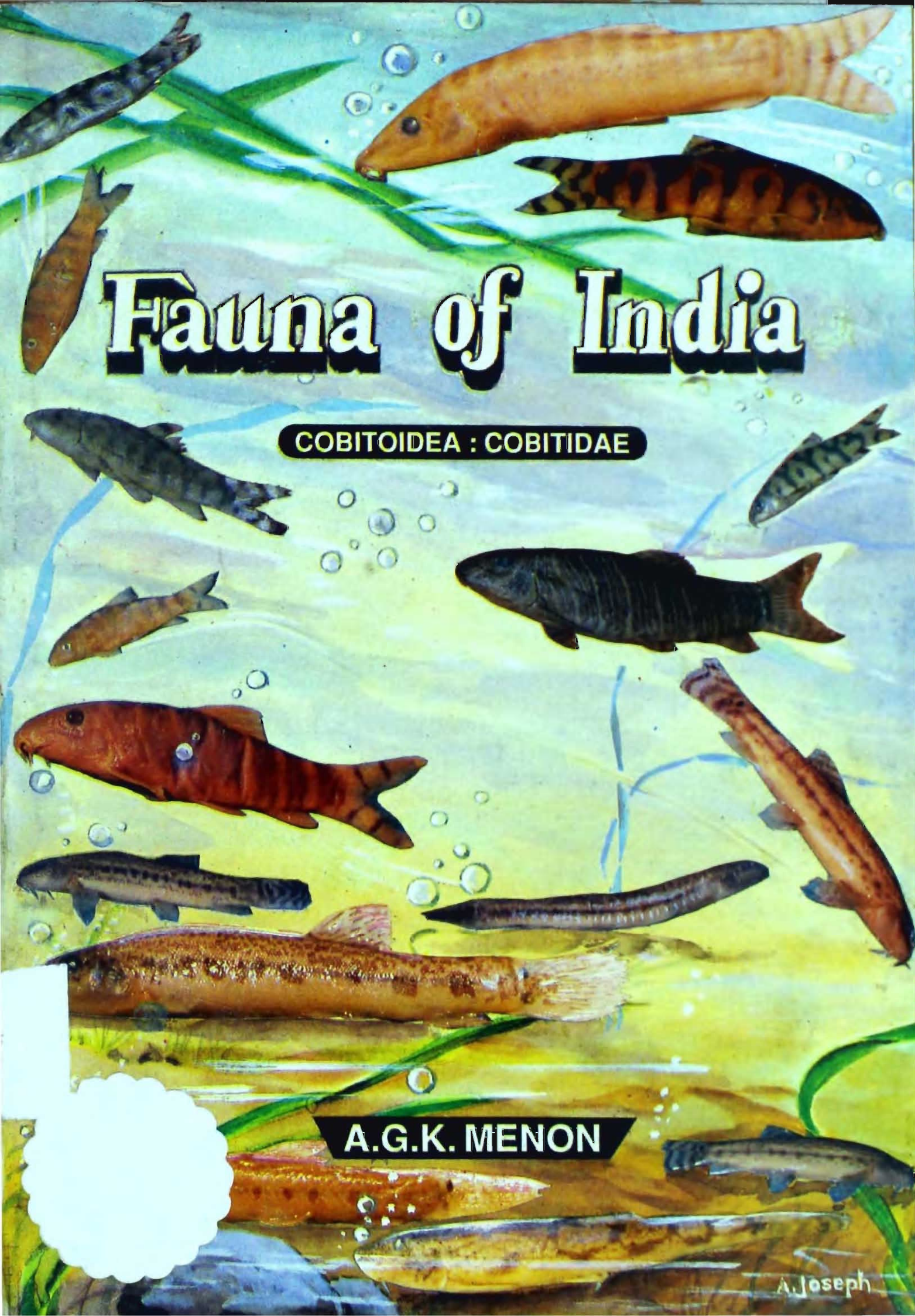
Fauna of India

COBITOIDEA : COBITIDAE

A.G.K. MENON



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AND
THE ADJACENT COUNTRIES

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COBITIDAE

By

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EDITOR'S PREFACE

The suborder Cyprinoidei of the Order Cypriniformes consists of three Families, Cyprinidae, Cobitidae and Homolopteridae. The latter two families have been brought under Superfamily Cobitoidea and dealt in two parts by Dr. Menon under Fauna of India Series. The first part dealing with Family Homolopteridae has already been published in 1987. The present volume, which is the second part, deals with Family Cobitidae and presents the description of 22 species under eight genera and two Subfamilies, Cobitinae and Botinae. Day (1878) in *Fishes of India* and (1889) in *Fauna of British India* described only 14 species. The addition of eight new species is mainly due to the contribution of pioneer workers like late Dr. S. L. Hora and late Dr. B L. Choudhury and later on by Dr. A. G. K. Menon and some others.

The fishes of Family Cobitidae, popularly known as sting loaches are mostly small, elongated and anguiliform bottom dwelling fishes occurring under pebbles or sand in swift streams, rivers and some lakes. The cobitids, alongwith their Cyprinoid ancestors seem to have originated in South East Asia. They differentiated from their Cyprinid ancestors by adopting bottom living habits probably during early Mieocine period in South West Chinese region and then dispersed to other parts. Their dispersal to India was probably through southern face of Himalaya during late Pliocene or early Pleocene period. Today they are found in Eurasia & adjaccent Islands and in Morocco. Because of their occurrence in clear waters of mountain streams with sandy and pebbly bottoms, their evolution and distribution appear to be related to the evolution of mountain system in South East Asia.

Cobitids are beautiful fishes most suitable for aquaria hobbyists, besides being reliable indicators of water quality. It is expected that this volume, which provides an updated knowledge on cobitids along with volume 1 will be useful both to Ichthyologists and naturalists alike.

Calcutta
1st January, 1993.

Dr. A. K. Ghosh
Director
Zoological Survey of India

AUTHOR'S PREFACE

This volume forms the Part II of the results of my studies on loaches dealing with the family Cobitidae for the *Fauna of India* series on fishes, the volume dealing with the family Homalopteridae published in 1987, being the Part.I. In Day's *Fishes of India* (1878) and *Fauna of India* (1889) only 14 species belonging to subfamilies Cobitinae and Botiinae comprising of 7 genera, *Botia* Gray (6), *Acanthopsis* V. Hasselt (1), *Somileptus* Swainson (1), *Lepidocephalichthys* Bleeker (3), *Acanthophthalmus* V. Hasselt (1), *Apua* Blyth (1) and *Jerdonia* Day (1) are recorded from India and adjacent countries. This volume deals with 22 species belonging to the two subfamilies, the increase in the number of species as compared to species in Day's volume is due to further additions to the Cobitid fauna of India made by the investigations of Indian and foreign workers namely the late Shri B.L. Chaudhuri, the late Dr. S.L. Hora, the late Dr. H. Rendahl, Drs. Pillai and Yazdani, Tilak and Hussain, Banarescu and Nalbant and myself.

Of the 22 species described, the distributional range of 3 species, *Lepidocephalus micropogon* (Blyth), *Misgurnus anguillicaudatus* (Cantor) and *Acanthopsis choirorhynchus* Bleeker does not extend to India while the distributional range of 3 species, *B. birdi* Chaudhuri, *B. histrionica* (Blyth) and *B. berdmorei* (Blyth) extends to adjacent countries, the first extending to Pakistan and the latter two to Burma.

Three species *Enobarbichthys maculatus* (Day), *Neoeucirrhichthys maydelli* Banarescu and Nalbant, and *Acanthophthalmus goaensis* Tilak and Hussain are known only by their holotypes and no other fresh material has been collected inspite of extensive survey of the area of their type localities.

The Introduction deals with the historical review, material and methods, evaluation of systematic characters and zoogeography and evolution. The species descriptions are in linear order in a manner that would best seem to reflect their evolutionary relationship.

Many species of the Cobitidae are similar in external morphology but the structure of their mental lobes, which is well developed and adapted for a sucking mode of feeding in these fishes, is of great value in the diagnosis of the species.

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CONTENTS

INTRODUCTION

The Cobitidae is one of the two families of the superfamily Cobitoidea, recently established by Sawada (1982), in the suborder Cyprinoidei of the order Cypriniformes. The families Cobitidae and Homalopteridae are recognised in the superfamily. For several years the author has been interested in the study of the loaches with a view to preparing a volume on Cobitoidea for the *Fauna of India* series and in 1987, he published part I of the volume dealing with the mountain loaches of the family Homalopteridae comprising the subfamilies Homalopterinae and Noemacheilinae. The present work deals with sting-loaches of the family Cobitidae and forms part II of the volume on Cobitoidea of India and adjacent countries, Nepal, Pakistan, Bangladesh, Burma and Sri Lanka.

Distributed in the Old World, loaches of the family Cobitidae are generally species of small size that range in body size from worm-like to chunky bodies (such as certain species of *Botia).* All are mostly bottom dwellers, inhabiting various habitats in rivers, small swift streams, lakes, and even stagnant pools in river beds with accumulation of leaves. All have a subterminal mouth with three pairs of barbels and a pair of erectile sub-orbital bony spines; most of them bury themselves in the sand or gravel of stream bottoms during the day and come out at night for feeding.

The subfamily Botiinae comprises of two genera:
i) *Leptobotia* Bleeker; 1870, distributed in temperate East Asia, from Amur drainage and Japan to the Yangtze, ii) *Botia* Gray, 1831 which is tropical in distribution, ranging from South China through Irrawaddy, Mekong and Menam drainages, Sumatra and Borneo, to Brahmaputra-Ganges drainages and to as far as the Indus, and south westwards to peninsular India and Sri Lanka. Subfamily Cobitinae, on the other hand, is widely distributed in Eurasia and Morocco in Africa and comprises of 13 Genera: 1. *Misgurnus* Lacépède, 1803; 2. *Cobitis* Linnaeus, 1758; 3. *Sabanejewia* Vladykov, 1928; 4. *Niwaella* Nalbant, 1963; 5. *Somileptus* Swainson, 1839; 6.*Enobarbichthys* Whitley, 1931; 7. *Acantopsis* Van Hasselt, 1824; 8. *Acantopsoides* Fowler, 1934; 9. *Lepidocephalus* Blecker, 1858; 10. *Paralepidocephalus* Tchang, 1935; 11. *Acanthophthalmus* Van Hasselt, 1824; 12. *Neoeucirrhichthys* Banarescu and Nalbant 1968 and 13. *Eucirrhichthys* Perugia, 1892.

Descriptions of six species of *Botia* Gray, one sub-species of *Misgurnus* Lacépède, eight species of *Lepidocephalus* Bleeker, one species of *Enobarbichthys* Whitley, three species of *Acanthophthalmus* Van Hasselt including one new species, one species of *Neoeucirrhichthys* Banarescu and Nalbant and one species each of *Somileptus* Swainson and *Acantopsis* Van Hasselt occurring in India and adjacent countries are included in this work.

ACKNOWLEDGEMENT

I am greatly indebted to several persons who have contributed to this study in several ways especially by the loan of specimens, examination of specimen in their care, help either in procuring specimens from remote parts of India or assistance in the field, help in processing, printing of colour films and for reading through portions of manuscripts and for their valuable suggestions, throughout the course of the work: Drs. B.K. Tikader and B.S. Lamba, Directors, and Mr. T.K. Sen, Officer-in-Charge Freshwater fish Section, Zoological Survey of India, Calcutta for sending me to Madras the entire Cobitid collections for my study here; Drs. E. Trewavas, Gordon Howes, Bernice Brewster and Alwyne Wheeler of the British Museum (Natural History) London, Dr. Petru Banarescu, Inst. Stiinte Biologice, Bucuresti, Rumania, Dr. W. Klausewitz, Natur-Museum, Senchenberg, Frankfurt, Dr. Friedhelm Krupp, Institute fur Zoologie, Saarstra Be, Mainz, W. Germany, Dr. Erik AhLander, Curator of Fishes, Swedish Museum Natural History, Stockholm, Dr. Nijssen, Curator of fishes, Institut voor Taxonomische Zoologie (Zoologisch Meseum), University of Amsterdam, Dr. P.G. Banico, University Degli Studi Di L' Aquila,L' Aquila, Italy, Dr. Maurice Kottelat, Naturhistorische Museum, Basel,Switzerland, Prof. Adolf Kotthaus, Biologiche Austalt Helgoland, Hamburg, Dr. Brian W. Coad, National Museum (Natural History) Ottawa, Dr. David R. Edds, Oklahama State University, Stillwater, Oklahama, Dr. Yukio Sawada, Faculty of Fisheries, Hokkaido University, Hokkaido, Japan, Prof.Y. Taki, University of Tokyo, Tokyo, Dr. Masao Watanabe, Watenabe Ichthyological Institute, Tokyo, Dr. Zhu song-quan, Academia Sinica, Beijing Dong lu, Nanjing, Dr. Chu Xin-luo, Kunming Institute of Zoology, Academia Sinica, Kunming, Dr. Li-si-zhong, Curator of Fishes, Institute of Zoology, Academia Sinica, Beijing, and Dr. M.R. Mirza, Lahore, Pakistan for attending to my several queries, supplying me with photographs, x-rays and for many useful sugestions.

My colleagues in the Southern Regional Station of the Zoological Survey of India, Madras, materially aided in progress of this study either by their efforts to collect specimens of the family during their field trips or by helping me with measurements and collecting data and references on various species of the Cobitidae or by reading portions of the manuscript, especially the Scientists, Dr. K. Rema Devi, Dr K. V. Lakshminarayana, and Dr. R.S. Pillai, the artists, Messers D. Sengupta, S.L. Vijayaraghavan and Shankar, my project staff Dr. K.B. Jagadeesh and Mr. R.Kannan. To each I am greatly indebted.

Although the Cobitid colections of the Zoological Survey of India, Calcutta is by far the largest collections in the country, it was necessary for me to examine many additional specimens which have been made available to me by several individuals in India and abroad. A list of these individuals and institutions, together with the appropriate abbreviations used in the text under " Material examined" are as follows:

BMNH	British Museum(Natural Histoıy) London	Drs. Gordon Howes & Bernice Brewster
DE-N	David Edds, Natural History Museum, Tribhuvan University, Katmandu.	R. L. Shrestha
DZGU (G)	Department of Zoology, Gauhati University, Gauhati.	S. C. Dey
DZGU (S)	Department of Zoology, Garhwal University, Srinagar	H. R. Singh
DZPU	Department of Zoology, Punjab University, Chandigarh	K. K. Tandon
DZSTT	Department of Zoology, St. Thomas College, Trichur	M. P. Thobias
DZKU	Department of Zoology, Kumaun University, Almorah	S. S. Pathani
DZTU	Department of Zoology, Tribhuvan University, Katmandu	Jeevan Shrestha
ERS/ZSI	Eastern Regional Station, Zoological Survey of India, Shillong, Meghalaya	C. Radhakrishnan Kamble Nivedita Sen J. R. B. Alfred
NRS/ZSI	Northern Regıonal Station, Zoological Survey of India, Dehradun	B. S. Lamba R. Tilak Hussain
NMC	National Museum of Colombo	De Silva
NHMK	National History Museum, Katmandu	Rajendra Shrestha
SRS/ZSI	Southern Regional Station, Zoological Survey of India, Madras	R. S. Pillai, K. Rema Devi
USNMNH	U. S. National Museum of Natural History, Washington D.C.	Victor G. Springer

WRS/ZSI	Western Regional Station, Zoological Survey of India, Poona	G. M. Yazdani Ramakrishna
ZMH	Zoologische Institut und Zoologiche Museum,Universitat, Hamburg	H. Wilkens
ZSI	Zoological Survey of India, Calcutta.	T. K. Sen

HISTORICAL REVIEW AND CRITIQUE

The first species of Cobitidae known from India are those described by Hamilton - Buchanan (1822). He described twelve loaches of which five are referable to Cobitidae, *Cobitis cucura* (p. 352) *C. gongota* (p.351), *C. guntea* (pp. 353 and 394), *C. pangia* (p. 355) and *C. balgara* (pp. 356 and 394) and two to Botiinae, *Cobitis dario* (pp. 354 and 394) and *C. geto* (pp. 355 and 394). Of these, *Cobitis gongota* (= *Somileptus gongota*), *C. guntea* (= *Lepidocephalus guntea*), *C. dairo* (= *Botia dario*) and *C. pangia* (= *Acanthophthalmus pangia*) are valid species and are described in this work. *C. balgara* is the male of *C. guntea,* while *C. cucura* and *C. geto* are synonymous with *C. gongota* and *C. dario* respectively.

After Hamilton - Buchanan, Gray in 1831, described *B. almorhae* from Almorha, (Uttar Pradesh, India), and he illustrated it under *Botia grandis* in *Illustrations of Indian Zoology*, (pl. xciv, fig.3, 1838) based on General Hardwicke's figure of the species.

In 1839, McClelland described seven species in *Asiatic Researches* (Indian Cyprinidae), pt. 2, under the generic denominations of *Cobitis* and *Schistura.* He divided loaches according to the shape of the tail irrespective of the presence or absence of the spine and reproduced the figures from Hamilton-Buchanan's manuscript drawings now preserved in the Asiatic Society of Bengal: *C. gongota* (pl. 51, fig. 1), *C. cucura* (pl. 51, fig. 2), *C. guntea* (p. 51, fig. 3), *C. cinnamomea* (*C. pangia;* pl. 51. fig. 5) *S. balgara* (pl. 53, fig. 2), *S. dario* (pl. 61, fig. 8) and *S. geto* (pl. 61, fig. 9). Of these, *S. geto* of Hamilton - Buchanan is the young of *C. dario* (= *Botia dario*), *S. balgara* the male of *C. guntea* (= *Lepidocephalus guntea*) and *C. cucura,* the same as *C. gongota* (= *Somileptus gongota*). McClelland in the same work gave a description of *Botia grandis*, under the subgenus *Schistura*, based on Gray's illustration of the species (pl. 94, fig.3). Two other species he described as possessing four barbels only. *C. guttata* (pp. 305,438, pl. 52, fig. 5,6) and *C. phoxocila* (pp. 305, 449. pl. 52, fig. 4) were considered by Gunther as doubtful species in the appendix to the genus *Nemachilus.*

In 1839, Swainson assigned for *Botia* Gray a new generic name *Diacantha* and included *B. dario* (Ham.) and *B. geto* (Ham.) in it and described two new species *D. zebra* and *D. flavicauda.* He, however, erroneously stated his *Diacantha* to have the

body devoid of scales. He referred *C. guntea* Ham-Buch. to a new genus *Canthophrys* and by a new name *vittatus*. In the same year Sykes (1839) giving an account of the fishes of Dukhun, added another species to the Indian Cobitid fauna *Cobitis maya,* considered by Day as a synonym of *Lepidocephalus guntea* (Ham-Buch.).

Valenciennes in 1846 recognised only the genus *Cobitis* under the family Cobitidae and described *C. cucura, C. gongota, C. balgara, C. pangia, C. geto, C. dario* and *C. grandis* and added one more species *Cobitis thermalis* (= *Lepidocephalus thermalis*) obtained from Ceylon. Jerdon (1849) described *Cobitis carnaticus, C. mysorensis* and *C. rubripinnis*, all are synonyms of *Lepidocephalus thermalis*.

In 1852, Bleeker described *Cobitis hymenophysa* from Sumatra and in the year 1860, *Hymenophysa macclellandi* from Langi, Lampong. *B. hymenophysa* is considered in this work as a distinct species from *B. berdmorei* (Blyth).

In the year 1858, Bleeker erected the genus *Lepidocephalus* with *Cobitis macrochir* from Java and Sumatra as its type species.

Blyth (1860) in his "Report on some fishes received chiefly from Sitang river and its tributary streams, Tenasserim Province" described four new genera, *Syncrossus* with *S. berdmorei* as type, *Prostheacanthus* with *P. spectabilis* as type, *Pangio* with *Cobitis pangio* Ham-Buch. and *Apua* with *A. fusca* as type. *Syncrossus* and *Prostheacanthus* are synonymous with *Botia* Gray and *Pangia* with *Acanthophthalmus* Van Hasselt.

Blyth (*op. cit*) established the genus *Apua* based on two specimens which he distinguished from *Pangia* (*Acanthophthalmus*) primarily by the total absence of ventral fins. Both Gunther (1868) and Day (1878) recognised *Apua* and regarded the absence of ventrals as a character of great importance. Hora (1921) in a note on the occasional absence of paired fins in fishes pointed out that *Apua* cannot stand distinct from *Acanthophthalmus* and that the two specimens should be considered as abnormal so far as the paired ventral is concerned. Hora(1930), however, writing on "Animal plasticity and environment" stated that the specimens without ventrals be considered as a habitat variety of *Acanthophthalmus*, as ventrals are an encumbrance for life among debris and are therefore supressed. Vinciguerra (1890) considered *Apua* as a synonym of *Acanthophthalmus*. In the same work, Blyth added four more species to the fish fauna of India and Burma namely, *Botia nebulosa* from Darjeeling, and *B. histrionica, Acanthops micropogon*, and *A. berdmorei* from Tenasserim. *Botia nebulosa*, whose description was based on a single specimen from Darjeeling, is present in the collections of the Zoological Survey of India, Calcutta. Hora (1922) considered it belonging to a species of *Nemachilus*, most probably to the male of *N. botia* (Ham - Buch.). Blyth (*op. cit.*) characterised the genus *Acanthops* Agassiz as "more elongated shape with dorsal fin somewhat backwardly and distinctly posterior to ventrals, tail rounded and head not so much compressed" He included under *Acanthops: taenia, gongota, curcura, berdmorei* sp. nov., *guntea* and *micropogon* sp.

nov., *A. micropogon* and *A. berdmorei* are considered as valid species in the work synonymising *Lepidocephalus birmanicus* Rendhal, 1948, with *L. berdmorei* (Blyth).

