the depth of the body below it. It is observed that the comparative length of the dorsal spine in relation to the body depth below it decreases with age. The material is characterised by the presence of double lower edge of the preoperculum serrated. The interoperculum is smooth. The preorbital is serrated. The lateral line is interrupted. There are 10 rays each in the dorsal and anal fins. The scales are ctenoid.

*Distribution*.—Seas and estuaries of India, Africa, Malaya Archipelago, China etc.

(35) **Chanda thomassi** (Day)

1870. *Ambassis thomassi* Day, *Proc. zool. Soc. London*: 369. (Type-locality: Coast of Canara.)

1875. *Ambassis thomassi*, Day, *Fishes of India*: 52, pl. XV, fig. 2.

*Material*.—(i) 5 exs. (76-103 mm. total length), Valus river, Goa, 17.ix.1969, R. C. Sharma Coll.

*Remarks*.—The vertical limb and the double lower edge of the preoperculum serrated. The posterior part of interoperculum is serrated. The preorbital is serrated. There are 11 rays in the dorsal and 10 in the anal.

*Distribution*.—Coast of Canara upto Cochin, Goa etc.

(36) **Etroplus suratensis** (Bloch)

1785. *Chaetodon suratensis* Bloch, *Syst. Ichthyol.*, pl. 217. (Type-locality: Surat.)

1877. *Etroplus suratensis*, Day, *Fishes of India*: 415, pl. LXXXIX, fig. 6.

*Material*.—(i) 7 exs. (53-89 mm. total length), Zuari river, near Borim bridge, Goa, 1.iv.1966, K. S. Pradhan Coll.

*Remarks*.—The material agrees with the description of this species given by Day (1877) but differs in the number of spines and rays in the dorsal and the anal fins. There are 16-18 spines and 14-16 rays in the dorsal and 11-12 spines and 12-13 rays in the anal fin. In young examples, there is a black

ocellus, surrounded by white, at the middle of the soft portion of the dorsal fin; the same is absent in adults.

*Distribution.*—According to Day (1877) the type-locality of this species, as given by the author of the species, is not Surat, where it does not occur. According to Day (1877) the material was probably collected from Tranquebar. Fresh and estuarine waters of India, upto Orissa, Ceylon etc.

### (37) *Etroplus maculatus* (Bloch)

1785. *Chaetodon maculatus* Bloch, *Syst. Ichthyol*: pl. 427, fig. 2. (Type-locality: Unknown.)

1877. *Etroplus maculatus*, Day, *Fishes of India*: 415, pl. LXXXIX, fig. 4.

*Material.*—(i) 1 ex. (61 mm. total length), Valus river, 8 Kms. east of Forest Rest House, Valpoi, Goa, 16.ix.1969, (ii) 3 exs. (65-96 mm. total length), Valus river, Goa, 17.ix.1969, all R. C. Sharma Coll.

*Remarks.*—The sides of the body bear three dark blotches. There are 20 spines in the dorsal fin and 15 in the anal. The operculum is smooth and the pelvics have one spine each.

*Distribution.*—Freshwaters of Madras, South Cananra along Malabar, Goa, Ceylon etc.

### (38) *Scatophagus argus* (Linnaeus)

1766. *Chaetodon argus* Linnaeus, *Syst. Nat.* 1 ed. 12: pl. 464. (Type-locality: India.)

1875. *Scatophagus argus*, Day, *Fishes of India*: 114, pl. XXIX, fig. 3.

*Material.*—(i) 5 exs. (34-45 mm. total length), Zuari, river, near Borim bridge, Goa, Goa, 1.iv.1966, K. S. Pradhan Coll.

*Distribution.*—Seas and estuaries of India, Ceylon, to China and Australia.

### (39) *Johnius belengerii* (Cuvier)

1830. *Corvina belengerii* Cuvier, *Hist. Nat. Poiss.*, 5: 120. (Type-locality: Malabar.)

1876. *Sciaena belengeri*, Day, *Fishes of India*: 191, pl. XLIV, fig. 5.

1936. *Johnius belengeri*, Weber & Beaufort, *Fish. Indo-Austral. Archipel.*, 7: 533.

*Material.*—(i) 1 ex. (121 mm. total length), Zuari river, Goa, 12.iv.1966, K. S. Pradhan Coll.

*Distribution.*—Seas of India, Malaya Archipelago and

beyond. Recently two examples of this species have been recorded from freshwater at Poonpoon river, near Patna (Tilak, Mss.)