Bleeker (1863) in his *Atlas Ichth.* Vol. III, described the following genera under the family Cobitiodes:

Botia Gray (= *Hymenophysa* McClelland = *Schistura* McClelland = *Diacantha* Swainson = *Syncrossus* Blyth) with *Botia grandis* Gray as type species.

Somileptus Swainson with type *S. gongota* = *Cobitis gongota* Ham. Buch.

Acantopsis Van Hasselt (= *Prostheacanthus* Blyth) with type *A. dialyzona* Van Hasselt.

Acanthophthalmus Van Hasselt with *A. fasciatus* Van Hasselt as the type species.

Lepidocephalus Bleeker. with *Cobitis macrochir* Blkr. as the type and characterised it thus: "Pinnae, dorsalis anilimagis quam ventralibus approximate, ventrales in dimidio corpis posteriore site, pectoral falacate vortex squamous."

Lepidocephalichthys Bleeker with *L. hasselti* Blkr. as the type, and characterised it thus: "Pinnae, dorsalis vix post ventrales, ventrales in dimidi Corporis anteriore site, pectorals not falcate. Vortex alepidotus"

Apua Blyth with *A. fusca* Blyth as the type species.

In 1864, Bleeker described and figured *Lepidocephalichthys thermalis* Valenciennes based on fresh specimens obtained from Ceylon.

Day (1865 a,b) added a new genus *Platacanthus* with *P. agrensis* as the type obtained from Trichoor (Trichur) near Cochin, from a paddy field. The fish is distinguished with a short dorsal fin with 9 rays, pectoral large with internal ray forming a broad spine, and with scales over the whole of the body and cheek except on the top of the head. Evidently Day has the male of *Lepidocephalus thermalis* his generic name thus becoming synonymous with *Lepidocephalus* Bleeker, 1858.

Day (1867 b) described another species *P. maculatus* from Madras, characterised by a long dorsal fin composed of 30 rays. On the habit of this fish he remarked :

> "This pretty loach was kept upwards to a mouth in a vase of water. When at rest it usually remained on the sand or rock work supported by its two pectoral and anal fins, its abdomen not touching the ground. When frightened it burrowed under the sand

with great rapidity. It consumed animal and vegetable food indifferently and grew considerably while at rest."

It is noteworthy that there is no mention of the fish ascending to the surface of the water to gulp in atmospheric air as in *Lepidocephalus.*

In 1868, Gunther in his catalogue of fishes of the British Museum described two new species, *Botia rostrata* and *Misgurnus lateralis*, both from Bengal, and figured the head of the latter species and also considered *Botia geto* of Hamilton to be the young of *B. dario* of the same author. *B. rostrata* is here considered as synonymous with *B. almorhae* while *M. lateralis* is the same species as *Lepidocephalus guntea* (Ham.)

Day (1869) redescribed Blyth's species: *Botia nebulosa, B. berdmorei, B. histrionica and Apua fusca*. As stated earlier *B. nebulosa* and *A. fusca* are synonymous with *Nemachilus botia.* (Ham.) and *Acanthophthalmus fusca* (Blyth) respectively, while *B. berdmorei* and *B. histrionica* are valid species and are described in this work.

Day (1872) erected a new genus *Jerdonia* to accomodate *Platacanthus maculatus* Day (1867, p.941), the genus *Platacanthus* being a synonym of *Lepidocephalus* as indicated earlier. Following Gunther, Day in the same work considered *B. geto* Hamilton to be the young of *B. dario* of the same author.

Day (1878) included in the *Fishes of India* 14 species referrable to the family cobitidae, 6 species of *Botia*, a single species each of *Acantopsis, Somileptes, Acanthophthalmus, Apua* and *Jerdonia* and 3 species of *Lepidocephalichthys.* In selecting the generic name *Lepidocephalichthys* for the Indian lepidocephalids in preference to the earlier name *Lepidocephalus,* Day seems to have been influenced by the character of the origin of dorsal fin in these two genera described by Bleeker. The origin of the dorsal fin in *Lepidocephalichthys. Hasselti* (*Atl. Ich.* pl. C111. fig.2), the type of *Lepidocephalichthys* is nearly opposite to the base of the ventral as in all the Indian forms. In *Lepidocephalus macrochir* (*Atl. Ich.* pl. C111. fig. 6) the type of Bleeker's *Lepidocephalus*, the dorsal origin is somehow shown to originate behind that of the ventral. In none of the lepidocephalids the dorsal origin is so far behind the ventral as indicated in Bleeker's illustration. Hence the earlier name *Lepidocephalus* Bleeker is recognised in this work, *Lepidocephalichthys* being considered as a synonym of it.

In the same year in the *Fishes of India*, Day described *B. geto* and illustrated a specimen (pl. CLIV. fig. 2) from a stream in Sind Hill (wrong labelling, see below) he having earlier considered *B. geto* Ham - Buch.(1872. p. 177) to be the young of *B. dario* of the same author and considered *Diacanthus zebra* Swainson and *B. rostrata* Gunther as synonyms of his *B. geto.*

Besides the work of men like Hamilton - Buchanan, McClelland, Gunther, Bleeker and Day, workers like Chaudhuri, Rao, Whitley, Hora, Silas, Banarescu and

Nalbant, Tilak, Pillai, and Yazdani, Tilak and Hussain and Sen have also contributed much to our knowledge of Cobitid fishes of India.

Chaudhuri (1909) described a new species, *Botia birdi* from Rupar, Punjab, in the Sutlej drainage and compared it with *B. geto* of Day and *B. rostrata* Gunther and considered it differnt from *rostrata* in the shape and formation of head and colouration, the fins of *B. rostrata* being conspicuously striped with brown cross-bands whereas in the new fish none of the fins are banded or striped.

Chaudhuri (1912) described a new fish *Lepidocephalicthys annandalei* obtained from the river Tista near Jalpaiguri collected by Dr Annandale and Mr. S.W. Kemp and from the river Mahananda at Siliguri cellected by Dr. N. Annandale and distinguished it from other known lepidocephalids by its intensely black spot in the middle of the outer margin of the caudal base and its notched or concavely lunate outside border. He also described another species, *Botia lohachata*, from the Gandak river in Saran, Bihar, collected by Mr. M. Mackenzie, locally known as " Lohachat"

Rao (1920) discovered for the first time a fish belonging to the genus *Botia* from the south of the Deccan, in the River Thunga, Shimoga and described it as *B. striata*.

Hora (1921) described a new species *Lepidocephalichthys irrorata* from the lakes and streams of the Manipur valley and described *Botia berdmorei, B. histrionica, Lepidocephalichthys guntea, L. berdmorei* and *Acanthophthalmus pangia*. He considered *Apua fusca* as a hillstream phase of *A. pangia*.

In 1922 Hora considered *B. geto* of Day a synonym of *B. birdi* Chaudhuri mainly influenced by the great variety in colour exhibited by the large number of specimens of *B. birdi* he collected from the kashmir valley.

Whitley (1931) proposed the name *Enobarbichthys* to replace *Jerdonia* Day, with *Platacanthus maculatus* Day as the type, the name Jerdonia being preoccupied in Malacology (Blanford, 1861) and in Ornithology (Hume, 1870). No specimen of *Enobarbichthys maculatus* has been collected since Day's time and the only specimen available is the holotype in the British Museum, London. In external morphological characters *Enobarbichthys* is allied to *Lepidocephalus* than to any other *Cobitid* genera.

Hora (1932 a) considered Day's *B. geto* as a distinct speices and named it *B. dayi* after examining a number of specimens of *Botia* from the Mahananda river at the base of Darjeeling Himalayas, and comparing them with the original specimen of Day's figure of *B. geto* which is said to have come from "a stream in Sind Hills". This last Hora considered as due to wrong labelling of the specimen. The new species he differentiated from *B. dario* by the form of the caudal peduncle which is square, whereas in *B. dario* it tapers posteriorly. In the possession of a long and pointed

snout he further considered his new species as closely related to *B. rostrata* Gunther. In the present work *B. dayi* has been synonymised with *B. almorhae*, a species widely distributed in the Gangetic system. Sexual dimorphism is exhibited by body markings in *B. almorhae, B. dayi*—type being the female. The snout in the female is distinctly longer than that of the male *B. almorhae.*

Rendahl (1943) recognised a subspecies *Misgurnus anguillicaudatus anguillicaudatus* (Cantor) from the Irrawaddi drainage, Burma, the other subspecies being *M.a. decemcirrosus, M.a. rubripinnis* and *M.a. formosanus* in China, Japan and Formosa respectively.

In 1948, Rendahl described a new subspecies *Lepidocephalus guntea birmanicus* from Burma on the basis of the colour pattern. Smith's (1945) *L. octocirrhus* from Thailand is this species and not *L. octocirrhus* Van Hasselt. *Lepidocephalus birmanicus* is synonymised here with *L. berdmorei* (Blyth).

Kulkarni (1951) recorded *B. striata* from Kolhapur and in 1958 Kelkar described it as a subspecies, *Botia striata kolhapurensis.*

Silas (1961) re-described *Enobarbichthys maculatus* (Day).

Nalbant (1963) proposed *Madrasia*, a new generic name to replace *Jerdonia* Day, 1870, preoccupied in Mollusca (Blanford, 1861). In proposing this name Nalbant had obviously overlooked Whitley's name *Enobarbichthys* to replace *Jerdonia* Day.

Banarescu and Nalbant (1968) established a new genus *Neoeucirrhichthys* with *N. maydelli* from Goalpara, Assam as the type, characterised by the strongly fringed lower lip with a round median papilla and the absence of barbels.

Tilak (1972) described a new species, *Acanthophthalmus goaensis* from Goa, S. India.

Pillai and Yazdani (1974) added a new species, *Lepidocephalichthys goalparensis* from Goalpara, Assam, and Tilak and Hussain (1978) another new species, *Lepidocephalus caudofurcatus* from Uttar Pradesh. *L. caudofurcatus* is synonymised with *L. goalparensis* in this work.

In 1981, Shrestha, described a new species of *Lepidocephalichthys nepalensis* from Biratnagar, Nepal which I have considered in this work as synonymous with *L. guntea* (Ham.).

Tilak and Hussain (1981) made a revision of the Indian fishes of the genus *Lepidocephalus* and recognised two subgenera: *Lepidocephalus* and *Lepidocephalichthys; Lepidocephalus* with scales on the vertex and *Lepidocephalichthys*

without scales on the vertex. In this criterion he placed all the Indian species except *L. irrorata* under *Lepidocephalichthys*.

In two recent publications, Sawada (1982) dealt with the phylogeny and zoogeography of Cobitoid fishes. In this work he considered noemacheiline loaches phylogenetically closer to Homalopteridae than to Cobitidae and accordingly transferred Noemacheilinae to Homalopteridae. The Cobitidae considered traditionally as an independent family of Cyprinoidei has been placed along with Homalopteridae in the superfamily Cobitoidea.

Chen-Jing-Xing (1984) discussed the phylogenetic relationships of the Noemacheilinae, Botiinae and Cobitinae.

MATERIAL AND METHODS

Measurements

The measurements made with a pair of fine - pointed dividers and recorded to one tenth of a millimetre (mm) are defined as follows:THE STANDARD LENGTH (SL) measured from the tip of the snout to the middle of the posterior edge of the hypural plate. The snout is the distance from the tip of the snout to the nearest point on the orbit. The DIAMETER OF the EYE is the horizontal length of the externally visible eye.The INTERORBITAL WIDTH refers to the bony interorbital distance measured by pressing the dividers against the soft skin on the head. The HEAD LENGTH (HL) is measured from the tip of snout to the posterior most edge of the gill membrance. The HEIGHT OF HEAD is a straight line distance between a point on the occiput and the isthmus at right angles to the longitudinal axis of the head. WIDTH OF HEAD is the distance through the head taken at the extreme posterior limit of head between the opercle on either side. The DEPTH OF BODY is the vertical measurement from the ventral surface to the base of the dorsal fin. This measurement approximates the greatest body depth. The LENGTH OF FIN BASE is measured from the front of the base of the first ray to the last rays. The CAUDAL PEDUNCLE DEPTH is its least depth and the LENGTH OF CAUDAL PEDUNCLE is the distance measured from the posterior edge of the base of the last anal fin ray to the middle of the base of the caudal fin.

The measurements referred to as the DISTANCE BETWEEN TWO FINS are the straight line measurements between the insertion of the last ray of the first mentioned to the base of the origin of the second mentioned fin. For example the DISTANCE BETWEEN PELVIC AND ANAL FIN is a stright line measurement between the insertion of the last ray of the pelvic and base of the origin of anal fin.

The lengths of the FINS are taken as the length of the longest ray of the fin.

In the species descriptions the measurements are recorded both in relative lengths and in percentage of standard length or other values (head length etc) with the range of the values separated by a hyphen and followed in parenthesis by the average value of the measurements. The most important benefit in recording the values in relative lengths is to avoid ambiguity in statements like "body elongate", "body not elongate" If on the other hand one states that the depth of the body is contained 3 times in the length for one species and 5 times in the length for another, one can easily establish that the second fish is more elongate than the first. Further it is easier for comparison of two different species with respect to a particular character. Therefore the relative measurements as well as the values expressed in percentage are given in the description of species.

Counts

The rays of the DORSAL, ANAL and VENTRAL FINS are counted anterioposteriorly and the CAUDAL and PECTORALS dorsoventrally. The number given for CAUDAL RAYS represents only the principal rays of that fin. The fin ray count has been taken by holding the fin against the light or with the help of a dissection microscope with the light directed through the fin from below.

The first 1-3 rays of the dorsal are spiny rays in both the subfamilies Botiinae and Cobitinae. The branched rays range from 9-10 in the subfamily Botiinae, 6-7 in the subfamily Cobitinae except in *Enobarbichthys* which has 31 rays. Three rays of the anal are unbranched and the remaining rays branched. The uppermost ray of the pectoral fin is unbranched in both Botiinae and Cobitinae without cross-serrations and shorter than the second ray. In some the inner ray of the pectoral fin is ossified in the male. In the ventral fin the outermost ray is always unbranched and the remaining branched. The number of branched *versus* the unbranched rays in the dorsal and anal fins has been recorded in the descriptions.

In the Cobitinae the mental lobes of the lower lip have generally two parts: the anterior one, which is generally shorter and lobulous, is sometimes subdivided into lobules, and the posterior part, which is flap-like and longer, is sometimes subdivided into 2, 3 or more secondary barbel-like extensions. The structural differences in the mental lobes of species are well brought out in the descriptions of the different species.

In the Cobitidae two types of suborbital spines are met with: the botinous type and the cobitinous type. In the botinous type the body is elongated and slightly curved with two unequal prongs distally, the longer one, the ventrocaudal process, has a ventral position relatively to the small one, the dorso-caudal process. The dorso-caudal process is situated nearer to the base of the spine.

The Cobitinous type is met with in all genera of Cobitinae except Misgurnus. The body is usually short, straight or slightly curved, with two prongs, the longer

medio-caudal process and a shorter laterocaudal process. The laterocaudal process has a horizontal position as compared with its homologue in the Botiinae, the dorsocaudal process. The differences in the measurements of the lengths of the ventro-caudal process in the different species of the botiinae and that of the mediocaudal in the various species of the Cobitinae are indicated in the descriptions of species.

Biometrical studies and species status

Wherever large populations of a species from different drainage systems are available, special efforts have been made to study them biometrically. Taxonomic characters are found to intergrade between closely related populations when sufficiently large number of individuals are studied in detail. The degree of intergradation varies considerably and the determination whether two populations constitute two distinct species or subspecies has been based on the degree of intergradation or in other words the degree of divergence (Ginsburg, 1938; Simson and Roe, 1942; Hubbs and Perlmutter,1942; Hubbs, 1952; Mayr, Linsley and Usinger, 1953; Hubbs and Hubbs, 1953). To test the significance accurately Hubbs and Perlmutter (1942) used the graphical method. In this method, for each variable character the range, mean, one standard deviation on each side of the mean and two standard errors on each side of the mean are delineated on a graph. This method of plotting the biometrical parameters has been followed in the present work.

In the present work biometrical studies of large populations of *Lepidocephalus thermalis, L. guntea* and *L. menoni* from different drainages of the Himalayas, the Peninsula and Sri Lanka have been carried out (See Graphs) and in the case of *L. thermalis* the peninsular populations (The Godavari, Krishna, Cauvery, the Chalakudy and the Periyar) and the Sri Lanka populations (see Graphs) were found to be the same though considerable variations in colour pattern in the various populations from the different drainages were met with (pls. 4,5 & 8). These colour variants, I have considered as ecomorphotypes or ecospecies (Mayr, 1979).

Since most species originate as geographical isolates one expects that populations geographically isolated are on the border line between species and subspecies. To consider such populations as subspecies or species is arbitrary. Since the morphological differences between the populations of *L. thermalis* from the different river systems of the peninsula and Sri Lanka are negligible I have refrained giving the Sri Lankan population a species status different from that of the Indian peninsula. Sri Lanka is known to have geographically separated from the Indian peninsula only 10,000 years ago (Jacob, 1949).

For want of sufficient material the statistical analysis of most of the forms recognised here as full species has not been carried out. I have however grouped some of the closely related allopatric species into species complexes instead of reducing them to the rank of subspecies. Some of these species complexes may be

shown in future to include superspecies ("a monophyletic group of geographically representative (allopatric) species which are morphologically too distinct to be included in one species" Mayr, 1942: 169).

Modern methods of investigations of populations have revealed that some of the species we recognise today as distinct species are a collection of dynamic populations responding rapidly to changing ecological conditions. To give them all species or subspecies names will obscure the relationships that exist among them (*vide* Menon, 1989). I have therefore recognised them as species complexes. To clearly indicate such species complexes or superspecies, distributional maps have been provided in this work.

EVOLUTION OF SYSTEMATIC CHARACTERS

Botiinae

In the subfamily Botiinae in distinguishing species I have relied mostly on colouration, especially the number and nature of the cross bands present in most of the species of *Botia. B. berdmorei, B. dario, B. histrionica* and *B. striata* can be easily distinguished by their cross bands. In species like *B. almorhae* and *B. birdi*, the colouration is complicated by the anastomosis of the bands with the age of the fish. The number of branched dosal rays, the body depth, the length of the snout, the length of the ventral fins in relation to the anal opening, and the depth of the caudal peduncle in relation to its length are the systematic characters generally employed in segregating the species.

Cobitinae

The Cobitinae are generally species of small size, elongated or anguilliform, bottom dwelling mostly burying in sand or gravel of stream bottom. They are adapted to a sucking mode of feeding and a mode of locomotion by swimming like an eel brought about by the lateral flexures of the body, namely undulation. Swimming by undulation and feeding by sucking have induced a variety of adaptive modifications of characters which are of special taxonomic significance employed in the segregation of species.

As Sawada (1982) pointed out when the fish moves by undulation the fins along the body tend to give resistance to forward movements. This necessitates an increase in the driving force created by the trunk. The first tendency therefore to overcome the resistance is the reduction in size of the fins and the absence of any differentiation in the fin structure in the cobitine fishes.

The second tendency in an effort by the fish for efficient forward motion by undulation is the elongation of the body. With the elongation of body the paired fins

especially pelvic fins which primarily have served as a stabiliser or keel appear to be of least importance and they gradually decrease in size and in extreme cases disappear (Sawada, 1982: 153). As a consequence of the elongation of the body for efficient forward motion by undulation not only the fins get reduced in size but the dorsal and pelvic fins get shifted backwards.

Thus the dorsal and ventral fins have different positions with respect to one another and to the other fins as well as to their position on the body of the fish. The position of these fins differ much in the various genera and even in the different species within the same genera and forms an important and reliable systematic character in distinguishing species.

In correlation with the sucking mode of feeding which depends so strongly on the stimulus of touch of the lips, the lips of the Cobitinae are highly modified. Apart from having an inferior and more or less arched mouth the lips are thick and fleshy. The upper lip is prominent and usually continuous; the lower lip does not reach the symphysis of the mandible and where it meets the symphysis of the mandible, the lips present a short interruption. In the process of evolution, for an efficient sucking mode of feeding, the lower lip has curled up its two anterior ends on the median line forming the mental lobes which assume different sizes and shapes in the different genera and species depending upon the niche in the environment the fish lives and the degree of adaptation it has achieved in its feeding habit. The differences in the structure of the mental lobes are therefore considered as of great value in the differentiation of the species.

It is generally conceded that the structural modifications shown to be adapted to particular habitat or mode of life seem to be more characteristic of genera or groups of higher ranks than species. This assumption is mainly due to the lack of our understanding of the finer gradations of the habitats. Minute differences in a particular adaptive character, for instance, in the mental lobes of the cobitid fishes, when studied ecologically can probably be correlated with the minute differences that exist in their habitat (*vide* Hora, 1932 b, 1955).

The differences in the nature of the osseous covering of the gas bladder are valuable only at the generic level and not of value for species differentiation. The nature of the scales can also be considered to a certain extent for generic differentiation but not for species separation. The body colouration is also highly variable and cannot be depended upon for species differentiation.

The presence or absence of secondary sexual characters in the males are found useful in species identification in the Cobitinae.

ZOOGEOGRAPHY AND EVOLUTION

Evolution of the family

The family seems to have evolved from Cyprinoid ancestor which had adapted to a bottom living habitat. Bottom living Cyprinid fishes are known to have developed the pipette like system of suction feeding method with the ability to protrude the mouth (Alexander, 1966). The Cyprinid feeding method with such a protrusion mechanism is useful in taking food from the bottom with the long axis of the body remaining as nearly horizontal as possible in fast flowing hill streams, where to maintain an oblique position of the body against the force of current is impossible. From such a Cyprinid ancestor the ancestors of the Cobitidae and the Homalopteridae were differentiated and the adaptation to the bottom habitat and feeding area in the homalopterid (Noemacheiline and Homalopterine) lineage seems to have occurred earlier than the Cobitid lineage (Cobitine and Botiine). The ancestors of the Cobitidae gave rise to the sub-families, the Botiinae and the Cobitinae. The Botiinae retained the original Cobitoid habitat while Cobitinae adapted to a complete bottom habitat through gradual reduction of pelivc fin, the elongation of the body (Sawada, 1982: 195) and the development of complicated mental lobes for an efficient sucking mode of feeding.

Centre of origin and dispersal

Distribution in time

The first fossil record of the Cobitidae is by Laube (1901) who recorded four species belonging to the Cobitidae from the upper Miocene of Ohningen, near lake Kanstanz, West Germany. The next record of a *Cobitis, C. senogalliensis* Erasma, is from the Neogene of Senogallia, Italy (Nalbant, 1963). Next is that of Lebadev (1959) who described numerous specimens of a *Cobitis*, closely related to *C. taenia* from Mid-Miocene beds of Saisson Nor Lake, near the source of Irtysh river, W. Siberia. The latest record is of Gaudant (1976) who reported a single incomplete fossil *Cobitis* related to the recent species, *Cobitis taenia* from the lignitic shales of Pliocene of Puy-de-Dome, France.

Distribution in space

Cobitidae : The family Cobitidae, comprising two subfamilies Botiinae and Cobitinae, is found to-day in Eurasia and the adjacent islands and in north Morocco.

Botiinae : This subfamily comprises of two genera *Leptobotia* Bleeker, and *Botia* Gray (Sawada, 1982: 184):

Genus	*Distribution*
1. *Leptobotia* Bleeker	North-East Asia (Amur, Usuri, Sungari and Liao drainages), Central Japan and South east Asia (Fukien).
2. *Botia* Gray	South China, Sumatra and Borneo, Thailand (Mekong and Menam drainages), Burma, Himalayas (Brahmaputra-Ganges-Indus drainages), and the Peninsular India, Sind and Baluchistan.

Cobitinae: The Cobitinae has the largest number of genera and species of all the Subfamilies of Superfamily Cobitoidea and comprises the following 13 genera:

	Genera	*Distribution*
1.	*Misgurnus* Lacépède	Europe and East Asia
2.	*Cobitis* Linnaeus	Eurasia, and North Western Africa
3.	*Sabanejewia* Vladykov	Southern East Europe (Black Sea - Caspian Sea - Aral Sea Region) and West Asia.
4.	*Niwaella* Nalbant	Central Japan and South-eastern Korea.
5.	*Somileptus* Swainson	Assam, North-eastern India.
6.	*Enobarbichthys* Whitley	Madras, South-eastern India.
7.	*Acantopsis* Van Hasselt	Borneo, South-eastern Sumatra and Java, Malay Peninsula, Thailand (Mekong and Menam drainages) and Burma (Irawaddy-Chindwin drainages).
8.	*Acanthopsoides* Fowler	Thailand (Mekong and Menam drainages).
9.	*Lepidocephalus* Bleeker	South-eastern Asia and India.
10.	*Paralepidocephalus* Tehang	Yunnan, S. China.
11.	*Acanthophthalmus* Van Hasselt(=*Cobitopsis*Myers)	South-eastern Asia and India.
12.	*Neoeucirrhichthys* Banarescu & Nalbant	Janali River (Brahmaputra drainage), Goalpara District, Assam, India.
13.	*Eucirrichthys* Perugia	North-western Borneo.

It is a well known fact that the centre of origin and dispersal of the Cyprinoid fishes is in South East Asia, most probably South China (Hora, 1949, Menon 1973).

From the distributional records of the cobitidae both of time and space it can be concluded with a certain amount of certainty that the cobitid fishes were differentiated from their cyprinid ancestor in the South Chinese Region during the late Oligocene or early Miocene period and had spread to Europe and thence to North Africa during the Oligocene-Miocene through a siberian route when the climatological conditions there were favourable (*vide* Banarescu, 1973). Their dispersal to India and thence to West Asia seems to have been along the southern face of the Himalayas during the late Pliocene or early Pleistocene. The migration south-westwards to the Indian Peninsula and southwards to the Malay Archipelago had probably taken place during the pluvial periods of the Pleistocene.

Geological history of the Himalayas and South-West Chinese mountain and river Systems.

In considering the origin and dispersal of any group of animals an understanding of the geological history of countries it inhabits is essential. In the case of Cobitidae which is generally found in clear waters of mountain streams in the Siwaliks, the lesser Himalayas and the Western Ghats or in clear waters along base of mountain streams with sandy and pebbly bottom their evolution and distribution seem to be closely related to the evolution of mountain systems in South East Asia. In order therefore to understand the causes of evolution and dispersal it is necessary to consider the geological facts regarding the evolutionary history of the mountain systems of the South East Asia.

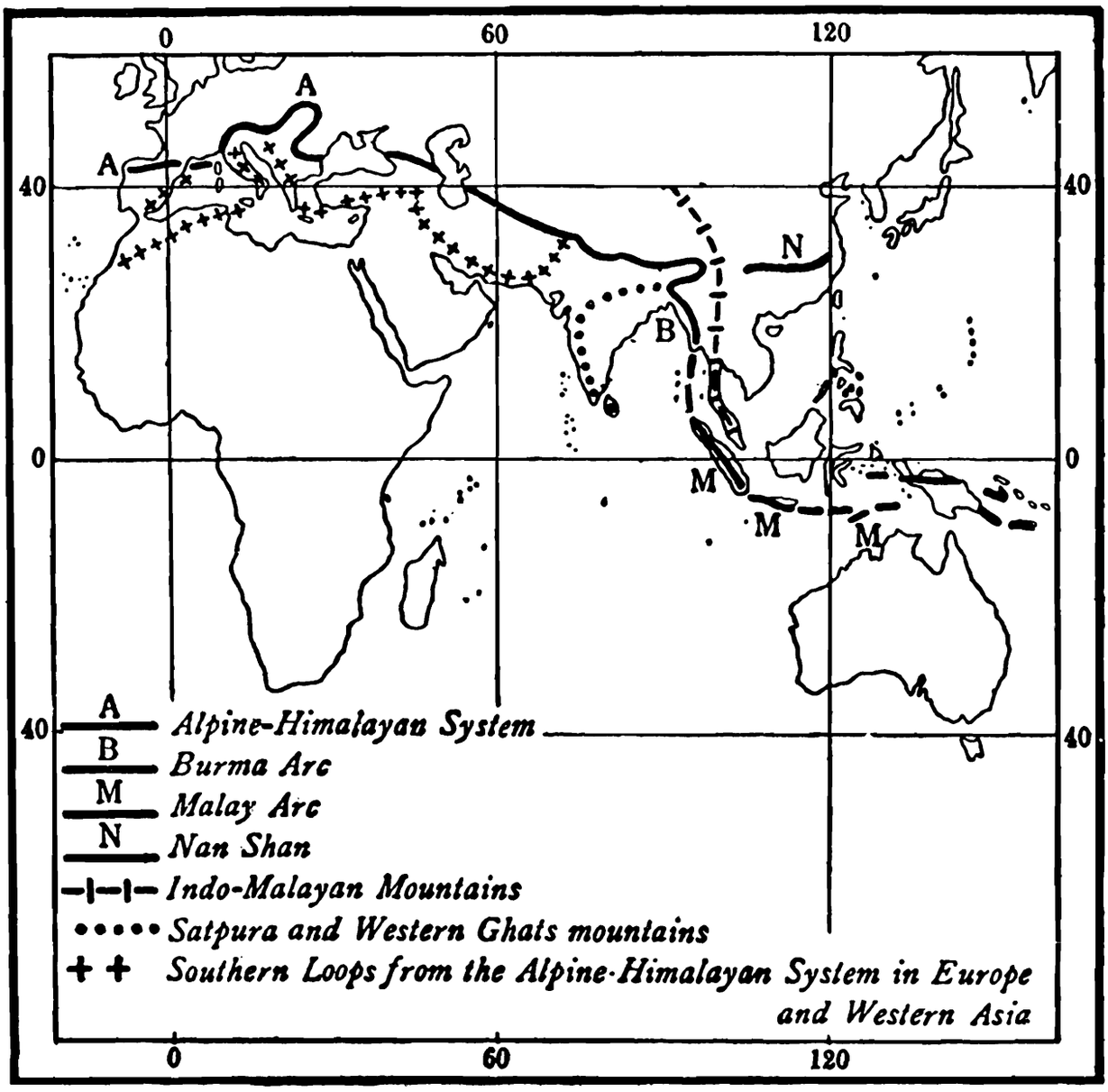
The Himalayas

There is no evidence to show that the Himalayas as a great mountain range are older than the later part of the Eocene period (Burrad and Hayden, 1933). Before that the Himalayan Area formed the northern coast of Gondwanaland and a number of rivers drained northward into the Tethys Sea of that time. The orogenic movement which was strongly pronounced during the Oligocene, probably began in the late Cretaceous times and continued through the Eocene and the Middle Tertiary Periods. There is considerable evidence to show that it was still active during the Pliocene and later periods. The ossiferous beds of Nagri Khoram and of the Karewas of Kashmir, however, indicate that during the Pleistocene period the Himalayas had already acquired the general features of their present day form. The nature of the Siwalik deposits shows that the main drainage lines of the southern face of the Himalayas date as far as the Pliocene epoch and that the rivers which brought down sands and boulders from mountains to build up the Siwaliks of the Duns and Hundes were the direct ancestors of the modern Sutlej and Ganges.

The mountain systems of China and the Malay Archipelago

Gregory and Gregory (1923) and Gregory (1925) have given a very lucid account of some of the recent geological changes in South Eastern Asia, with a view

to making clear the geographical relations and the evolution of the mountain and river systems in this part of the continent.



Map 1. Alpine-Himalayan and associated Mountain systems of Asia and Europe.

The eastward extension of the Alpine-Himalayan systems has long been a subject of great controversy. According to one view it passed north eastward across China to Bering Straits; according to another it was bent round against the mass of Chinese Tibet and passed through western Burma to Sumatra and thence along the southern islands to the eastern Archipelago. The interpretation of the mountain structure of Chinese Tibet is, however, complicated by being due to movements at two different periods. The Himalayan movements as has already been pointed out are not older than the later part of the Eocene period while the other group is much

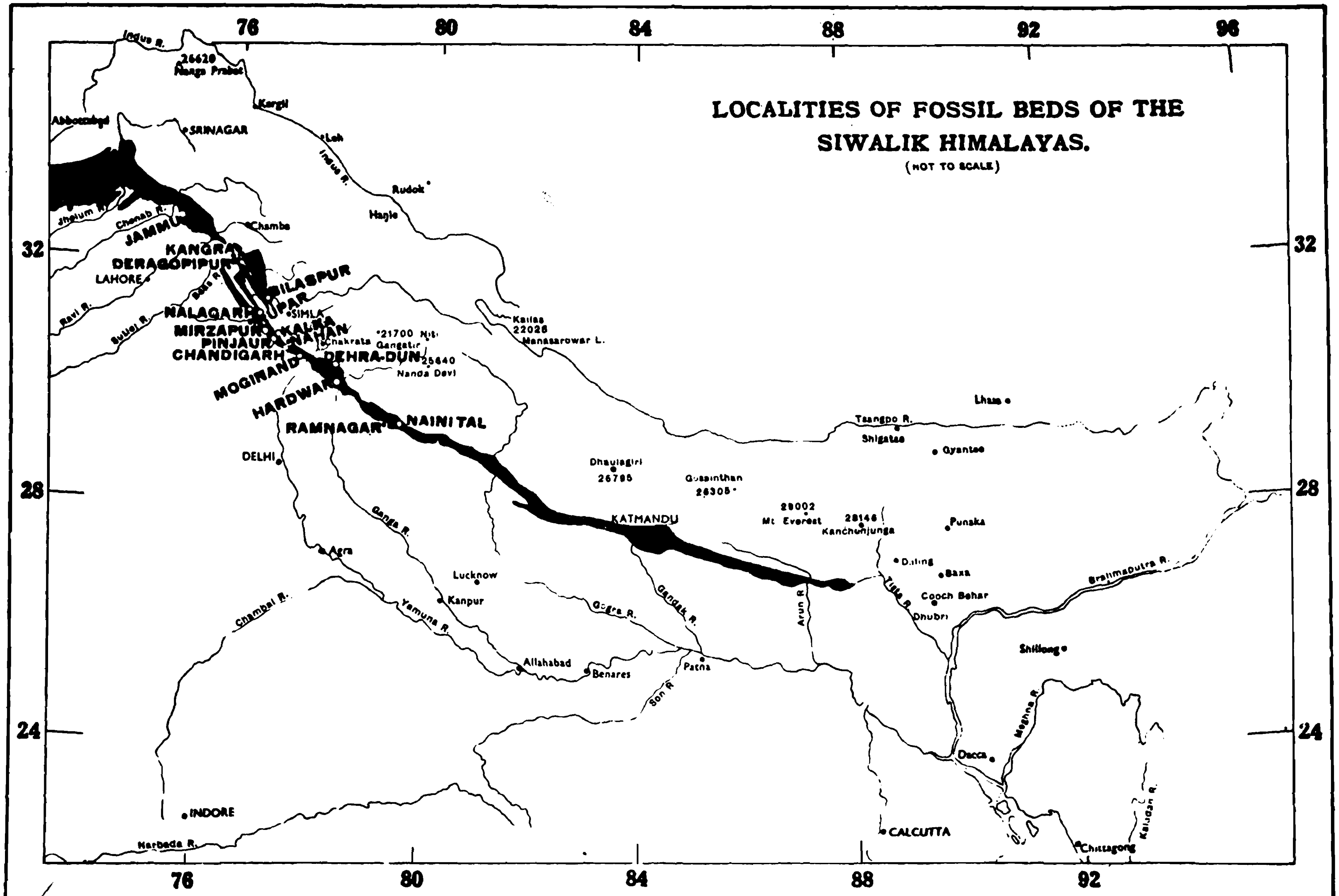
older, this movement being culminated in South Eastern Asia in the middle Permian. The older system is represented in Europe by the Hercyian mountains, and in Asia by the Altaids, the members of which cross Chinese Tibet on lines approximately north and south, and continue southwards as the Indo-Malayan mountains. The older system is supposed to have stemmed the eastward extension of the direct Himalayan uplift. In this region of the Chinese Tibet where Himalayan and the Altaid mountains meet, crustal movements have produced complex topographical features. As a result of the resistance offered by the Altaid mountains, the Himalayan movements became resolved into two factors one resulting in a chain of intense folding across southern China known as Nan Shan and the other in the uplift of the Burmese-Malayan Arc.

Miocene-Pliocene geology and distribution of Cobitid fishes

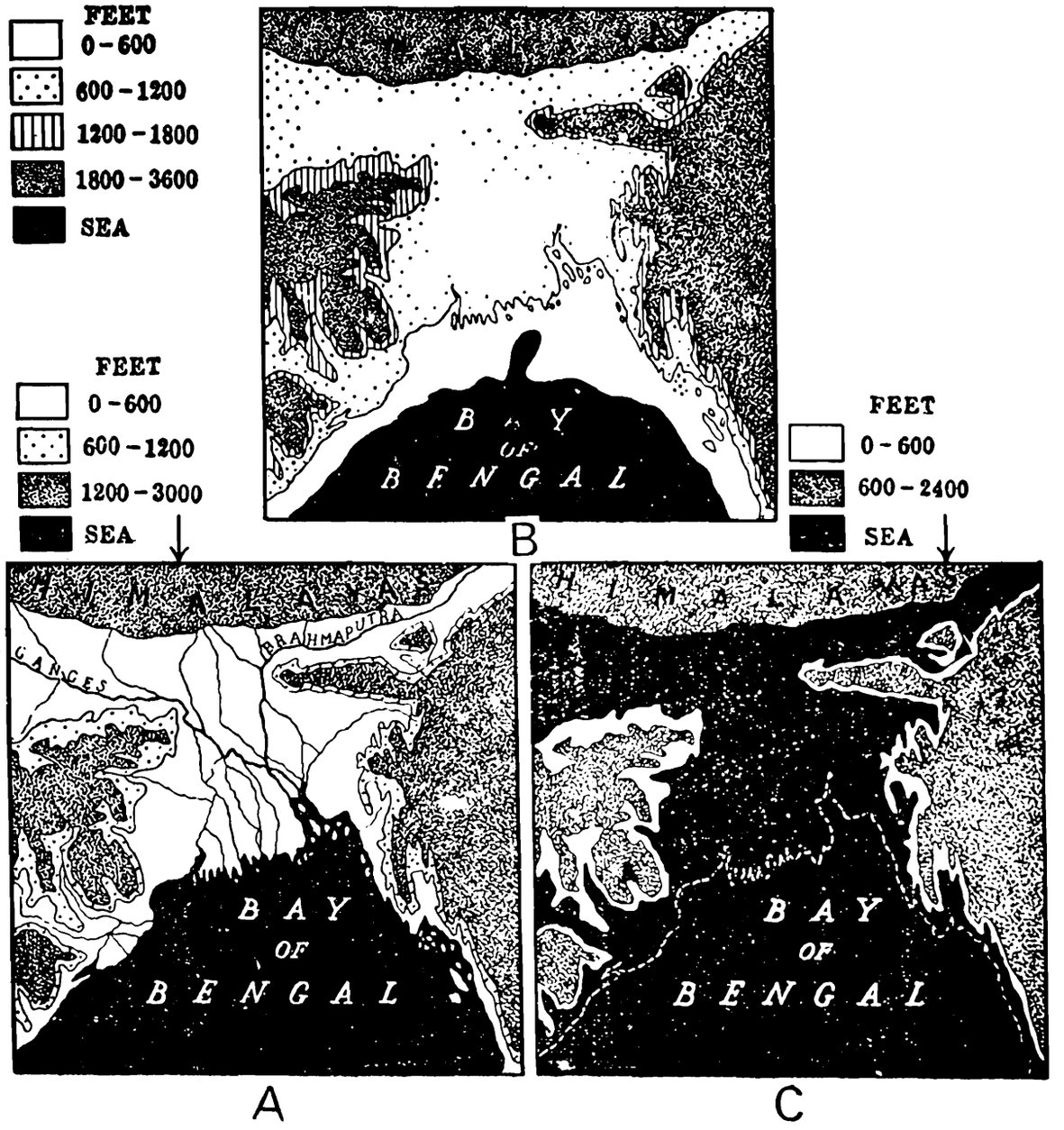
Geologists have shown that the transgression of the Bay of Bengal during the Mid-Eocene cut off the land route between India and Burma and it lasted the whole of the Miocene. During this period no freshwater fish seems to have migrated into India from South China (Hora and Menon, 1953). It is known (Menon, 1951) that during the Pliocene wet tropical conditions prevailed along the southern face of the Himalayas extending to China in the East and beyond Baluchistan towards the west facilitating the spread of marsh loving fishes from south west China to as far as Africa. Cobitid fishes had most probably dispersed along the southern face of the Himalayas during the early Pleistocene period. During the end of Pliocene or early Pleistocene, the major final upheaval of the Himalayas had occurred which raised the Siwalik sediments into dry land and the Siwalik fore-deep gradually disappeared leaving a shallow depression-the Pleistocene fore-deep-which with the formation of the Assam Plateau by then began draining northern India from Assam to the Arabian Sea (Hora, 1952).

The Garo-Rajmahal gap was under the sea during the whole of the Pliocene period and therefore practically no migration of cobitid fishes from the north to the Indian Peninsula was possible. During the Pleistocene, however, the Garo-Rajmahal gap became a dry land facilitating the migration of hill-stream fishes (Hora, 1951). During the Glacial periods of this epoch, aeustatic drop in the sea level of 200 metres had actually bridged up the Garo-Rajmahal gap topographically and climatically enabling cobitid fishes like *Lepidocephalus* and *Botia* to cross over from the north to the Peninsula. There was also greater run off of water in the streams and rivers especially in the big rivers like Narmada-Tapti along the Satpura-Vindhyas during the ice-ages of the Pleistocene enabling the quick spread of these fishes to the Peninsula and *Lepidocephalus* even to Sri Lanka, the final separation of Sri Lanka from the Peninsula being about 10,000 years ago (Jacob, *Op.cit.*)

The spread of cobitid fishes from South China to the Malay Archipelago occurred during the Pluvial periods of the Pleistocene (Silas, 1951).



Map 2. Siwalik fore-deep along the Himalayas as evidenced by the Siwalik fossil fishes.



Map 3. Orographic features of Garo Rajmahal gap during the glacial and interglacial periods of the Pleistocene(After Hora, 1951). A. Present day conditions. B. During Height of Glacial period. C. Condition during an inter glacial period.