#### (40) *Lutjanus johnii* (Bloch)

1692. *Anthias johnii* Bloch, *Natuurg. Ausland. Fische.*, 6: 113, pl. 318. (Type-locality: Surat, India.)

1875. *Lutjanus johnii*, Day, *Fishes of India*: 42, pl. XIII, fig. 1.

1936. *Lutjanus johnii*, Weber & Beaufort, *Fish. Indo-Austral. Archipel.*, 7: 244.

*Material.*—(i) 1 ex. (195 mm. total length), Zuari river at Cortalim, Goa, 12.iv.1966, K. S. Pradhan Coll.

*Remarks.*—Weber & Beaufort (1936) have wrongly quoted in the synonymy of this species some of the species mentioned by Day (1875), such as *Mesoprion johnii* (instead of *Lutjanus johnii* on page 42) and *Mesoprion yapilli* (instead of *Lujanus yapilli* on page 45).

*Distribution.*—Seas and estuaries of India, Malaya Archipelago and beyond.

#### (41) *Pomadasys hasta* (Bloch)

1790. *Lutjanus hasta* Bloch, *Naturg. Ausland. Fische.*, 4: 109, (Type-locality: Japan.)

1875. *Pristipoma hasta*, Day, *Fishes of India*: 73, pl. XIX, figs. 3, 4.

1955. *Pomadasys hasta*, Munro, *Marine & Freshwater Fish Ceylon*: 148, fig. 430.

*Material.*—(i) 1 ex. (158 mm. total length), Zuari river at Cortalim, Goa, 12.iv.1966, K. S. Pradhan Coll.

*Distribution.*—Seas and estuaries of India, Ceylon, Red sea, East coast of Africa, Malaya Archipelago to Australia etc.

#### (42) *Mugil parsia* Hamilton

1822. *Mugil parsia* Hamilton, *Fishes of Ganges*: 215, 380, pl. 17, fig. 71. (Type-locality: Freshwater rivers of Bengal.)

1876. *Mugil parsia*, Day, *Fishes of India*, p. 350, pl. LXXV, fig. 2.

*Material.*—(i) 6 exs. (87-173 mm. total length), Zuari river, Cortalim, Goa, 12.iv.1966, K. S. Pradhan Coll.

*Distribution.*—Seas and estuaries of India, Ceylon etc.

#### (43) *Petroscirtes bipunctatus* Day

1876. *Petroscirtes bipunctatus* Day, *Fishes of India*: 327, pl. LXXI, fig. 3. (Type-locality: Calicut.)

*Material.*—(i) 1 ex. (27 mm. total length), Shallow pool

of water, at Durbate, 5 Kms. from Ponda, Goa, 17.iv.1966, K. S. Pradhan Coll.

*Distribution.*—Calicut, Goa etc.

(44) **Petroscirtes punctatus** (Valenciennes)

1836. *Blennechis punctatus* Valenciennes (in Cuvier & Valenciennes), *Hist. Nat. Poiss.*, 11: 286. (Type-locality: Bombay.)

1876. *Petroscirtes punctatus*, Day, *Fishes of India*: 326.

*Material.*—(i) 1 ex. (65 mm. total length), Zuari river, Cortalim, Goa, 11.iv.1966, K. S. Pradhan Coll.

*Remarks.*—The species is characterised by the following characters. The gill opening is restricted to a small foramen above the base of the pectoral. The ventral fin has 2 rays. There are 34 rays in the dorsal and 23 in the anal. The length of the head is contained 6.5 times in total length. The jaws have fixed teeth and well developed lateral canines.

*Distribution.*—Seas and estuaries of India to Australia.

(45) **Glossogobius giuris** (Hamilton)

1822. *Gobius giuris* Hamilton, *Fishes of Ganges*: 51, 366, pl. XXXIII, fig. 15. (Type-locality: ponds and freshwater rivers of Gangetic Provinces.)

1876. *Gobius giuris*, Day, *Fishes of India*: 294, pl. LXVII, fig. 1.

1953. *Glossogobius giuris*, Koumans, *Fish. Indo-Austral. Archipel.*, 10: 165.