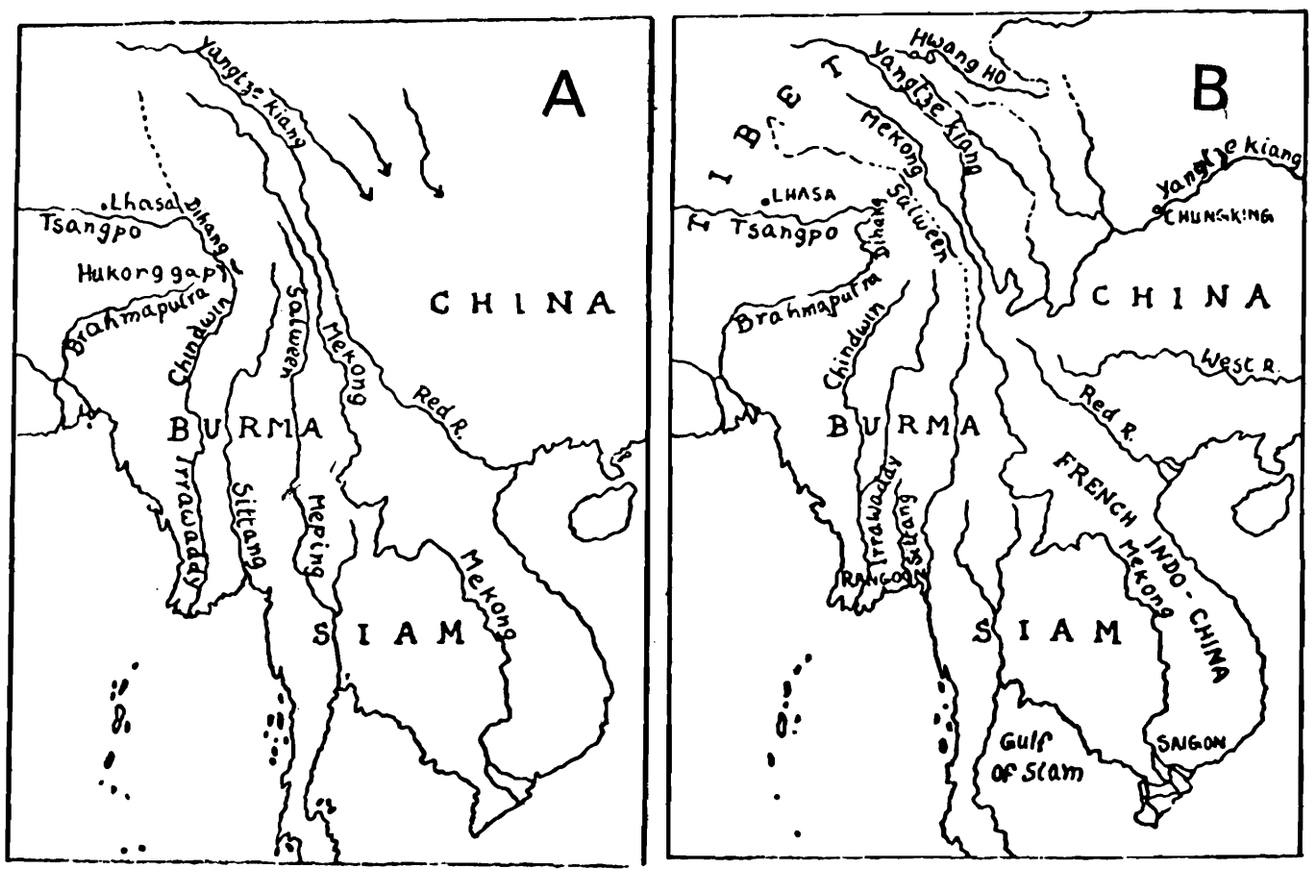
Geography and river systems of S.E. Asia

The distribution of fresh-water fishes of South East Asia (Hora, 1944) support that the centre of dispersal of this remarkable fauna can be traced to south west China, particularly Yunnan. It is also rich and highly diversified that there must have been favourable ecological conditions for it to flourish and speciate.

The dissected plateau of Western Yunnan are parts of the eastern uplift of the direct Himalayan Movements. In Yunnan the movements have occurred in the foot

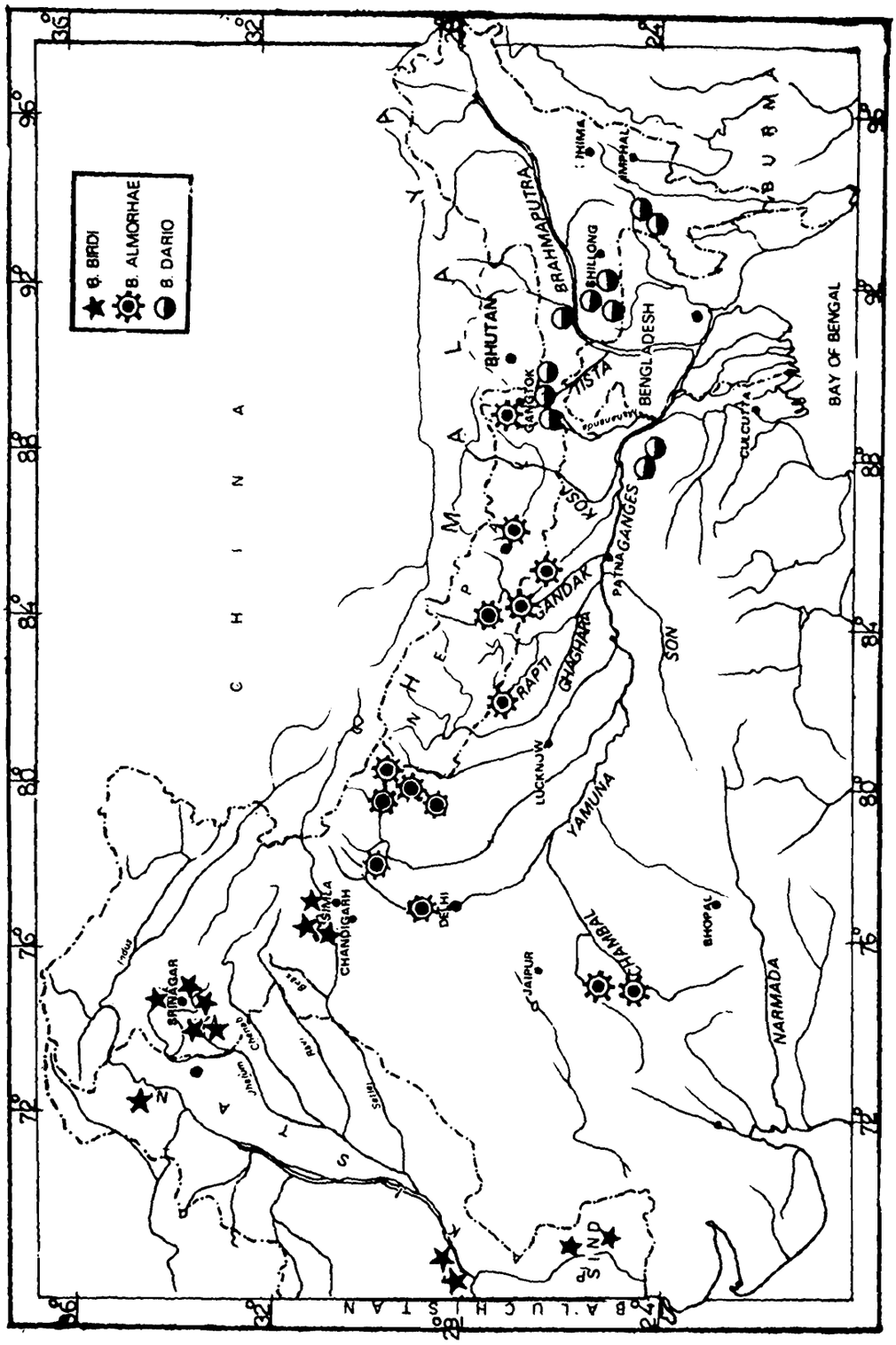
hills and have been planed down by rivers (Gregory, 1925). Post-Himalayan movements have been particularly felt in Yunnan and its immediate vicinity. These movements and the resulting habitudinal variations are supposed to have been responsible for the dynamic evolutionary processes in Yunnan plateau and the prolific differentiation of the cobitid-stock of fishes from the ancestral stock. The Pleistocene orogenic movements, which affected the drainage systems in South East Asia, also helped in the dispersal of their aquatic fauna. It would seem that to the Cobitid fishes, which spread from Yunnan, the main Himalayan trend in the West, the Burmese-Malayan Arc in the south and the Nan Shan trend in the east acted as the principal migratory highways.

The changes that took place in the main river systems in South East Asia during this period had no doubt facilitated the dispersal of the cobitidae.



Map 4. Drainage systems of S. E. Asia(After Gregory, J.W., 1925) 1. The Post-Himalayan River System, 2. Existing river system.

The rivers of Yunnan have cut deep valleys in their course probably due to regional subsidence of the area (Gregory and Gregory, 1923) or as a result of a regional uplift (*vide* Hora, 1953). Whatever may be the reason for the deep canyons of the South-Western Chinese rivers, from the point of view of distribution of fishes,



Map 5. Distribution of *Botia almorhae; B. birdi* and *B. dario.*

it is noteworthy that the original Salween which is supposed to have discharged through the Me-ping and Me-nan rivers of the Gulf of Siam had its eastern branch diverted towards the West which now discharges into the Gulf of Martaban and is known as the Salween, while its eastern branch joined the Mekong River and its waters were thus diverted to the east. All the rivers west of Salween had their head waters beheaded by more eastern rivers. These facts, indicate the probable direction of subsidence from South West China and the distribution of Cobitid fishes to South East Asia (Fukien) and further east to Japan. During the Oligocene to Pleistocene, the Japanese area was a marginal part of the Asian continent (Minato et al, 1965).

Probable Sequence of Evolution and Spread of Cobitidae to India and Adjacent Countries

The Botiinae

The Wave of evolution of the Botiinae - the *almorhae-dario-histrionica* stock- from Yunnan seems to have taken place during the late Pliocene along the southern face of the Himalayas to as far west as Sind, Baluchistan and Pakistan.

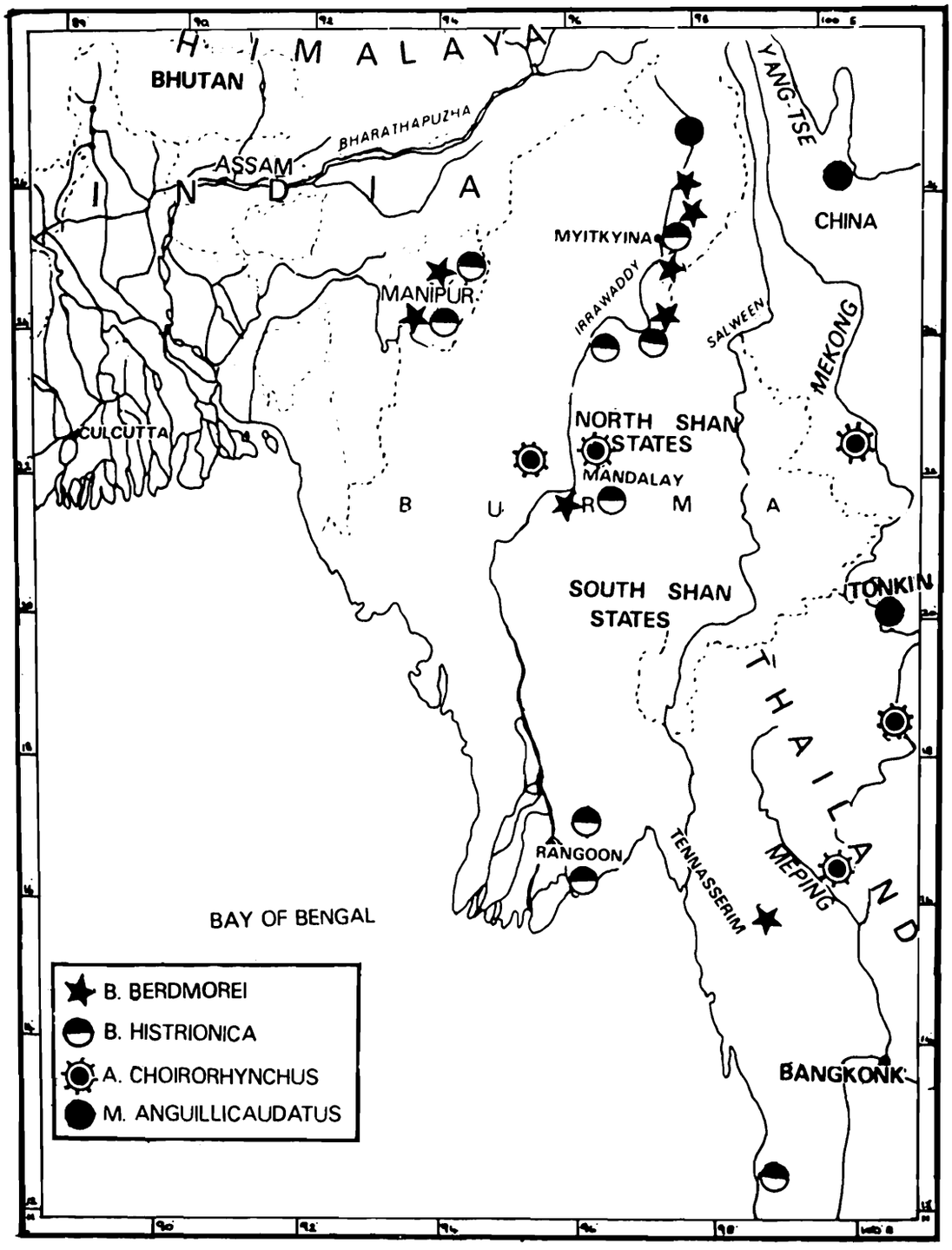
In the second wave of Botiinae as a consequence of the first wave, but probably after some time lag we get the *B. striata* species in the Indian Peninsula. The Garo-Rajmahal gap was under the sea during the Pliocene (Hora, *op.cit*) and hence the first *Botia* Wave does not seem to have spread to the Peninsula till the end of that epoch. The *striata* with its characteristic striped body colour pattern must have evloved in the peninsula from an early offshoot of the *almorhae-dario-histrionica* stock.

The *berdmorei* wave: The spread southwards from Yunnan to Burma and Manipur seems to have been accompanied only during the second or third pluvial period of the glacial epoch. The evolution of *berdmorei* in Manipur-Burmese area and *hymenophysa-modesta* group of the Thai-Malay Archipelago are the results of this wave (Taki, 1972).

The Cobitinae

The *Lepidocephalus* - Wave: The spread westwards to India and Pakistan as far as the Indus system seems to have taken place during the early Pleistocene along the fore-deep of the Himalayas. *Lepidocephalus goalparensis, L. annandalei* and *Neoeucirrichthys maydelli* have probably evolved in the eastern Himalayas from this stock during the late Pleistocene or even recent epochs.

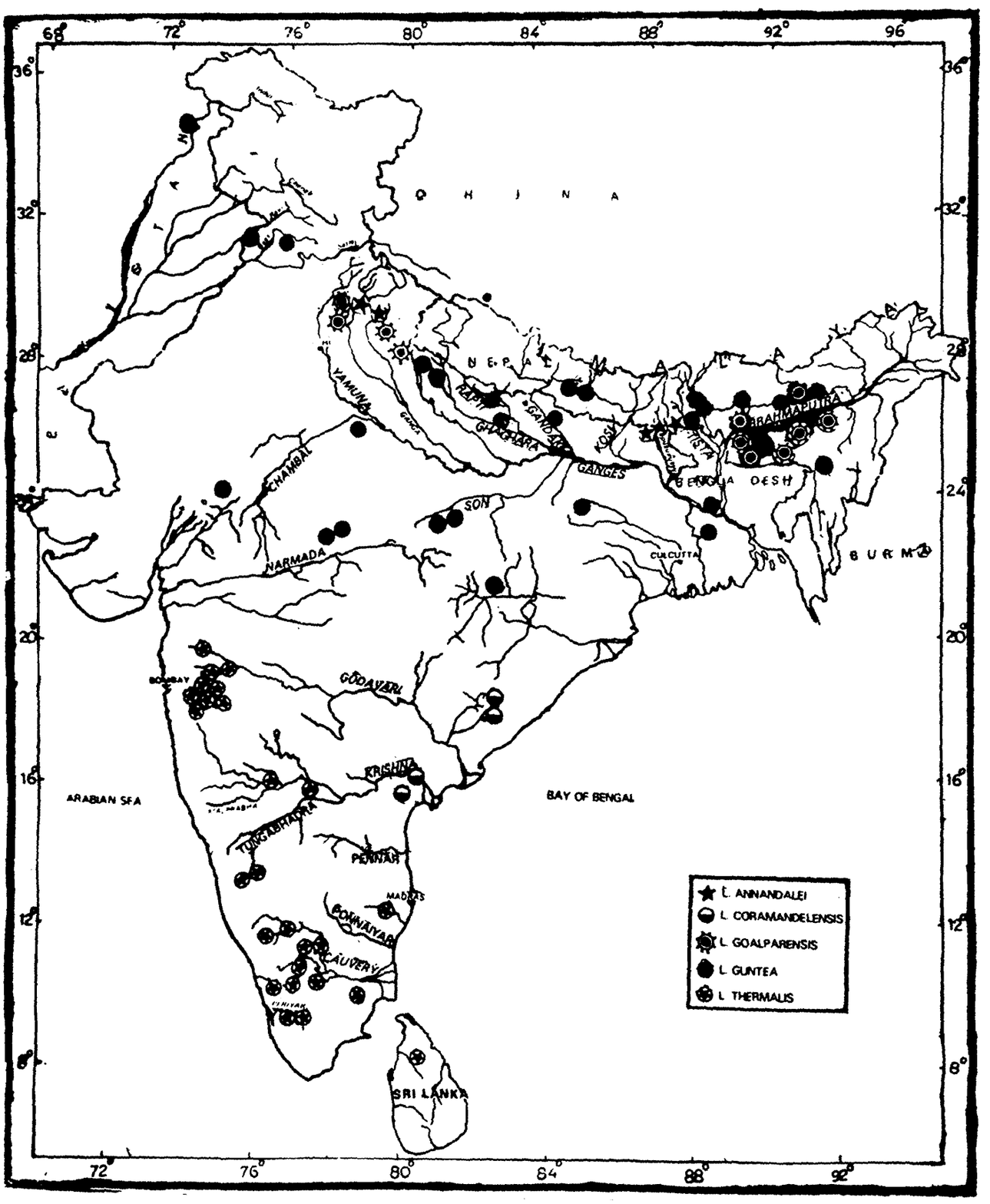
The second wave of *Lepidocephalus* as a consequence of the first wave, but probably after some time lag had brought about *L. thermalis* species in the Peninsular India and Sri Lanka (See Map 7). *Enobarbichthys maculatus* has eveloved in the Peninsula from this stock (See Map 8).



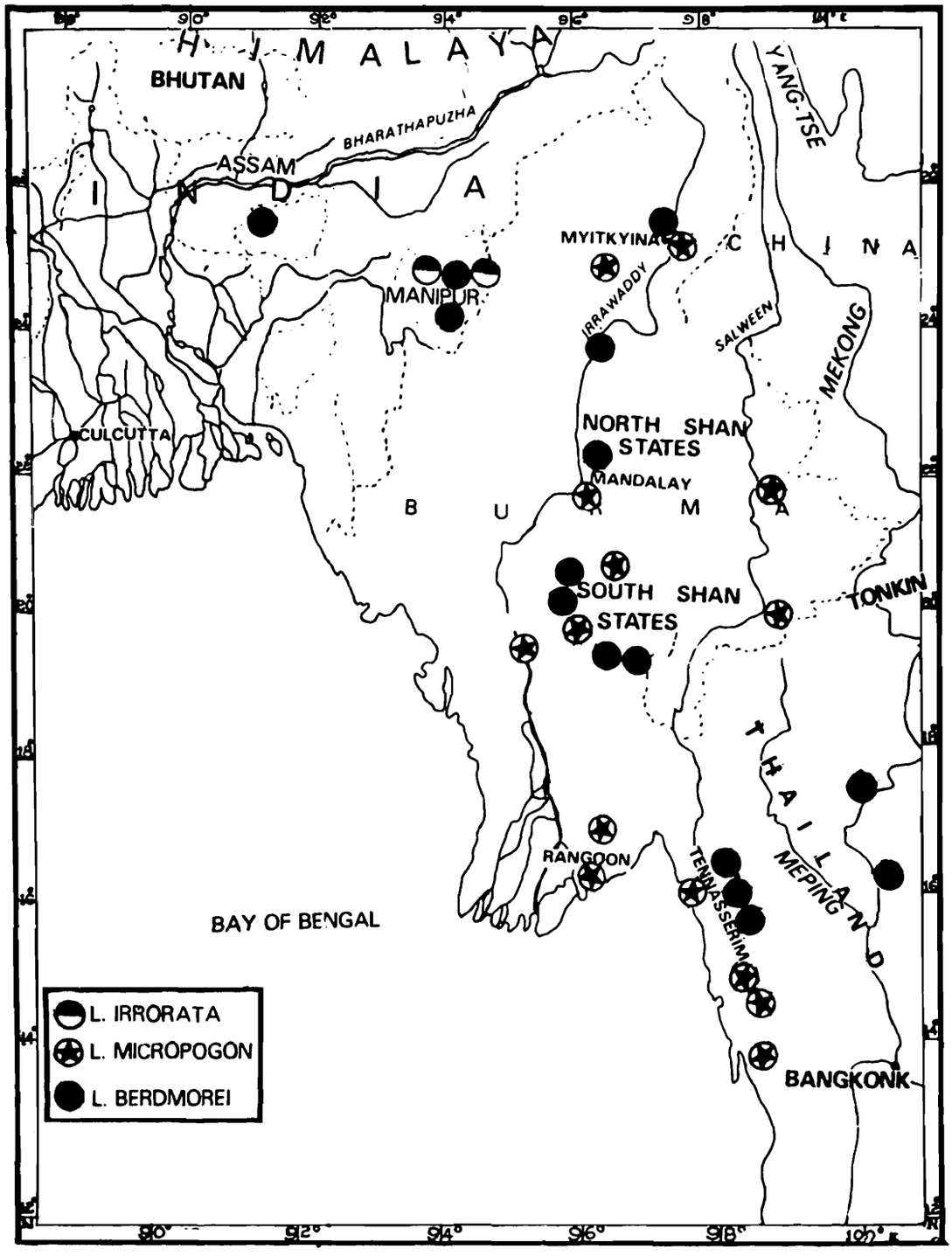
Map 6. Distribution of *Botia histrionica; Botia berdmorei, Acantopsis choirorhynchus*;(also found in the South-eastern Asia and Indo-Australian Archipelago) and *Misgurnus anguillicaudatus* (also found in North-eastern Asia and Southwards to Central China).

The *Acantophthalmus* - wave: The spread westwards to South Eastern Asia and India seems to have been accomplished during the late pleistocene period.

The *Acantopsis*-wave : The last evolutionary line is that of *Acantopsis*. Since *Acantopsis choirorhynchus* has some primitive characters (osseous air-bladder capsule transversely elongated and well forked caudal fin) the genus seems to have evloved first though its spread to Malay Archipelago and Thailand-Burma seems to



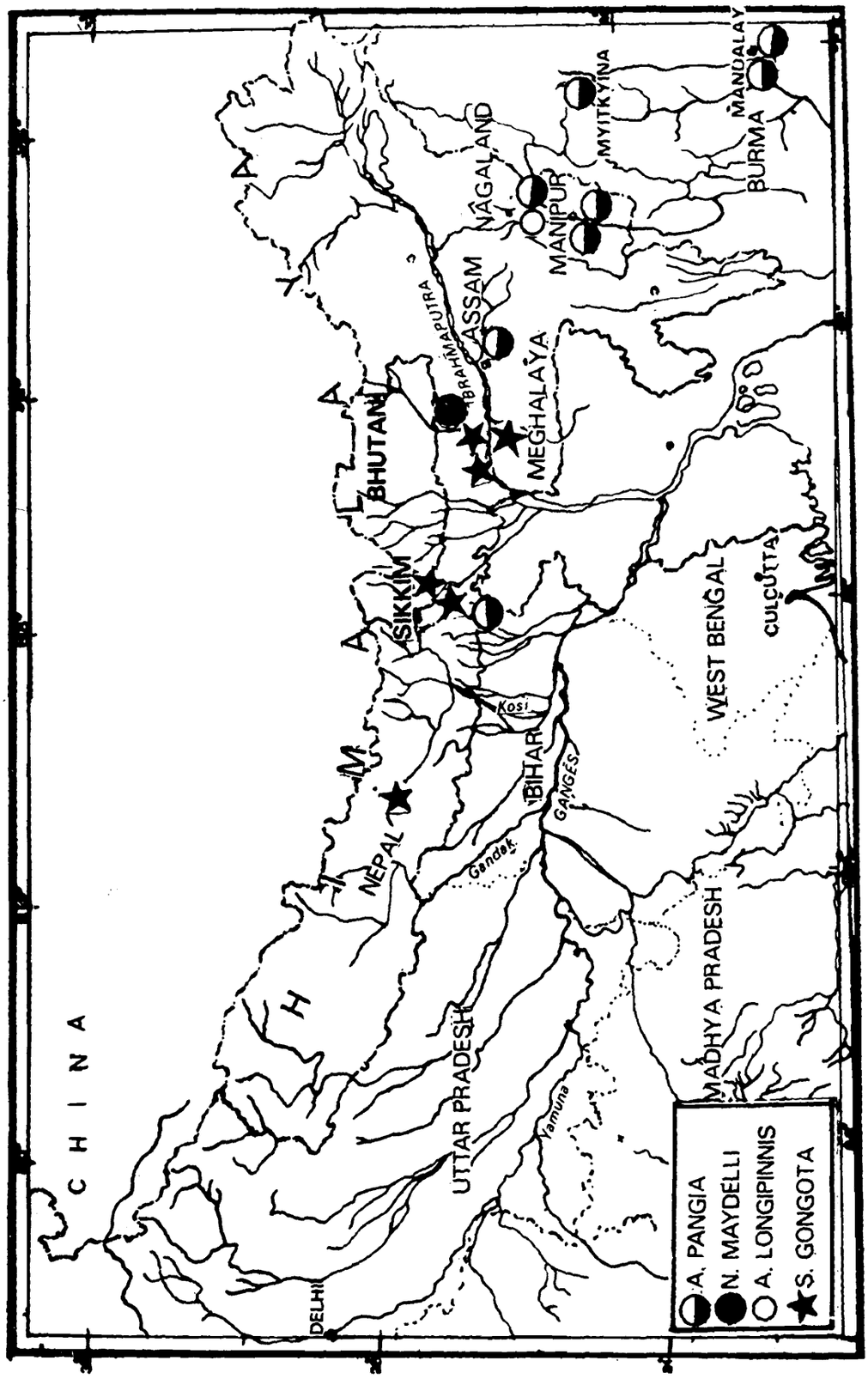
Map 7. Distribution of *L. guntea; L. thermalis; L. coromandelensis; L. menoni; L. anandalei*



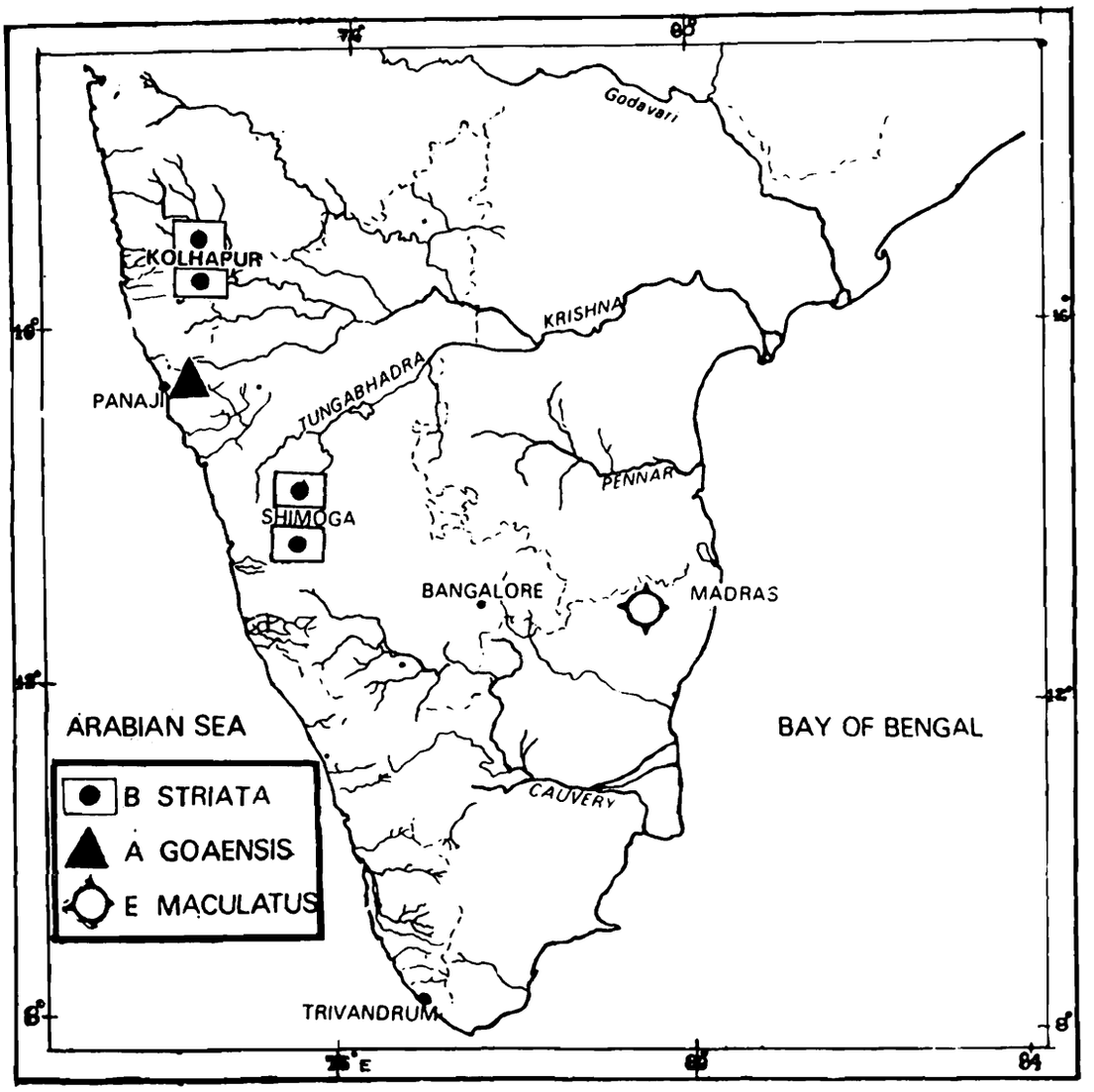
Map 8. Distribution of *L. berdomorei*(also found in Thailand) *L. micropogon; L. irrorata.*

have been accomplished only during the last glacial period of the Pleistocene.

The *Misgurnus*-wave : *Misgurnus* appears to be the most primitive genus by the structure of the osseous capsule of the air bladder and by the character of the non-functional suborbital spine (Nalbant, 1963). The genus seems to have spread to Europe along a Siberian route during the Oligocene-Miocene period. After a great palaeartic E-W discontinuity the genus appears in East Asia including the Irrawaddy



Map 9. Distribution of *Acanthopthalmus pangia*



Map 10. Distribution of *B. striata.*, *E. maculatus.*, *A. goaensis*

drainage at Myitkyina as *Misgurnus anguillicaudatus* (Cantor). This distribution in Myitkyina separated from its main distributional range is probably brought about by a second dispersal from South China (Sawada, 1982) during the late Pleistocene or recent times due to the recent changes in the drainage systems (*vide* Supra p 22).

The *Somileptus* - wave: *Somileptus* appears to be closer to *Cobitis-Sabanejewia-Niwaella* group of the Cobitinae occuring in Eurasia and North West Africa (*Cobitis*), Southern-East Europe and West Asia (*Sabanejewia*) and Japan and south eastern Korea (*Niwaella*). Like the first wave - *Misgurnus* wave - this group appears to have spread along a Siberian route during the Oligocene-Miocene period. *Somileptus* appears to have evolved during Recent times in North-Eastern India (probably) from a early off-shoot of the stock which gave rise to *Cobitis-Sabanejewia-Niwaella* group.

SYSTEMATIC ACCOUNT

Order CYPRINIFORMES

Suborder CYPRINOIDEI

Key to families of suborder CYPRINOIDEI

1(a)	Head and body compressed, not flattened below.	
	2(a) A single suborbital or preorbital spine, mouth inferior; barbels 6; pharyngeal teeth in a single row; air bladder enclosed in bone, its posterior part small or vestigial	Cobitidae
	2(b) No suborbital or preorbital spine; mouth terminal or inferior; barbels none, 2 or 4; pharyngeal teeth in 1, 2 or 3 rows; air bladder divided into anterio-posterior part not enclosed in bone.....	Cyprinidae (+ Psilorhynchidae)
1(b)	Head and body depressed, flattened below	Homalopteridae

Family COBITIDAE

Key to the subfamilies of family COBITIDAE

A.	Two pairs of rostral and one pair of maxillo-mandibular barbels present.Caudal deeply forked.	Subfamily Botiinae (Genus *Botia*)
B.	One pair of rostral, a pair of maxillary and a pair of maxillo-mandibular barbels present. Caudal fin rounded or slightly emarginate (except *Acantopsis).*	Subfamily Cobitinae (Genera: *Neoeucirrhichthys, Enobarbichthys, Acantopsis, Somileptus, Acanthophthalmus, Misgurnus* and *Lepidocephalus*)

Subfamily BOTIINAE

Distribution: East and S.E.Asia

Genus **Botia** Gray, 1831

1831. *Botia* Gray, *Zool. Miscell.*, p.8 (Type, *Botia almorhae* Gray, monotypic.)

Body oblong, compressed, with dorsal profile more or less arched. Head moderately elongated. Mouth small with thick lips. Barbels six, four rostral and two maxillo-mandibular. Eye with a free circular orbital margin. An erectile bifid spine before and partly below eye. Scales rudimentary, none on the head. Origin of the dorsal in advance of the ventral, situated in the middle of the body. Pectorals low down. Caudal forked.

Anterior chamber of air-bladder covered by fibrous capsule, above which is an osseous one, covering it to a smaller or greater degree. Posterior chamber free, usually developed.

Sexual dimorphism: Not evident.

Distribution: India, Burma, the Indo-Australian Archipelago (Sumatra, Java, Borneo and Singapore), Southern China.

Key to species of the genus **Botia**

1. Head and body marked with a number of oblique vertical stripes	*B. striata* (Shimoga to Kolhapur in Maharashtra)
Head and body marked with a few broad vertical bands or reticulation	2
2. Ventrals short, not reaching anal opening	*B. birdi* (Kashmir, Sind and Baluchistan)
Ventrals long, reaching or extending beyond anal opening	3
3. Body marked with regular cross bands, both in young and adult	4
Body marked with irregular and partly confluent cross bands (female) or reticulated with grey on yellow back-ground (male) or "Y" shaped bands in young.	*B. almorhae* (Eastern Himalayas through Nepal to Himachal Pradesh, Chambal and Sone drainages, M. P.)
4. 10 or more cross bands on body with 5 longitudinal rows of black dots.	*B. berdmorei* (Burma and Manipur)

Less than 10 cross bands on body without longitudinal rows of black dots.	5
5. 7 to 8 oblique cross bands on body with three oblique cross bands on each caudal lobes.	*B. dario* (Assam and Upper Bengal)
5 vertical cross bands on body with two oblique cross bands on each caudal lobes.	*B. histrionica* (Burma and Manipur)

The *almorhae* Complex

1. Botia almorhae Gray

(Figs. 1-5, pl. I; Figs. 1-8, pl. II; Fig. 6, pl. IX)

1831. *Botia almorhae* Gray, Zool-Misc., p. 8 (Type locality: Almorha., type of the species presented by general Hardwicke)

1838. *Botia grandis,* Gray, *Ill. Ind. Zool.*, pl. 94, fig. 3

1846. *Botia grandis*, Velenciennes (in C. & V.) *Hist. Nat. Poiss.* 18:86.

1863. *Cobitis grandis*, Bleeker, *Atl. Ich.*, p. 70

1868. *Botia almorhae*, Gunther, *Cat. Fish Brit. Mus.*,7:367 (India)

1868. *Botia rostrata* Gunther, *Cat. Fish Brit. Mus.*,7:367 (type Locality:Bengal)

1872. *Botia almorhae,* Day, J.Asiat.Soc. Beng. 41(2):178

1878. *Botia geto*, Day (nec Hamilton) (in part), *Fish.India* ,p.606, pl.154, fig. 2 (From Sind, through the Punjab, Himalaya, Valley of Ganges, Jamuna, Sone river and Assam. Sind, Punjab and Assam excluded).

1878. *Botia almorhae*, Day (in part), *Fish. India*, p.607, pl.154 fig. 5(Kashmir, Almorha and Khasi hills. Kashmir and Khasi hills excluded).

1889. *Botia almorhae*, Day (in part) *Faun. Brit. Ind.Fish.,* 1:217 (Kashmir, Almora and Khasi Hills., Kashmir and Khasi hills excluded).

1889. *Botia geto*, Day (nec Hamilton) (in part) *Faun. Brit. Ind.Fish.*, 1:216 fig. 77 (from Sind, through the Punjab, Himalayas, Valley of the Ganges, Jumna and Sone rivers to Assam. Sind, Punjab and Assam excluded).

1912. *Botia lohachata* Chaudhuri, *Rec.-Indian Mus.*, 7:441, pl.40, figs. 2, 2a, 2b (Type locality:Gandak river at Saran, Bihar).

1922. *Botia almorhae*, Hora, *Rec.Indian Mus.*, **24**:320 (Almorha, revision).

1922. *Botia almorhae*, Hora, *Rec.Indian Mus.*, **24**:321 (Gandak river at Saran, Bihar., revision).

1932. *Botia dayi* Hora, *Rec. Indian Mus.*, **34**(4):571 (Type locality:Mahanadi river at the base of Darjeeling Himalayas., also the original of Day's figure of *B. dayi*).

1937. *Botia dayi*, Shaw and Shebbeare, *J. Asiat. Soc. Beng.*, **5**:66 (Mahananda River, Darjeeling).

1949. *Botia almorhae*, Menon *J. Bombay nat. Hist. Soc.*, **48**(2):539, 542 (R.Kosi in Almorha).

1953. *Botia lohachata*, Shina & Shiromani, *Rec. Indian Mus.*, **51**:62 (Kali river, Meerut).

1966. *Botia lohachata*, Mahajan, *J. Bombay nat. Hist. Soc.*, **62**(3):448 (Kali river, Muzaffarnagar district, U.P.).

1967. *Botia lohachata*, Srivastava, *Fish. East.* U.P., Varanasi, pp. 60, 61 (Gorakhpur:Rohini river, at Domingarh Choti Gandak at Banjari ghat).

1974. *Botia almorhae*, Menon, *Inl. Fish. Soc. India*, Special Bull., **1**:50 (Check.list).

1974. *Botia rostrata*, Menon, *Inl. Fish. Soc. India*, Special Bull., **1**:52 (Check.list).

1981. *Botia lohachata*, Sharma and Kulshreshtra, *J. Zool. Soc. India*, **33** (1-2): 65 (Kota district, Rajasthan).

1984. *Botia lohachata*, Hussain & Tilak, *Rec. zool. Surv. India.* **81** (3-4):274 (Faizabad district, U.P.).

1986. *Botia lohachata*, Sharma & Rajput, *J.Bombay nat. Hist. Soc.* **83** (3):565 (Bijnour district, U.P.).

1987. *Botia almorhae*, Sing and Dobriyal, *Proc. Nat. Acad. Sci. India*, **57**(B), 4:538-539 (River Alaknanda, Garhwal Himalaya).

Diagnosis : A Botia found along the base of the eastern Himalays and Chambal in Rajasthan and Sone in U.P. with 9 branched dorsal rays; comparatively long ventral 5.90 (5.12-6.83) in SL extending beyond anal opening; and comparatively long anal, 5.46 (4.24-6.83), reaching base of caudal. Body marked with confluent brown cross bands enclosing variously shaped yellow spots in female; reticulated with grey on a yellow background in male; 4 or 5 "Y" shaped bands passing over large vertical bands in young. All fins with regular cross bands.

Description : Based on 23 Specimens, 31.0-115.0 mm SL from Jammarri Nadi, Saran (4); Kosi river, Kosi Survey (7); Balkhau river, near Anhar Dist. Chapra, Bihar (5); and Katmandu, Nepal (2): Almorha (5);

D. 3/9, P.1/13, V.1/7, A. 3/5, C.19.

Body elongate, compressed with dorsal profile somewhat elevated, ventral profile less curved. Body depth 3.10-5.71(4.24) in SL. Caudal peduncle compressed, longer than high, its least depth 1.00-1.46 (1.12) in its length. Anus slightly in advance of anal fin.

Head long, longer than height of body in adult, nearly as long as height of body in the young, 3.18-4.07 (3.60) in SL. Snout pointed, longer than the post orbital length; in adult female the snout is distinctly longer than that of the male, 1.67-2.44 (2.14) in HL. Nostrils nearer to eye than tip of snout. Mouth small, sub-inferior, greatly arched. Lips thick, upper more prominent and continous, finely fringed internally, lower separated from chin by deep groove laterally and continous with chin mesially by mental lobes; mental lobes well developed with a pair of barbel-like structures (Pl.I fig.2). Barbels six, four rostral, close to each other at the base arising from a flap of skin hanging down from tip of snout, not extending to anterior margin of orbit; two maxillo-mandibular barbels; rostral and maxillary pairs approximately of equal length. Eye small, lateral, in posterior half of head, its diameter 3.33-7.5 (5.01) in head. Inter-orbital rather wide,convex, its width 2.57-4.29(3.36) in head. Suborbital spine bifid in a crescent-shaped groove below eye; its origin nearer to nostril than to eye, ventrocaudal process long, slightly curved; its tip extending to below the hind margin of eye.

Scales : Scales cycloid, minute, embedded, present on body and nape. Absent on head. Lateral line complete, extends to middle of caudal base.

Fins : Origin of dorsal nearer base of caudal than tip of snout in adult; origin of ventrals behind that of dorsal; pectoral shorter than head, extending more than half distance to ventrals; ventrals shorter than pectoral, extending to beyond anal opening; anal fin reaching to almost base of caudal, caudal deeply forked; its length slightly shorter than head, lobes acutely pointed. Distance from tip of snout to dorsal origin 1.79-2.12(1.92) in SL. distance from tip of snout to ventral origin 1.68-2.04 (1.81); distance from origin of dorsal to base of caudal 1.78-2.19(1.97); distance from origin of pectoral to ventral origin 3.09-4.07 (3.65); distance from base of ventral to anal origin 3.78-5.33 (4.36); length of the longest pectoral ray 4.0-5.14 (4.73); of ventral 5.12-6.83 (5.90); of dorsal 4.24-6.0 (5.05); of anal 4.24-6.83 (5.46); length of dorsal fin base 5.15-10.10(6.87); length of anal fin base 8.8-14.33(11.40). Length of the caudal fin from mid-base to tip of longest ray 2.4-4.50 (3.23).

Measurements in percent of SL : Length of head 24.55-31.43 (27.82)., length of snout 12.17-15.65 (13.08); diameter of eye 3.48-8.82(5.84)., width of inter orbital 6.09-11.29 (8.44)., length of maxillo-mandibular barbel 3.81-8.57 (6.18)., depth of body 17.50-28.41 (23.65).

Measurements in percent of HL : Length of snout 40.91-60.00 (47.10)., eye

diameter 11.90-30.00 (20.41) width of Inter-orbital 23.33-38.89 (30.22)., length of maxillo mandibular barbel 14.81-27.27 (22.02)., width of body 10.0-14.89 (12.99)., least depth of caudal peduncle 13.75-17.99 (15.61)., length of caudal peduncle 14.52-20.0 (17.27)., distance from tip of snout to dorsal origin 47.14-55.81 (52.2)., distance from tip of snout to ventral origin 49.09-59.46 (55.24)., distance from origin of dorsal to base of caudal 45.71-56.19 (50.84)., distance from origin of pectoral to ventral origin 24.55-32.35 (27.53)., distance from base of ventral to origin of anal 18.75-26.44 (23.08)., length of dorsal fin base 10.0-19.4 (14.76)., length of the anal fin base 6.98-11.36(8.90).

Colour : *Female*: Body and head in the adult with a number of irregular brown cross bands generally three Y-shaped bands,the first in front of dorsal, second below dorsal, third behind, bands becoming confluent enclosing variously shaped yellow spots with age., all the fins with more or less regular cross bands, generally dorsal, anal and pectoral with three, ventral with two and caudal four or five. *Male:* body and head of adult reticulated with grey on a yellow background., all fins with more or less regular cross bands, generally dorsal with three ventral with two or three, pectoral and caudal with three to five. *Young*: bands on body form Y-shaped arches, four or five in number, passing over large size vertical bands.