*Material.*—(i) 2 exs. (79-110 mm. total length), a river uphill, Sanguem, Goa, 19.xi.1967, K. S. Pradhan & party Coll. (ii) 3 exs. (96-154 mm. total length), Zuari river, 5 Kms. from Ponda, Durbate, Goa, 17.iv.1966, K. S. Pradhan Coll. (iii) 1 ex. (70 mm. total length), a nulla near Colva beach, 12.xi.1967, K. S. Pradhan & party Coll. (iv) 1 ex. (25 mm. total length), a river uphill, Sanguem, Goa, 19.xi.1967, K. S. Pradhan Coll. (v) 1 ex. (108 mm. total length), Valus river, Goa, 17.ix.1969, R. C. Sharma Coll. (vi) 1 ex. (106 mm. total length), Shopura river, 5 Kms. off Ponda, 24.ix.1969, R. C. Sharma Coll.

*Distribution.*—Fresh- and estuarine waters of India, Ceylon, Andamans, Siam, Malaya Peninsula, China, Japan, Philippines etc.

(46) **Awaous grammepomus** (Bleeker)

1855. *Gobius grammepomus* Bleeker, *Nat. Tijdschr. Ned. Indie*, 9: 200, (Type-locality: Java.)

1953. *Awaous grammepomus*, Koumans, *Fish. Indo-Austral. Archipel.*, 10: 151.

*Material*.—(i) 1 ex. (106 mm. total length), a river up-hill, near the market at Sanguem, Goa, 19.xi.1967, K. S. Pradhan Coll. (ii) 1 ex. (108 mm. total length), Valus river, 17.ix.1969, R. C. Sharma Coll.

*Remarks*.—The two specimens of this species examined here resemble the description of the species given by Koumans (1953) but show differences in some respects. The interorbital is half of the eye diameter. In the specimens from Sanguem, the tongue is extremely reduced and its tip is emarginate whereas the same is apparently absent in the example from Valus river. The tongue in *Awaous* is bilobate (Koumans, 1953).

*Distribution*.—Fresh- and estuarine waters of India, Ceylon, Java, Sumatra, and other nearby islands.

#### (47) *Bathygobius fuscus* (Rüppell)

1828. *Gobius fuscus* Rüppell, *Atl. Reise N. Afr. Fische*: 137. (Type-locality: Red seas.)

1953. *Bathygobius fuscus*, Koumans, *Fish. Indo-Austral. Archipel.*, 10: 187.

*Material*.—(i) 2 exs. (53-58 mm. total length), river Mandovi, near ferry jetty, Betim, Goa, 29.iii.1966, K. S. Pradhan Coll.

*Remarks*.—In this material the ventral fins are united by strong membrane. The two dorsal fins are separate at the base. The teeth in jaws are in many rows. The first rays of both the dorsal fins are soft. The caudal fin is shorter than the head. There are no barbels on the head. The tongue is bilobate. There are no fleshy flaps on the inside of the shoulder girdle. A few of the upper rays of the pectoral fin are silk like.

*Distribution*.—Seas and estuaries from East coast of Africa and Red Sea, through India to Japan, Philippines, Australia etc.

#### (48) *Periophthalmus dipus* Bleeker

1854. *Periophthalmus dipus* Bleeker, *Nat. Tijds. Ned. Indie*, 7: 320. (Type-locality: Sumatra.)

1953. *Periophthalmus dipus*, Koumans, *Fish. Indo-Austral. Archipel.*, 10: 212.

*Material*.—(i) 2 exs. (39-41 mm. total length), Zuari river, Cortalim, Goa, 15.xi.1967, K. S. Pradhan & party Coll.

*Distribution*.—Andamans, Goa, Sumatra, Java, Borneo, Celebes, etc.

#### (49) *Periophthalmus variabilis* Eggert

1935. *Periophthalmus variabilis* Eggert, *Zool. Jahrb. (Syst.)*, **66**: 63. pls. 3, 4, figs. 13, 14, 15. (Type-locality: Java and Sumatra.)

1953. *Periophthalmus variabilis*, Koumans, *Fish. Indo-Austral. Archipel.*, **10**: 205.

*Material*.—(i) 3 exs. (40-65 mm. total length), Vascodegama, 45 Kms. west of Ponda, Goa, 25.ix.1969, R. C. Sharma Coll.

*Remarks*.—In this material the ventral fins are slightly united at the base. The eyes are prominent. The bases of the pectoral fins are muscular. The eyes are close together. There are 60 scales along the lateral line.

#### (50) *Eleotris andamensis* Herre

1939. *Eleotris andamensis* Herre, *Rec. Indian Mus.*, **41**: 344. (Type-locality: Andamans.)

1941. *Eleotris andamensis*, Koumans, *Mem. Indian Mus.*, **13**: 312.