Sexual dimorphism : Body markings are distinctly different in the two sexes (see paragraph above on colouration). An external sexual dimorphism is also apparent in the length of the snout., that of the female is distinctly longer.

Size: Largest specimen examined, a female 148 mm SL.

Affinities: This species is most closely related to *B. birdi* which shows a number of differences in form and colour., ventral comparatively short, not reaching anal opening., anal fin comparatively short not reaching caudal base (cf. *B. almorhae*). body generally marked with 8-10 dark cross bands from back to abdomen, though considerable variation in colour is met with the age of the fish.

Range: India : Eastern Himalayas: Testa at Darjeeling through Nepal to as far as Jumna at Delhi., Rajasthan: Chambal drainage., U.P. : Sone drainage. The young are common in lower reaches and the adults appear to migrate to higher elevations in the Himalayas reaching as north as Katmandu in Nepal, Almorha in Kumaon and Srinagar in Garhwal Himalayas.

Material examined : Type : None

Other material: India: Bihar: 1. ZSI F 8069, Jamwari river, Saran, Coll. M.Mackenzie, Nov. 1958. 1, ZSI F 8070, Data same as above. 1, ZSI F 4267, Data same as above. 1. ZSI F 4269, Data same as above. 5, ZSI uncatalogued, shalkia river, Dist-Chapra. 15, ZSI uncatalogued, Kosi Survey, Coll. Chaudhuri.

Delhi: 3. ZSI F 2665, 2, Yamuna river, Coll. R.Chatterjee.

Rajasthan: 1, ZSI F 4005/2, Gambhir river, Sawai Madhapur, Coll. Majumdar & R.N. Bhargava, 17.6.1983.

Uttar Pradesh: 1, ZSI F 9148, Almorah, Coll. F.Day. 1, ZSI F 2460, Data same as above. 1, ZSI F 1397, Rapti river, Gorakhpur, 2.2.1949. 7, ZSI uncatalogued, Kosi river, near Kashipur, Almorha, 1986. 1, uncatalogued ZSI, Kosi Survey, Kumaon Hills, 6.6.1948. 1., ZSI uncatalogued, Srinagar, Garhwal, Coll. H.R.Singh. 4, ZSI uncatalogued, Markunda river, (Exchange) April 1974. 2, SRS/ZSI uncatalogued, Almorha, DR. S.S. Pathani, 2.7.85.,

Nepal : 3, SRS/ZSI uncatalogued, Katmandu, Coll. Mrs. Jeevan Shrestha, May 1985. 2, DE-N-102, Gandak. W.canal at Tribeni, Katmandu, 9.3.1985. 5, DE-N-96, Narayani river at Narsi, Katmandu, 6.3.1985.

2. **Botia birdi** Chaudhuri
(Figs. 1-3,pl. III; Figs. 5 & 6, Pl.VII; Figs. 1 & 2, Pl.IX)

1878. *Botia geto*, Day (nec Hamilton), in part, *Fish India*, p.606 (Sind and Punjab).

1887. *Botia geto*, Day (nec Hamilton), in part, *Faun.Brit. India*.Fish., 1:216 (Sind and Punjab).

1909. *Botia birdi* Chaudhuri, *Rec. Indian Mus.*, 3:399 (Type locality:Sirhind Canal, Punjab).

1922. *Botia birdi*, Hora, *Rec.Indian Mus.*, 24:319 (Sind in the Kashmir valley and Punjab).

1943. *Botia lohachata*, Ahmad (nec. Chaudhuri), *Bull. Zool. Dept. Punjan Univ.*, 1:303 (Lahore).

1972. *Botia birdi*, Tandon and Johal, *Res.Bull. Punjab Univ.*, 23:46.

1975. *Botia birdi*, Tandon and Gupta, *J. Zool, Soc. India*, 27 (1 &2):20, fig. 14 (Ferozepore).

1980. *Botia birdi*, Mirza, *Proc. 1St. Pakistan Congr. Zool.*, p.20 (Pakistan:N.W.F.P.).

1980. *Botia rostrata*, Mirza (nec Gunther), *Proc. 1St. Pakistan Congr. Zool.*, p.20 (Punjab, Sind, and Baluchistan).

1980. *Botia lohachata*, Mirza (nec.Chaudhuri), *Proc. 1St. Pakistan Congr. Zool.*, p.20 (Punjab, Sind and Baluchistan).

1980. *Botia birdi*, Johal and Tandon, *Pb. Fish Bull.*, 4 No.1:29, fig. 53 (Ropar, Ferozepur and Machiwara).

1980. *Botia geto*, Johal and Tandon (nec Hamilton., nec Day) *Pb. Fish Bull.*, 4, No. 1:29 (Sangur).

1980. *Botia lohachata*, Johal and Tandon (nec Chaudhuri), *Pb. Fish Bull.*, 4 , No. 1:30 (Dasuya, Devigarh, Ropar and Ferozepur).

Diagnosis : A *Botia* found in Kashmir Valley and Himachal Pradesh in Western Himalayas and Pakistan with 9 branched dorsal rays; comparatively short ventrals, 6.84 (6.33-7.37) in SL, not reaching to anal opening, and comparatively short anal fin 6.19 (5.35-6.91), not reaching caudal base. Body marked with a varying number, generally 8-10, dark oblique bands often breaking up to form an irregular reticulation. All fins with regular cross bands.

Description: Based on 17 specimens, 65.0-110.5mm SL from Jhelum river, Srinagar, Kashmir.

D. 3/9., P.1/13., V. 1/7., A. 3/5., C.19.

Body elongate, compressed with dorsal profile somewhat elevated, ventral profile less curved. Body depth 3.30-4.40 (3.95) in SL. Caudal peduncle compressed, longer than high, its least depth 1.0-1.14 (1.06) in its length. Anus slightly in advance of anal fin.

Head moderately long, 3.30-4.25 (3.84) in SL. Snout pointed, as long as or longer than the post-orbital length, 1.79-2.0 (1.90) in HL. Nostrils nearer to eye than tip of snout. Mouth small, sub inferior, slightly arched, lips thick, upper more prominent and continuous, not fringed, lower notched at symphysis, roughly ridged, separated from chin by deep groove laterally and continuous with chin mesially by mental lobes., mental lobes fleshy, well developed with a pair of barbel-like structures. Barbels six, four rostral, close to each other at the base, not extending to anterior margin of orbit; two maxillo-mandibular barbels, slightly longer than the rostral. Eye small, in the middle of head in the young and adult male, posterior half of head in adult female; its diameter 5.71-8.33 (6.74) in head. Interorbital rather wide, convex, its width 3.50-4.44 (3.84) in head. Suborbital spine bifid; its origin nearer to nostril than to eye; ventrocaudal process long, moderately curved., its tip extending to below the posterior margin of eye or slighly fall short of it.

Scales : Scales cycloid, minute, embedded, present on body and nape. Absent on head. Lateral line complete, extending to middle of caudal base.

Fins : Origin of dorsal midway between base of caudal and tip of snout in the male, slightly nearer base of caudal than tip of snout in female; origin of ventrals slightly behind that of dorsal; pectoral shorter than head, extending more than half distance to ventrals, ventrals shorter than pectorals not reaching anal opening. Anal fin not reaching base of caudal; caudal deeply forked, its length as long as head, lobes acutely pointed. Distance from tip of snout to dorsal origin 1.79-2.0 (1.90) of S.L., distance from tip of snout to ventral origin 1.66-1.93 (1.82); distance from origin of dorsal to base of caudal 1.84-2.13(2.0); distance from origin of pectoral to ventral

origin 3.19-3.76 (3.47); distance from base of ventral to anal origin 3.82-4.75 (4.23); length of longest pectoral ray 5.0-6.5 (5.62); of ventral 6.33-7.37 (6.84); of dorsal 5.28-6.92 (6.17); of anal 5.35-6.91 (6.19); length of dorsal fin base 6.38-8.64 (7.25); length of anal fin base 12.29-16.25 (14.31); length of caudal fin from mid-base to tip of longest ray 3.07-4.70 (3.71).

Measurements in percent of HL : Length of snout 50.0-56.0 (52.85); diameter of eye 12.0-17.5 (15.06) width of inter-orbital 22.5-28.57 (26.20); length of maxillo-mandibular barbel 23.09-30.03 (26.45).

Measurements in percent of SL : Length of head 23.53-30.30 (26.14); depth of body 22.72-30.26 (25.41); width of body 11.36-17.09 (14.08); least depth of caudal peduncle 13.33-16.67 (15.16); length of caudal peduncle 15.42-20.0 (18.11); distance from snout to dorsal origin 49.75-55.86 (52.63); distance from tip of snout to ventral origin 51.81-60.24 (54.94); distance from pectoral origin to ventral origin 26.59-31.35 (28.82); distance from base of ventral to anal origin 21.05-26.18 (23.64); length of longest pectoral ray 15.38-20.0 (17.79); of ventral 13.57-15.80 (14.62); of dorsal 14.45-18.94 (14.92); of anal 14.47-18.69 (16.15); length of dorsal fin base 11.57-15.67 (13.79); length of caudal fin 21.28-32.57 (26.95).

Colouration : Varying number, generally 8-10, dark oblique bands on the sides of body which often break up to form an irregular reticulation on the dorsal surface and on the sides., all fins with regular cross bands; dorsal, anal and ventral two, pectoral and caudal four in female; dorsal, anal and ventral three, pectoral and caudal four in male.

Sexual dimorphism : None

Size : Largest specimen examined 113.0 mm SL

Affinities : Close to *B. almorhae* (see above, paragraph on affinities of *B. almorhae*).

Range : India: Kashmir Valley and Himachal Pradesh, Pakistan: N.W.F.P., Sind and Baluchistan.

Material examined : *Type*:Syntypes 3, ZSI F 3578/1 to ZSI F 3580/1, Sirhind Canal, Punjab, Coll. W.J.A. Bird, in the Zoological Survey of India, Calcutta.

Other material: Himachal Pradesh: 1. HAZFS/ZSIF 384 Nakera Khud, 10 Km from Dehragopipur, Kangra. Kashmir: 2, ZSI F10113/1, Jhelum river, Srinagar. 5, specimens, ZSI F12206/1, Srinagar, Yale North Indian Expedition, 19-20 March 1932 2, ZSI Jhelum river, Srinagar, Coll. G.M. Mullick, 11.6.1954. 13, SRS/ZSI uncatalogued, Kashmir valley, Coll. H.S. Raina, uncatalogued, 9.5.1985. 9, Kashmir valley, Coll. H.S. Raina, CIFRI, September 1984. 2. ZSI uncatalogued, Kashmir valley, Coll. H.S. Raina, February 1982.

3: Botia dario (Ham.)
(Fig. 7, Pl. III; Fig. 4, Pl. IX)

1822. *Cobitis dario* Hamilton, *Fish Ganges*, pp. 354, 394, p.29 fig. 95 (Type locality: rivers of Bengal).

1822. *Cobitis geto* Hamilton, *Fish Ganges*, pp. 355, 394, pl. 11, fig. 96 (Young)

1839. *Cobitis dario*, McClelland, *Asiat. Res.*, 19:306, 444, pl. 61, fig. 8 (from Hamilton's Ms. drawings).

1839. *Diacantha flavicauda*, Swainson, *Nat. Hist. Fish.*, 2, p.310.

1839. *Diacantha zebra* Swainson, *Nat. Hist. Fish.*, 2, P.310

1839. *Cobitis geto*, McClelland, *Asiat. Res.*, 19:306, 444, pl.61, fig. 9 (from Hamilton Ms. drawings).

1846. *Cobitis dario*, Bleeker, *Verh. Bat. Gen. Netherl. Ind., 25. Beng & Hind.*, p.143.

1846. *Cobitis geto*, Valenciennes (in C & V), *Hist. Nat. Poiss*; 18:81.

1868. *Botia dario*, Gunther, *Cat. Fish. Brit. Mus.*, 7:366 (Bengal and Assam).

1872. *Botia dario*, Day, *J. Asiat. Soc. Beng.* **41**(2):177.

1878. *Botia dario*, Day, *Fish India*, p.606, pl. 154, fig. 1 (Bengal, Assam, Cachar, N.W. Provinces excluded).

1889. *Botia dario*, Day, *Faun. Brit. Ind. Fish*; 1:216

1922. *Botia dario*, Hora, *Rec. Indian Mus.*, **24**:320

1932. *Botia dario*, Hora, *Rec. Indian Mus.*, **34**:573

1937. *Botia dario*, Shaw and Shebbeare, *J. Asia. Soc. Beng.*, **3**(3):65 (Singhimari streams and Chel river in Western Duars, N. Bengal).

1937. *Botia dario*, Hora, *Rec. Indian Mus.*, **40**:176. (Rajmahal Hills, Santal Parganas, Bihar).

1968. *Botia dario*, Banarescu and Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.*, **65**:314, fig. 12 (Kaziranga, Mikir Hills, Assam, Brahmaputra R. at Palasbari, Assam).

1968. *Botia dario*, Srivastava, *Fish Eastern U.P.*, (Maheshra Tal., Rohini River, Gorakhpur).

Diagnosis : A *Botia* with a sharply arched dorsal profile; 9-10 branched dorsal rays; body with seven broad oblique brownish cross bands; and three oblique dark bands on the caudal fin.

Description : Based on 10 specimens, 32.0-106.0 mm SL from Goalpara, Assam

D.3/9-10; P.1/13-14; V.1/7; A.3/5; C.19

Body compressed with the back sharply arched tapering abruptly towards the caudal fin. Body depth 3.53-4.30 (3.93) in SL. Caudal peduncle compressed, almost as high as long., its least depth 1.0-1.38 (1.14) in its length. Anus slightly in advance of anal fin. Head moderately long, nearly equal to height of body, 3.53-4.30 (3.93) in SL. Snout pointed, very long considerably more than the post-orbital length, 1.63-2.08 (1.86) in head length.Nostrils nearer to eye than tip of snout. Mouth small, sub-inferior, greatly arched. Lips thick, upper more prominent and continuous, finely fringed; lower notched at symphysis, finely ridged, separated from chin by deep groove laterally and continuous with chin mesially by mental lobes; mental lobes moderately developed, fleshy, with a pair of small barbel like structures. Barbels six, four rostral close to each other at the base, not extending to anterior margin of orbit; two maxillo-mandibular; rostral and maxillo-mandibular pairs approximately of equal length. Eye small in posterior half of head., its diameter 3.25-6.20 (4.39) in head. Inter-orbital rather wide, strongly convex., its width 2.36-3.33(2.83) in HL. Pre-orbital spine bifid, moderately curved., its origin nearer to nostril than to eye, ventrocaudal process long and curved., its tip extending to nearly below hind margin of eye.

Scales : Scales cycloid, minute, embedded, present on body and nape. Absent on head. Lateral line complete extending to middle of caudal base.

Fins : Origin of dorsal fin midway between base of caudal and tip of snout, slightly behind that of ventrals; pectoral shorter than head, extending more than half distance to ventrals; ventrals shorter than pectorals, reaching anal opening. Anal fin when depressed, reaching almost base of caudal fin. Caudal deeply forked., its length slightly shorter than head, lobes acutely pointed. Distance from tip of snout to dorsal origin 1.88-2.08 (1.95) of SL., distance from tip of snout to ventral origin 1.74-1.92(1.83)., distance from origin of dorsal to base of caudal 1.67-1.94 (1.82)., distance from origin of pectoral to ventral origin 3.41-4.28(3.79); distance from base of ventral to anal origin 3.91-4.73 (4.27); length of longest pectoral ray 4.46-5.26 (4.86); of ventral 5.38-7.14 (6.15); of dorsal 4.5-6.13 (5.41); of anal 4.57-6.82 (5.77); length of dorsal fin base 5.33-6.25 (5.74); length of anal fin base 8.60-15.14 (11.34); length of caudal fin from mid-base to tip of longest ray 4.30-7.50 (6.19).

Measurements in percent of HL : Length of snout 48.15-61.29 (54.01)., eye-diameter 16.13-30.77 (24.02)., width of inter-orbital 30.0-42.31 (35.74); maxillo-mandibular barbel 18.75-29.63 (23.34).

Measurements in percent of SL : Length of head 26.67-31.25 (28.76); length of snout 13.27-17.93 (15.55); diameter of eye 4.67-9.30 (6.94); width of inter orbital 9.33-12.79 (10.26); length of maxillo-mandibular barbel 5.17-9.38 (6.74); depth of body 23.28-28.30 (25.58); width of body 12.24-26.17 (16.01); least depth of caudal peduncle

13.33-23.28 (16.52); length of caudal peduncle 13.33-23.28 (16.52); distance from tip of snout to dorsal origin 48.00-53.13 (51.31); distance from tip of snout to ventral origin 52.0-57.33 (54.77); distance from origin of dorsal to base of caudal 51.56-59.14 (55.02); distance from origin of pectoral to ventral origin 23.36-29.33 (26.54); distance from base of ventral to origin of anal 21.13-25.58 (23.50); length of longest pectoral ray 19.01-22.41 (20.66); of ventral 14.0-18.75 (16.46); of dorsal 16.33-22.22 (18.66); of anal 14.67-21.88 (17.68); length of the dorsal fin base 16.0-18.75 (17.49); length of anal fin base 6.6-12.5 (9.12); length of the caudal fin 13.33-23.78 (16.52).

Colouration : Seven broad oblique brownish cross bands, which are of a deeper colour in young, from dorsal almost to ventral side of body, 2 before dorsal, 2 under dorsal base, 3 behind dorsal. Each caudal lobe with three oblique brown cross bars; other fins without cross bars.

Sexual dimorphism : None

Size: Largest specimen examined 108 mm SL

Affinities : Closely allied to *B. histrionica* which differs in colour having five dark vertical bands on body and all the fins having two dark cross bands.

Range : India: Assam, N.Bengal., also Rajmahal Hills in South Bihar.

Material examined :Type:None

Other material: India: Assam: 10, SRS/ZSI uncatalogued, Silchar, Coll, Devasish Kar, 5.11.1984. 3, SRS/ZSI uncatalogued, Brahmaputra river 12 km N.E. of Rongjuli, Goalpara. 12, SRS/ZSI uncatalogued, Krishnai river, 35 km South of Goalpara, Coll. A.G.K. Menon, 14.4.1985. 2, Silchar. West Bengal: 2,ZSI F 12775/1, Santal Parganas.1, ZSI F 11393/1, Siliguri, Coll. E.G. Shaw and E.O. Shebbeare. 2, ZSI F 982 B, No history.

4. **Botia histrionica** Blyth
(Fig. 4, Pl. III., Fig. 3, Pl. IX)

1860. *Botia histrionica* Blyth, *J. Asiat. Soc. Beng.* 29:166 (Type locality:Tenasserim)

1869. *Botia histrionica,* Day, *Proc. Zool. Soc. Lond.*, p. 550.

1872. *Botia histrionica*, Day, *J. Asiat. Soc. Beng.*, 41(2):179.

1878. *Botia histrionica*, Day, *Fish India*, p. 607, pl. 154, Fig. 4 (Burma). 1889. *Botia histrionica*, Day, *Faun. Brit. Ind. Fish.*, 1:218. 1889. *Botia histrionica*, Vinciguerra, *Ann. Mus. Civ. Nat. Genova*, p. 346. 1921. *Botia histrionica*, Hora, *Rec. Indian Mus.*, 22:195 (Manipur).

1922. *Botia histrionica*, Hora, *Rec. Indian Mus.*, 22:320 (Revision)

1948. *Botia histrionica*, Rendahl, *Ark. Zool.*, 40A(2):60, fig. 28. (Burma : Rangoon, Mandalay, Shweli Kyaungsudl, Myitkyina)

1962. *Botia histrionica*, Menon, *Journ. Zool. Soc. Ind.*, 14, No.1:28 (Chindwin drainage)

1974. *Botia histrionica*, Menon, *Inl. Fish. Soc. India.*, Special Bull., 1:50 (Check-list)

*Diagnosis:*A *Botia*, found in Manipur and Burma in the Irrawaddy drainage, with 9 branched dorsal rays. Body marked with five dark vertical bands and two brown bands on all the fins.

*Description:*Based on 5 specimens, 37.0-119.0 mm SL from Manipur.

D. 3/9; P. 1/13-14;, V.1/7; A. 3/5; C. 19.

Body elongate, compressed, with dorsal profile somewhat elevated, ventral profile less curved. Body depth 3.46-4.41 (3.85) in SL. Caudal peduncle compressed, slightly deeper than long., its least depth 1.03-1.20 (1.11) in its length. Anus slightly in advance of anal fin.

Head moderately long, nearly equal to height of body, 3.46-4.41 (3.85) in SL. Snout pointed, very long, considerably more than the post-orbital length, 1.69-2.09 (1.84) in HL. Nostrils nearer to eye than tip of snout. Mouth small, sub-inferior, greatly arched., lips thick, upper more prominent and continuous, finely fringed, lower notched at symphysis, roughly ridged, separated from chin by deep groove laterally and continuous with chin mesially by mental lobes; mental lobes moderately developed, fleshy, with a pair of barbel-like structures. Barbels six, four small rostrals, close to each other at the base, not extending to nostrils,two maxillo-mandibular, slightly longer than the rostral. Eye small, situated in posterior half of head; its diameter 3.33-6.10 (4.64) in head. Inter-orbital rather narrow, convex, its width 2.50-3.50 (2.79) in head. Suborbital spine bifid, its origin nearer to nostril than to eye, ventro-caudal process long, moderately curved; its tip extending to below middle or almost posterior margin of eye.

Scales : Scales cycloid, minute, embedded, present on body and nape. Absent on head, Lateral line complete, extends to middle of caudal base.

Fins : Origin of dorsal fin, midway between base of caudal and tip of snout; origin of ventrals slightly behind that of dorsal; pectoral shorter than head, extends more than half the distance to ventrals; ventrals shorter than pectorals, extending to anal opening. Anal fin when depressed almost touches the base of caudal fin; caudal deeply forked; its length slightly longer than head, lobes acutely pointed. Distance from tip of snout to dorsal origin 1.84-2.05(1.92) in SL; distance from tip of snout to

ventral origin 1.73-1.86 (1.77)., distance from origin of dorsal to base of caudal 1.86-2.11 (2.0)., distance from origin of pectoral to ventral origin 3.23-3.52 (3.43)., distance from base of ventral to anal origin 3.8-4.63 (4.23)., length of longest pectoral ray 3.23-3.52 (4.88)., of ventral 5.11-6.43 (5.69)., of dorsal 4.85-5.95 (5.40)., of anal 5.11-5.95 (5.44)., length of dorsal fin base 5.29-7.21 (6.14)., length of anal base 10.86-13.22 (12.02).

Measurements in percent of HL : Length of snout 50.0-59.26 (54.39)., eye-diameter 16.39-30.0 (22.79), width of Inter-orbital 32.79-40.0 (36.12)., maxillo-mandibular barbel 18.03-30.0 (24.68).

Measurements in percent of SL : Length of head 25.63-27.84 (27.06)., length of snout 13.05-16.49 (14.71)., diameter of eye 4.2-8.11 (6.18)., width of inter-orbital 8.40-11.0(9.82)., length of maxillo-mandibular barbel 4.62-8.11 (6.70)., depth of body 22.69-28.87 (26.17)., width of body 11.84-17.01 (14.19)., least depth of caudal peduncle 15.79-19.07 (16.87)., length of caudal peduncle 13.16-16.49 (15.22)., distance from tip of snout to dorsal origin 48.75-54.32 (52.03)., distance from tip of snout to ventral origin 53.78-57.89 (56.38)., distance from origin of dorsal to base of caudal 47.30-53.70 (50.90)., distance from origin of pectoral to ventrtal origin 28.38-30.93 (29.21)., distance from base of ventral to origin of anal 21.62-25.77 (23.76)., length of longest pectoral ray 18.42-24.23 (20.67)., of ventral 15.55-19.59 (17.69)., of dorsal 16.81-20.62(18.67)., of anal 16.81-19.59 (18.45)., length of the dorsal fin base 13.87-18.92 (16.47)., length of the anal fin base 7.56-9.21(8.35)., length of caudal fin 13.16-16.49 (15.22).

Colour : Olive, with five dark vertical bands on body, two on head; all the fins with two broad brown bands.

Sexual dimorphism : None

Size : Largest specimen examined 117.0 mm SL

Affinities : Closely allied to *B. dario* which differs in having seven broad oblique brownish bands (instead of five vertical in *B. histrionica*) and each caudal lobe having three oblique cross bands (instead of two in *B. histrionica*).

Range : India: Manipur. Burma (Irrawaddy drainage).

Material examined : Type: Holotype: ZSI F 2634/1, Pegu, Burma, Coll. Berdmore, in the Zoological Survey of India, Calcutta.

Other material: India: Manipur: 2., Amainbi Stream, 8 miles from Imphal. Burma: 1., ZSI, F 336/1, Kyenchinng, Lower Burma.

The Striata Complex
5. **Botia striata** Rao
(Fig. 5, Pl. III)

1920. *Botia striata* Rao, *Ann. Mag. Nat. Hist.* (9) 6:60, p. 2, figs. 4, 4a, 4b, (Type locality: River Thunga in Mysore State)

1922. *Botia striata*, Hora, *Rec. Indian Mus;* 24: 319 (Revision)

1951. *Botia striata,* Kulkarni, *Curr. Sci;* 20:335 (Kolhapur)

1958. *Botia striata kolhapurensis* Kelkar, *J. Bombay nat. Hist.* 53:669

Diagnosis : A *Botia* found in the Peninsular India, with 9 branched dorsal fin rays; head and body with a number of narrow oblique vertical bands.

Description : Based on 7 sepcimens 57.0-78.0mm SL from Tunga River, Shimoga.

D.3/9; P.1/10; V.1/6; A.3/5; C.19

Body moderately elongate, compressed with dorsal profile somewhat elevated, ventral profile less curved. Body depth 3.48-3.87 (3.70) in SL. Caudal peduncle compressed, slightly deeper than long; its least depth 0.74-1.05 (0.88) in its length. Anus slightly in advance of anal fin.

Head moderately long, less than height of body, 3.24-3.61 (3.45) in SL. Snout pointed, very long, considerably more than the post-orbital, 1.71-2.13 (1.89) in HL. Nostrils nearer to eye than tip of snout. Mouth small, sub-inferior, slightly arched. Lips thick, upper more prominent and continuous, finely fringed, lower notched at symphysis, roughly ridged, separated from chin by deep groove laterally and continuous with chin mesially by mental lobes; mental lobes fleshy, well developed with a pair of barbel-like structures. Barbels six, four small rostrals close to each other at the base, two maxillo-mandibular, slightly longer than rostral. Eye small, in posterior half of head., its diameter 3.90-4.89(4.46) in head. Inter-orbital rather narrow and convex., its width 3.0-3.70 (3.36) in head. Pre-orbital spine bifid, its origin nearer to nostril than to eye, ventrocaudal process long, and moderately curved, its tip extending to below the hind margin of eye.

Scales : Scales cycloid, minute, embedded, present on body and nape. Absent on head. Lateral line complete extends to middle of caudal base.

Fins : Origin of dorsal fin nearer base of caudal than tip of snout; origin of ventral slightly behind that of dorsal; caudal deeply forked., its length slightly shorter than head, lobes acutely pointed. Distance from tip of snout to dorsal origin

1.75—1.88(1.81) of SL., distance from tip of snout to ventral origin 1.59-1.78 (1.68)., distance from origin of dorsal to base of caudal 2.00-2.17 (2.06); distance from origin of pectoral to ventral origin 3.05-3.82 (3.35); distance from base of ventral to anal origin 4.11-5.20 (4.60); length of longest pectoral ray 4.92-5.63 (5.17)., of ventral 5.46-7.43 (6.42); of dorsal 5.0-7.13 (5.95); of anal, 6.38-7.22 (6.70); length of dorsal fin base 5.70-6.75 (6.24); length of anal fin base 11.77-20.10 (15.48); pectoral shorter than head, extends more than half distance to ventrals; ventrals shorter than pectoral, not touching the anal opening in males, extending to or even surpassing the anal opening in females. Anal when depressed touch the base of caudal.

Measurements in percent of HL : Length of snout 47.06-58.33 (53.02); eye diameter 20.45-25.64 (22.54); width of inter-orbital 27.03-33.33 (29.91); maxillo-mandibular barbel 16.67-24.32 (20.27).

Measurements in percent of SL : Length of head 27.69-30.83 (29.02); length of snout 14.04-16.51 (15.41); diameter of eye 5.77-7.41 (6.54); width of inter-orbital 7.69-9.93 (8.78); length of maxillo-mandibular barbel 4.62-7.03 (5.89); depth of body 25.83-28.76 (27.09); width of body 11.85-28.10 (14.73); least depth of caudal peduncle 15.38-17.65 (16.59); length of caudal peduncle 13.07-16.41 (14.58); distance from tip of snout to dorsal origin 53.08-57.04 (55.19); distance from tip of snout to ventral origin 56.15-62.75 (59.44); distance from origin of dorsal to base of caudal 46.15-50.00 (48.53); distance from origin of pectoral to ventral origin 26.15-32.81 (30.07); distance from base of ventral to origin of anal 19.23-24.36 (21.86); length of longest pectoral ray 17.78-20.31 (19.50); of ventral 13.46-18.33 (15.71); of dorsal 14.04-20.0 (17.02); of anal 13.85-15.69 (14.95); length of the dorsal fin base 14.81-17.54 (16.09); length of the anal fin base 5.0-8.50 (6.63); length of the caudal fin 13.07-16.41 (14.58).

Colouration : Head and body striped with a number of narrow oblique vertical bands., all fins with regular cosss bands, dorsal and ventral with two, pectoral and anal three and caudal five.

Sexual dimorphism : Ventral fins shorter in males, not extending to anal opening; ventrals extend to anus or slightly beyond in females.

Size : Largest specimen examined 78 mm SL

Affinities : Although this species is very distinct in colouration, it is close to *B. almorhae* than to any other known form. It can be readily separated from *almorhae* by its characteristic body colouration and a deeper body (body depth 3.48-3.87 in SL., 3.10-5.71 in *almorhae*).

Range : Peninsular India: from Thunga river near Shimoga, Karnataka, to north as far as Kolhapur and Sathara in the Krishna system.

Material examined : Type: Syntypes: 2, F 9817/1 to 9818/1, Thunga river,

Shimoga town, Mysore, Coll. C.R. Narayana Rao, 1919, in the Zoological Survey of India, Calcutta.

Other material : India : Karnataka : 3, SRS/ZSI, uncatalogued, Shimoga. 15, SRS/ZSI uncatalogued, Thunga River, Shimoga.

The *berdmorei* Complex
6. **Botia berdmorei** (Blyth)
(Fig. 6, Pl. III, Fig. 5, Pl. IX)

1860. *Syncrossus berdmorei* Blyth, *J. Asiat. Soc. Beng.,* **29**:166 (Type locality:Tenasserim)

1869. *Botia berdmorei,* Day, *Proc. Zool. Soc. London*, p.549

1878. *Botia berdmorei*, Day, *Fish India*, p. 607, pl. 154, fig. 3 (Irrawadi river; also Tenasserim)

1889. *Botia berdmorei*, Day , *Faun. Brit. Ind. Fish.,* 1:217.

1889. *Botia berdmorei,* Vinciguerra, *Ann. Mus. Nat. Genova*, 29, p. 345.

1921. *Botia berdmorei*, Hora, *Rec. Indian Mus.*, **22**:195 (Manipur)

1922. *Botia hymenophysa*, Hora, (in part) *Rec. Indian Mus.*, **24**:317 (Revision)

1962. *Botia berdmorei*, Menon, *Journ. Zool. Soc. India.,* 14 , No. 1:28 (Chindwin drainage)

1974. *Botia berdmorei*, Menon, *Inl. Fish. Soc. India*, Special *Bull.*, 1:50 (check-list)

Diagnosis : An elongated *Botia* of almost uniform depth, with 9-10 branched dorsal rays, 10-11 oblique dark bands extending from back to abdomen and five longitudinal rows of black dots commencing from below orbit and extending all over body and caudal fin; dorsal, with three rows of spots, caudal with four to five bands and anal with two.

Description : Based on 10 specimens 49.0-110.0 mm SL from Manipur

D.3/9-10; P. 1/14; V. 1/8; A. 3/5; C.19

Body elongate, compressed, of almost uniform depth 3.79-6.32 (4.43) in SL. Caudal peduncle compressed, slightly deeper than long; its least depth 0.94-1.15 (1.04) in its length. Anus slightly in advance of anal fin.

Head moderately long, longer than height of body, 3.16-3.73 (3.47) in SL. Snout pointed, very long, considerably more than post-orbital length, 1.89-2.42 (2.06) in head

length. Nostrils nearer to eye than tip of snout. Mouth small, sub-inferior, oblique, greatly arched; lips thick, finely fringed, upper and lower continuous, basally separated from each other by mental lobes; mental lobes poorly developed, fleshy, set at each side of symphysis, without any barbel-like structures. Barbels six, four rostral close to each other at the base not extending to posterior nostril, two maxillo-mandibular, rostral and maxillary paris approximately of equal length. Eye small, situated in posterior half of head in adult, almost middle in young, its diameter 3.63-7.50 (5.30) in head. Inter-orbital rather narrow, convex, its width 3.44-4.29 (3.96) in head. Suborbital spine bifid, moderately curved, its origin equidistant between nostril and eye, ventrocaudal process long, extending to below middle of eye.

Scales : Scales cycloid, minute, embedded, present on body and nape. Absent on head, Lateral line complete extending to middle of caudal base.

Fins : Origin of dorsal fin midway between base of caudal and posterior nostril; origin of ventrals slightly behind that of dorsal; pectorals shorter than head, extends more than half distance of ventrals; ventrals shorter than pectorals extending to the anal opening. Anal fin, when depressed, not touching base of caudal fin; caudal deeply forked; its length almost as long as head, lobes acutely pointed. Distance from tip of snout to dorsal origin 1.75-1.94 (1.83) of SL; distance from tip of snout to ventral origin 1.67-1.88 (1.77)., distance from origin of dorsal to base of caudal 2.0-2.18 (2.08); distance from origin of pectoral to ventral origin 3.17-4.17 (3.65); distance from base of ventral to anal origin 4.34-4.58 (4.51); length of longest pectoral ray 5.44-7.33 (6.20); of ventral 6.25-8.46 (7.25); of dorsal 5.20-7.10 (6.03); of anal 6.25-8.46 (6.92); length of dorsal fin base 5.20-6.67 (6.25); length of anal fin base 12.5-16.67 (13.80).

Measurements in Percent of HL : Length of snout 41.38-52.78 (48.80); eye-diameter 13.33-27.59 (19.52); width of Inter-orbital 23.33-29.03 (25.42); maxillo-mandibular barbel 18.75-27.77 (22.44).

Measurements in Percent of SL : Length of head 26.84-31.63 (28.88); length of snout 12.0-15.31 (14.07); diameter of eye 3.64-8.0 (5.63); width of inter orbital 6.32-8.18 (7.34); length of maxillo-mandibular barbel 5.77-7.63 (6.45); depth of body 15.83-26.36 (22.98); width of body 11.22-15.45 (13.73); least depth of caudal peduncle 15.0-17.35 (16.41); length of caudal peduncle 15.27-17.35 (16.47); distance from tip of snout to dorsal origin 51.58-57.14 (54.75); distance from tip of snout to ventral origin 53.29-60.0 (56.73); distance from origin of dorsal to base of caudal 45.92-50.0 (48.06); distance from origin of pectoral to ventral origin 24.0-31.58 (27.6); distance from base of ventral to origin of anal 21.0-23.03(22.19); length of longest pectoral ray 13.64-18.37 (16.28); of ventral 11.82-16.0 (13.9); of dorsal 14.09-19.23 (16.77); of anal 11.82-16.0 (14.59); length of the dorsal fin base 15.0-19.33 (16.06); length of the anal fin base 6.0-8.0 (7.29); length of the caudal fin 15.0-17.35 (16.27).

Colouration : Brownish, with 10 or 11 oblique dark bands, extending from the

back to the abdomen. Five longitudinal rows of black dots over the body commencing from below orbit and extending to all over the body and the caudal fin. The upper surface of head black with two black streaks from eye to snout. In young the black dots cease above the end of pectoral fin. Dorsal fin with three rows of spots; caudal with four to five bands and anal with two.

Sexual dimorphism : None.

Size : Largest specimen examined 110 mm SL

Affinities : Closely allied to *B. beauforti* Smith found in peninsular Thailand which differs in the origin of the ventral being considerably behind that of dorsal (instead of slightly in advance of dorsal in *B. berdmorei*) and in the absence of dark bands from back to abdomen (10 to 11 dark cross bands in *B. berdmorei*).

Range : India: Manipur. Burma.

Remarks : Hora (1922) synonymised *B. berdmorei* with *B. hymenophysa* (Bleeker). They are quite distinct species. *B. hymenophysa* is distributed over a wide area; it occurs in the Indo-Australian Archipelago, Thailand, Malay Peninsula and Singapore.

Material examined: Type: Syntypes: 4, F 2636/1, Tenasserim, Burma, Coll. Berdmore, in the Zoological Survey of India, Calcutta.

Other material: India: Manipur: 2, ZSI F9866, Manipur, donated by S.L.Hora. 12, F 2266, Imphal, Coll.Roonwal. 2 specimens, ZSI F 9871, Kharda Nadi Near Thauga, Manipur survey. 5, ZSI uncatalogued, Iril river at Morang Kambu, 4 miles east of Imphal, Coll. A.G.K.Menon and party, 25.1.1953.

Burma: 2, ZSI F 11449/1, Sinan Hoka, Mali Hoka river Dist-Myitkyina.

II. Subfamily COBITINAE

Key to the genera of subfamily COBITINAE.

1.	Barbels absent	*Neoeucirrhichthys (N. maydelli* Banarescu & Nalbant)
	Barbels present	2
2.	Dorsal fin much elongated (28 branched rays)	*Enobarbichthys* (*E. maculatus* Day)
	Dorsal fin short	3
3.	Lateral line complete and axial	4
	Lateral line absent	5
4.	Caudal forked; origin of dorsal slightly in front of ventrals	*Acantopsis* (*A. choirorhynchus* Bleeker)
	Caudal entire; origin of dorsal behind the ventrals	*Somileptus* (*S. gongota* Swainson)
5.	Origin of dorsal fin on the same line of insertion of ventral; situated slightly behind or before ventrals.	6
	Origin of dorsal fin far behind base of ventrals, sometimes extending over anal	*Acanthophthalmus* (3 species)
6.	Origin of dorsal situated in the second half of body; a carina between dorsal and caudal and between anal and caudal	*Misgurnus (M. anguillicaudatus* (Cantor))
	Origin of dorsal situated in first half of body; no carina	*Lepidocephalus* (8 species)

Subfamily COBITINAE

Genus 2. **Misgurnus** Lacépède, 1803

1809. *Misgurnus* Lacépède, *Hist. Nat. Poiss*; 5:16 (Type : *Cobitis fossilis* Linnaeus, monotypic)

1878. *Paramisgurnus* Sauvage, *Bull. Soc. Philom. Paris*, (7) 2:90 (Type:*Paramisgurnus dabryanus* Sauvage)

1935. *Mesomisgurnus* Fang, *Sinensia*, 6:129 (Type : Nemachilus bipartitus Sauvage et Dabry)

Diagnosis : Body elongate and compressed. Head relatively small. Mouth inferior with six barbels. Mental lobes well developed; lobulous part subdivided into three lobules. Suborbital spine bifid, non-functional. Dorsal fin opposite to ventral, situated in second half of body. Caudal rounded. Carina between dorsal and caudal, also between anal and caudal. Scales conspicuous, oval or rounded, imbricate. Head naked, lateral line short. Air bladder enclosed in a bony capsule.

Sexual dimorphism : Second ray of pectorals thickened during breeding in males.

Distribution : Europe and East Asia.

7. **Misgurnus anguillicaudatus** (Cantor).
(Fig. 5, Pl. VI)

Diagnosis : Elongate, cylindrical, strongly compressed posteriorly. A bifid non-functional suborbital spine; origin of dorsal opposite to ventral in the posterior half of body. Body yellowish brown marbelling, underside muddy yellow.

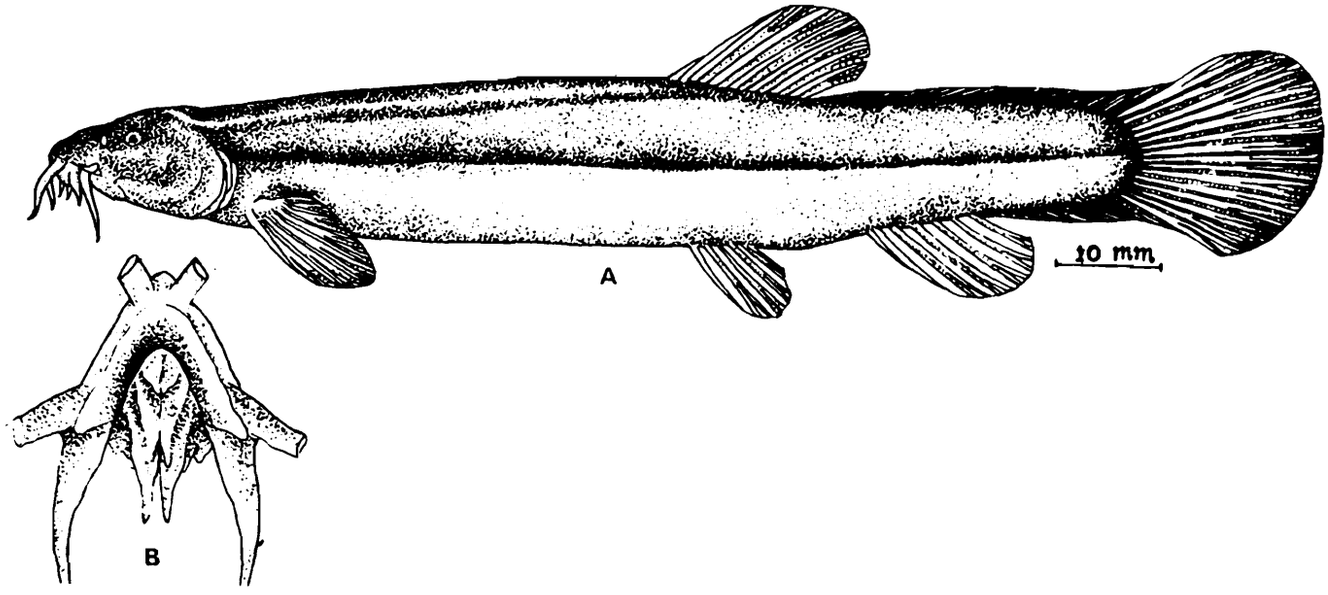
Description : Based on Rendahl's (1943) description of 20 specimens 43.5-60.3mm S.L. from Irrawaddy river at Myitkyina, Burma

D.2-4/5-7; P.1/9-10; V.1/5-8; A.2/5-6.

Body elongate, cylindrical, strongly compressed posteriorly. Body depth 13.3-15.3 (14.38) in SL. Caudal peduncle short; its least height 1.31-1.60 (1.49) in its length. Anus immediately in front of anal fin. Head moderately deep; its length 4.74-5.21 (4.97) in SL., snout rounded 2.4-3.1 (2.74) in HL, eye rather small covered by skin, situated before middle of head, 5. 4-6.5 (5.94). Nostrils situated immediately before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital convex, its width 4.41-5.32 (4.8) in head. Two non-functional bifid sub-orbital spines under a layer of muscles, below each eye, with dorso-caudal process close to base. Mouth small, inferior with thick lips, barbels six, two rostral close together near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, all well developed, longer than orbit. Mental lobes well developed, lobes divided into anterior and posterior branches, anterior longer, divided into three secondary lobules, posterior flap-like part with two short barbel-like projections (Fig.1). Gill opening extending to above base of pectoral.