*Material*.—(i) 1 ex. (21 mm. total length), a shallow pool at Durbate, Goa, 17.iv.1966, K. S. Pradhan Coll.

*Remarks*.—The present specimen has been, for the time being, assigned to this species because it resembles the description of this species. This present example is a young form. Koumans (1941) did not see examples of this species. However, there are 7 examples of the Holotype and paratype series in Zoological Survey of India, Calcutta. This material differs from *E. fuscus*. In this specimen, the ventral fins are separate, prevomer is edentulous, the preopercular angle bears a single downwardly curved strong spine, the head is naked between the eyes, the cheek is naked, operculum is partly scaled and there are 56 scales in the lateral line.

*Distribution*.—Andamans, Goa. The record of this species from Goa is interesting and extends the range of distribution of this species westwards.

#### (51) *Macropodus cupanus* (Valenciennes)

1831. *Polycanthus cupanus* Valenciennes (in Cuvier & Valenciennes),

*Hist. Nat. Poiss.*, 7: 357. (Type-locality: Arian Coupang river, Pondicherry.)

1909. *Macropodus cupanus*, Regan, *Proc. zool. Soc. London*, 2: 775.

*Material*.—(i) 2 exs. (37-57 mm. total length), a pond, 1.5 Kms. southwest of Rest House, Margao, Goa, 11.iv.1966, (ii) 1 ex. (49 mm. total length), a shallow muddy pond, 5 Kms. south-west of Rest House, Margao, Goa, 23.iv.1966, (iii) 7 exs. (16-29 mm. total length), a pool, 1 Km. south-west of Railway station, Margao, Goa, 1.iv.1966, (iv) 4 exs. (26-31 mm. total length), a pool at Concalim, 3 Kms. south of Margao, Goa, 6.iv.1966, (v) 1 ex. (60 mm. total length), a pool at Colva road, Goa, 14.iv.1966, (vi) 1 ex. (28 mm. total length), a brackish water pond, near beach, Colva, Goa, 10.xi.1967, (vii) 6 exs. (28-50 mm. total length) a pond, 3 Kms. south east of Govt. Rest House, Margao, Goa, 25.iv.1966, all *K. S. Pradhan* Coll.

*Remarks*.—In the material studied here, the outer rays of the pelvic fins are much produced. There are 20 spines in the anal fin. The accessory respiratory organs are present. The lateral line is incomplete. The shape of the caudal fin is lanceolate and pointed. The palate is edentulous.

Misra (1959) has misquoted Valenciennes (1831) by putting *Macropodus* as the generic name for the original reference.

*Distribution*.—Pools and ponds along the coast in India, Ceylon, Pakistan, Malaya, Malaya Archipelago.

## (52) *Mastacembelus armatus* (Lacépède)

1800. *Macrogathus armatus* Lacépède, *Hist. Nat. Poiss.*, 2: 286. (Type-locality: Unknown.)

1956. *Mastacembelus armatus*, Sufi, *Bull. Raffles Mus.*, No. 27: 134.

*Material*.—(i) 1 ex. (173 mm. total length), Valus river, Goa, 20.ix.1969, (ii) 4 exs. (200-300 mm. total length), Valus river, 8 Kms. east of Forest Rest House, Valpoi, Goa, 16.ix.1969, (iii) 2 exs. (187-250 mm. total length), Valus river, Goa, 17.ix.1969, all *R. C. Sharma* Coll.

*Distribution*.—Fresh- and estuarine waters throughout India, including Himalaya, Pakistan, Burma, Ceylon, Siam, Hainan.

### REMARKS ON DISTRIBUTION

Of the 52 species recorded here from Goa waters, 35 occur in other parts of India also. *Puntius filamentosus*

(Valenciennes), *Puntius vittatus* Day, *Puntius sarana subnasutus* (Valenciennes), *Oxygaster boopis* (Day), *Danio malabaricus* (Jerdon), *Chela* (Neochela) *dadyburjori* (Menon), *Lepidocephalus thermalis* (Valenciennes), *Mystus malabaricus* (Jerdon), *Aplocheilus blocki* (Arnold), *Aplocheilus lineatum* (Valenciennes), *Chanda thomassi* (Day) and *Etroplus maculatus* (Bloch) are endemic to peninsular India. The genus *Etroplus* is an Ethiopian element present in peninsular India and Goa. *Puntius melanampyx pradhani* Tilak, *Acanthopthalmus goaensis* Tilak and *Silurus goae* Haig are endemic to waters of Goa only. *Petroscirtes bipunctatus* Day occurs in Calicut and Goa on a small strip on the western coast of India.

The occurrence of some forms of fishes of Indo-chinese and Malayan sub-regions. (Oriental region), such as the genus *Acanthopthalmus*, *Puntius sarana orphoides* (Valenciennes), *Silurus goae* Haig, *Zenarchopterus striga* (Blyth), *Chanda interrupta* (Bleeker), *Periophthalmus dipus* (Bleeker), *P. variabilis* Eggert, and *Eleotris andamensis* Herre, in Goa is interesting from zoo-geographical point of view. The absence of these fishes in the intervening areas between the Indo-chinese and Malayan sub-regions on the one hand and Goa on the other, presents typical cases of discontinuous distribution, as shown below.

(a) The genus *Acanthopthalmus* is distributed mostly in the Malayan sub-region and one species (*Acanthopthalmus pangia* (Hamilton)) occurs in Indo-chinese sub-region. No record of this genus has earlier been made from the Indian or the Ceylonese sub-regions. The present record of *A. goaensis* Tilak from Goa shows discontinuous distribution in this genus.

(b) *Puntius sarana orphoides* (Valenciennes) has been recorded from the Indo-chinese sub-region (Manipur and Burma, Annandale, 1918 ; Hora, 1921) and the Malayan sub-region (Java, Borneo and Thailand) The presence of this species in Goa is, therefore, interesting.

(c) So far two species of the genus *Silurus* are recorded from India (Haig, 1950). *Silurus goae* Haig occurs in Goa and Trivandrum while *Silurus cochinchinensis* Valenciennes has been recorded from eastern Himalaya, Assam, Mysore, Burma, Siam and Cochin-china (Rau and Bhimachar, 1941 ; Haig, 1950). The distribution of the genus *Silurus* in the Oriental region is, therefore, discontinuous.

(d) *Zenarchopterus striga* (Blyth) has been known from

east coast of India, Ceylon and Malaya peninsula. The presence of this species along western coast of India is interesting.

(e) Other than Goa, *Chanda interrupta* (Bleeker) is known from Andamans and Malaya Archipelago; *Periophthalmus dipus* (Bleeker) occurs around Andamans and further east; *Periophthalmus variabilis* Eggert is distributed from Vizagapatam, Sumatra to Java; and *Eleotris andamensis* Herre is found only in Andamans. The record of these species from Goa and their apparent absence in the intervening areas is interesting.

As regards the distribution of freshwater forms, the Malayan and Indo-chinese elements travelled along the Satpura and Vindya trends of mountains to the Western Ghats in Peninsular India during a few million years ago (Hora, 1937). The dispersal of these species could have been uniform, but for some possible physiographic changes, they died out and vanished from the intermediate regions, causing a discontinuous distribution. *Acanthopthalmus goensis* Tilak and *Puntius sarana orphoides* (Valenciennes) are typical cases of this nature. After the dispersal of fishes of the genus *Acanthopthalmus* to Goa, where they survived till today, the long and spatial separation distinguished the Goa stock into a separate species. *Silurus goae* Haig is probably a parallel case.

As regards the estuarine forms, their distribution through sea could have taken place because many of them withstand varying degrees of salinity. *Chanda interrupta* (Bleeker), *Periophthalmus dipus* (Bleeker), *Periophthalmus variabilis* Eggert and *Eleotris andamensis* Herre are estuarine and marine forms. They are all Malayan forms which could have taken the route to India through the Bay of Bengal, partly got settled along Andamans and partly migrated westwards around Ceylon to the western coast of India. The contemplated manner of migration of these fishes to Goa is, however, interesting.

#### SUMMARY

The importance of the present work is realised in view of the earlier knowledge of the fish fauna of Goa, particularly of freshwater, being meagre. In this paper altogether 52 species, occurring in fresh- and estuarine waters of Goa have been recorded. Of these two have been described as new taxa by the present author. Sexual dimorphism in *Puntius melanampyx*

*pradhani* Tilak has been described. Important points of the morphology and distribution of the species recorded, have been noted. The fish fauna of Goa is interesting from Zoo-geographical point of view. Of the 52 species on record, 31 are distributed in all other parts of India, 11 species are Indian peninsular forms, while the rest are either restricted to Goa and its vicinity or have migrated from Malayan or Indo-Chinese sub-regions.

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