Scales : Very small oval with an eccentric focal area, imbricate. Head naked. On the ventral side scales extend anterior to pectoral base only. 30-37 rows of scales between back and anal fin.

Fins : Dorsal short; its origin nearer caudal base than tip of snout; midway



Text Fig. 1 A.Misgurnus anguillicaudatus (Cantor) from Irrawadi drainage. Yunnan. 99.0 mm SL. ♀ Mental lobes of A. much enlarged.

between caudal base and base of pectoral. Ventrals on the same line of insertion as dorsal or slightly behind the insertion of dorsal, not extending to anal opening. Anal short behind dorsal. Pectoral falciform, shorter than head. Caudal rounded. Distance from tip of snout to dorsal origin 1.63-1.73 (1.68) in SL, from pectoral to ventral origin 2.28-2.55 (2.42);length of ventral ray 10.10-12.50 (11.06); length of longest pectoral 6.10-8.62 (7.29); length of dorsal base 10.0-12.05 (11.07); length of anal base 10.2-13.16 (12.04).

Measurements in percent of HL : Length of snout 32.26-41.67 (36.75); diameter of eye 15.38-18.52 (16.89); width of interorbital 18.8-22.7 (20.55).

Measurements in percent of SL : Length of head 19.2-21.1 (20.14); depth of body 13.3-15.3 (14.38); least depth of caudal peduncle 9.3-11.3 (10.44); length of caudal peduncle 14.2-16.7 (15.48); distance from snout to dorsal origin 57.7 -61.3 (59.51); from pectoral to ventral origin 39.2-43.8 (41.4); length of pectoral 11.6-16.4(13.86); of ventral 8.0-9.9 (9.08); base of dorsal 8.3-10.0 (9.07); base of anal 7.6-9.8 (8.36).

Colour : Body yellowish-brown marbling, upperside considerably darker, underside pale.

Sexual dimorphism : Second ray of pectoral thickened in male, the first two rays of pectorals are much longer and on the body, under the dorsal fin, on each side, there is a swelling.

Size : Maximum size attained 220 mm (22 cm.) TL

Affinities: Very close to *M. mizolepis* Gunther.

Range : North eastern Asia including Burma southwards to Central China.

Remarks : Rendahl (1943) records the following subspecies of *Misgurnus anguillicaudatus* (Cantor), *M. mizolepis* Gunther and *M. erikssoni* Rend.

1. *Misgurnus anguillicaudatus anguillicaudatus* Tschusan Island, *W.Yunnan* and Burma (Yangtze Kiang & Irrawaddy basins). 2. *Misgurnus anguillicaudatus decemcirrosus* (Basil), China northwards from Yantze-kiang basin. 3. *Misgurnus anguillicaudatus rubripinnis* (Schleg.), Japan. 4. *Misgurnus anguillicaudatus formosanus* Rend., Taiwan (subspecies of *Misgurnus mizolepis* Gunther).

1. *Misgurnus mizolepis mizolepis* Gunther, Yangtze-kiang basin. 2. *Misgurnus mizolepis fukien* Nichols, China southwards form Yangtze-Kiang basin. 3. *Misgurnus mizolepis hainan* Nichols & Pope, Hainan. 4. *Misgurnus mizolepis tonkinensis* Rend., Tokin.

Subspecies of *Misgurnus erikssoni* Rend., *Misgurnus erikssoni erikssoni* Rend., Inner Mongolia and some parts of North Schansi.

Material examined: Type : None

Other material: China : 3, Irrawaddy drainage, West Yunnan, Coll. Xin. Luo Chuol. 4 Academia Sinica catalogue Nos. 58244, 58246, 58247 and 58050 Wu County, Jiangu Province, Coll. Li Si-Zhong, 17.4.1975.

Genus 3. **Lepidocephalus*** Bleeker, 1858

1858. *Lepidocephalus* Bleeker, *Natuurk. tijdschr. Nederl. Ind.*, p. 303 (Type ; *Cobitis macrochir* Bleeker, monotypic)

1863. *Lepidocephalichthys* Bleeker, *Versl. Meded. Akad.*, Amsterdam, 15, p. 35 (Type: *Cobitis hasselti* Cuv. & Val., monotypic)

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* In the figure of Bleeker (1863, Vol.III) of *Lepidocephalus macrochir* the dorsal is placed on the second half of body. This led to the separation of genus *Lepidocephalus* into two subgenera, *Lepidocephalus* and *Lepidocephalichthys* and in Day's recognition of the name *Lepidocephalichthys* for the Indian species. This separation is not valid and in all species examined I find the dorsal placed in the middle of the body.

1865. *Platacanthus* Day, *Proc. Zool. Soc. Lond.*, p. 296. (Type : *Platacanthus argensis* Day, monotypic)

Diagnosis : Body relatively elongate, slightly compressed, back not arched. Inferior mouths with six barbels, two rostral, two maxillary and two maxillo-mandibular. A small straight or slightly curved, erectile, bifid suborbital spine. Dorsal fin inserted opposite or nearly opposite to ventrals, placed on middle of body. Caudal truncate or slightly emarginate. Anal opening close to anal fin. Scales very visible, imbricate rectangular with small eccentric focal area. Sides of head covered in patches with smaller, usually rounded scales. Vertex scaled or naked. Lateral line absent. Air bladder enclosed in a bony capsule.

Distribution : Pakistan, India, Bangladesh, Burma, Sri Lanka, Thiland, Indo-China and Malay Archipelago.

Key to species of genus **Lepidocephalus**

1.	Origin of dorsal fin distinctly nearer to tip of snout than to caudal base; caudal deeply emarginate	*L. menoni* (Assam, Meghalaya and U.P)
	Origin of dorsal fin nearer to caudal base than to tip of snout; caudal not deeply emarginate (except in *micropogon*)	2
2(1).	Mental lobes not well differentiated into fleshy lobulous and flap-like parts; lobulous part poorly developed (Fig. no.7)	*L. micropogon* (Burma)
	Mental lobes well differentiated into fleshy lobulous and flat-like parts; lobulous part well developed	3
3(2).	Flap-like part of mental lobes with barbel-like extensions	4
	Flap-like part of mental lobes without barbel-like extensions	6
4(3).	Lobulous part divided into two lobules (Fig. no.6)	*L. berdmorei* (Manipur, Meghalaya, Burma, Thailand)
	Lobulous part not divided into lobules	5
5(4).	Body elongate; depth of body more than 6 times in SL; no dark lateral band or grey spots on body.	*L. coromandelensis* sp. (Eastcoast of India)
	Body not elongate; depth of body less than 6 times in SL; a dark lateral band or dark grey spots on body.	*L. guntea* (N. India, Pakistan Bangladesh)

6(3). Origin of ventral in front of dorsal origin; its origin equidistant between posterior part of eye and caudal base. *L. irrorata* (Manipur)

Origin of ventral not in front of dorsal origin; its origin not equidistant between posterior part of eye and caudal base (nearer caudal base) 7

7(6). Origin of ventral directly opposite to that of dorsal; caudal fin notched; two intensive dark spots; one above middle of caudal base, another at notch. *L. annandalei* (Eastern Himalayas)

Origin of ventral slightly behind that of dorsal; caudal fin slightly emarginate; a dark spot above middle of caudal base. *L. thermalis* (Peninsular India and Sri Lanka).

1. The *guntea* Complex

8. **Lepidocephalus *guntea*** (Ham.)

(Figs. 1-6, Pl. IV; Fig. 1 & 2, Pl. VIII)

1822. *Cobitis guntea* Hhamilton, Fish. Ganges, pp. 353, 394 (Type locality : ponds and freshwaters of Bengal)

1822. *Cobitis balgara* Hamilton, Fish Ganges, pp. 356, 394 (Type locality : Kosi River)

1839. *Canthophrys vittatus* Swainson, *Nat. Hist. Fish*; 2; p. 310.

1839. *Canthophrys olivaceous* Swainson, *Nat. Hist. Fish*; 2; p. 310

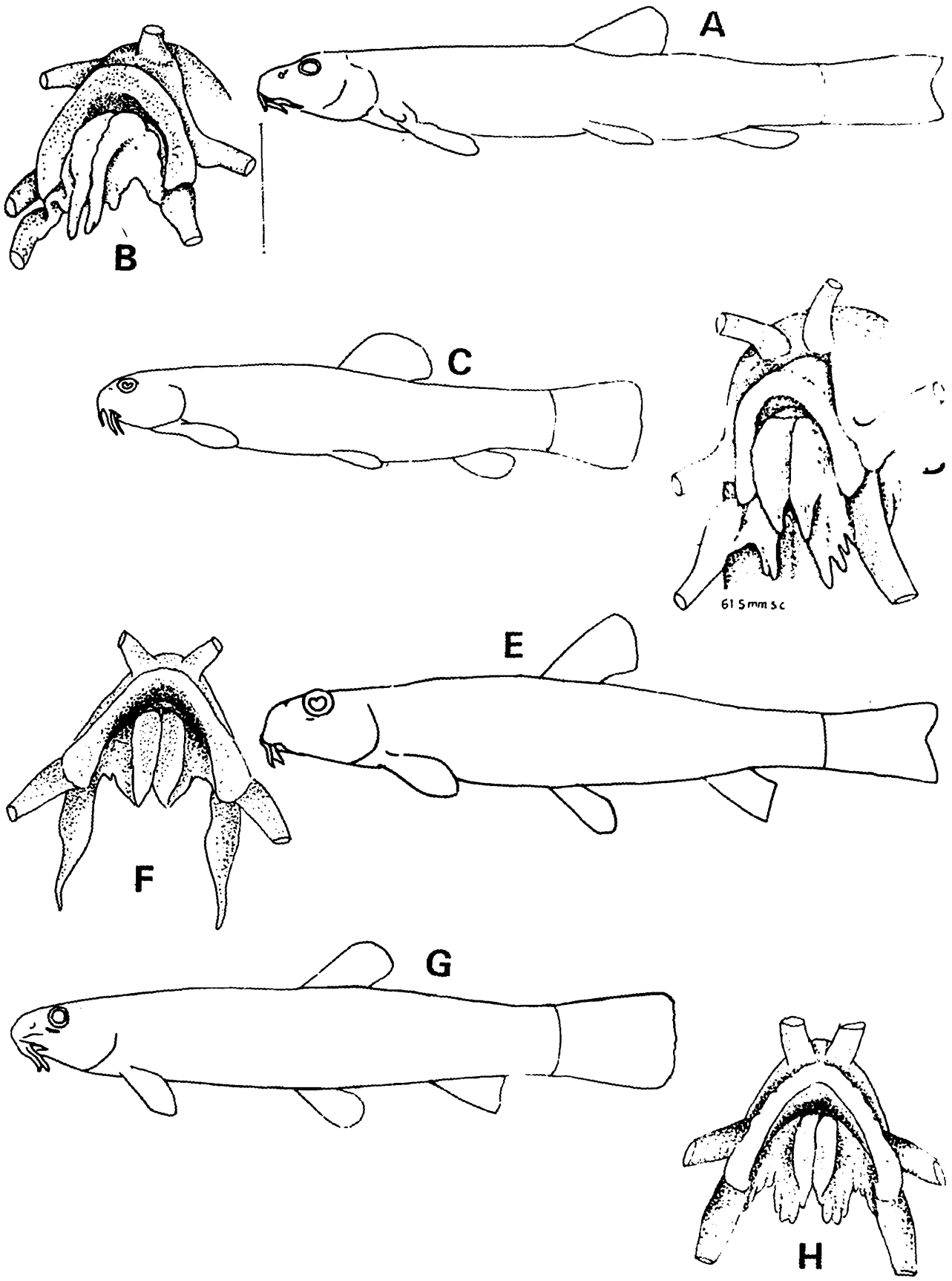
1839. *Cobitis maya* Sykes, *Tans. Zool. Soc. Lond.*, 2: 367

1839. *Cobitis phaxacheila* McClelland, *Asiat. Res.* **19**: 305, 439, pl. 52, fig. 4 (Type locality: Mishmee mountains)

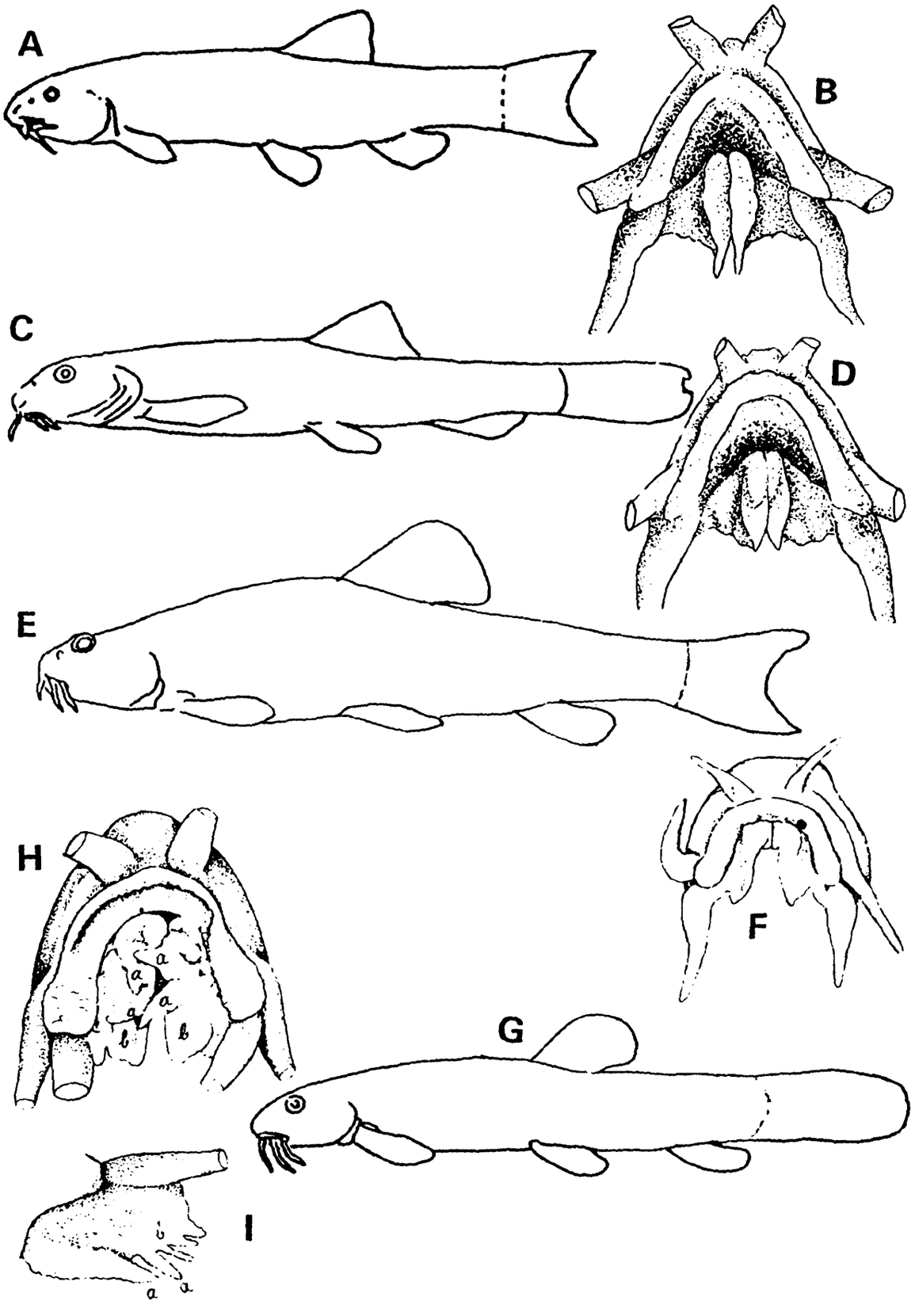
1839. *Cobitis balgara*, McClelland, *Asiat. Res.* **19**:307, pl. 53, fig. 2 (From Hamiltons Ms. drawings)

1839. *Schistura balgara*, McClelland, *Asiat. Res.*, **19**:307 (Assam)

1846. *Cobitis guntea*, Valenciennes (in C & V.) *Hist. Nat. Poiss*; **18**:67.



Text Fig. 2. Mental lobes of various species of *Lepidocephalus.* A. Outline of *L.thermalis,* B. Mental lobes of same, much enlarged. C. Outline of *L. guntea.* D. Mental lobes of same much enlarged, E. Outline of *L. menoni,* F. Mental lobes of the same, much enlarged, G: Outline of *L. coromandelensis,* H. Mental lobes of the same much enlarged.



Text Fig.3. A. Outline of *L.irrorata*, B. Mental lobes of same, much enlarged. C. Outline of *L.annendalei*, D. Mental lobes of the same, much enlarged. E. Outline of *L. micropogon*. F. Mental lobes of the same, much enlarged. G. Outline of *L.berdmorei*. H. Mental lobes of the same, much enlarged, I. Flap like part of the mental lobes of the above showing barbel-like extensions.

1853. *Cobitis phaxocheila*, Valenciennes (in C & V.), *Hist. Nat. Poiss*; 17:79

1864. *Cobitis guntea*, Gunther, *Cat. Fish. Brit. Mus.*, 7:346.

1864. *Misgurnus lateralis*, Gunther, *Cat. Fish. Brit. Mus.*, 7:346 (Bengal)

1869. *Cobitis guntea*, Day, *Proc. Zool. Soc. Lond*; p. 383.

1878. *Lepidocephalichthys guntea*, Day, *Fish India*, p. 609, pl. 155, fig. 4; pl. 156, fig. 12.

1889. *Lepidocephalichthys guntea*, Day, *Faun. Brit. Ind. Fish*; 1:220, fig. 80

1937. *Lepidocephalichthys guntea*, Shaw and Shebbeare, *J. Asiat. Soc. Beng*; 3:68 (gravelly and muddy streams and tanks in Terai and Duars, N. Bengal).

1941. *Lepidocephalichthys guntea*, Hora and Gupta, *J. Asiat. Soc. Beng*; 6: 81 (Kalimpong)

1949. *Lepidocephalichthys guntea*, Menon, *Rec. Indian Mus.*, 47:234 (Bisharia ghat, near Chhatra, E. Nepal)

1960. *Lepidocephalichthys guntea*, De Witt., *Stanford Ichth. Bull*; 7(4):77 (Biratnager and vicinity, Nepal)

1968. *Lepidocephalus birmanicus*, Banarescu & Nalbant (nec Rendhal; in part), *Mitt. Hamburg. zool. Mus. Inst.*, 65:345, pl. 2, fig. 21 (Verei R., at Nichangara, Tarai, Ganges drainage. Manipur excluded).

1968. *Lepidocephalus guntea*, Srivastava, *Fish Eastern U.P*, p. 62 (Gorakhpur)

1974. *Lepidocephalus guntea*, Menon (in part). *Inld. Fisheries Soc. India*, Special publication, p. 53.

1975. *Lepidocephalichthys guntea*, Tandon and Gupta, *J. Zool. Soc. India*. 27(1-2):28 (Ferozepur).

1976. *Lepidocephalus berdmorei*, Mathur & Mishra (nec. Blyth), *Newsl. Zool. Surv. India*, 2 (4) ; 157

1976. *Lepidocephalus annandalei*, Pillai and Yazdani (nec Chaudhuri), *J. Zool. Soc. India*, 26 (1-2): 12 (a stream at Dainadubi forest, Garo Hills, Meghalaya).

1977. *Lepidocephalichthys annandalei*, Pallai and Yazdani (nec Chaudhuri), *Rec. zool. Surv. India*, 72 (1-4):13 (a stream at Dainadubi forest, Garo Hills, Meghalaya)

1979. *Lepidocephalus dibruensis* Sen, *Bull. zool. Surv. India*, 2 (1); 35 (Type locality: Dibru river, Guijan, 60 km from Dibrugarh, Assam)

1980. *Lepidocephalichthys guntea*, Johal and Tandon, *Pb. Fish. Bull.*, 4 No. 1 :30 (Hoshiarpur).

1980. *Lepidocephalus guntea*, Mirza, *Proc. 1st pakistan Congr. Zool.*, p. 24 (NWFP.)

1981. *Lepidocephalichthys guentta*, Shrestha, *Fish. Nepal*, p. 127 (Biratnagar; Pokhara)

1981. *Lepidocephalichthys nepalensis* Shrestha, *Fish. Nepal*, p. 129 (Type locality: Singhia River, Biratnagar)

1981. *Lepidocephalus (Lepidocephalichthys) guntea*, Tilak and Husain, *Rec. zool. Surv. India*, Occ. Paper No. 32:7, figs. 1-4 (Northern India, Nepal. Pakistan).

1981. *Lepidocephalus (Lepidocephalichthys) guntea*, Jayaram (in part), *Handbook Freshwater Fish. India*, p. 181 (Throughout India except Karnataka, Kerala and South of Krishna. Nepal. Bangladesh. Pakistan. Burma excluded).

Diagnosis : A large lepidocephalid loach with origin of dorsal before that of ventrals or almost opposite or slightly behind ventrals and somewhat nearer to caudal base than to tip of snout. Distance between insertion of ventrals and anal fin about two in distance between insertion of pectoral and anal fins (See Graphs 1-5). A broad intensive dark band from end of snout to caudal base with a black ocellus above base of caudal. In females below this band and the back are festooned with dark-brown pigmentation.

Description : Based on 24 specimens, 37.5-63.0 mm SL., F 1460/2, from Ghagra River, Katharinian ghat, Baraich Dist., U.P. (10); F 1479/2, from Bhabhakhan village, Pareva, Gonda Dist., UP (10); Sarada River, Tanakpur, U.P. (4).

D. 3/6; P. 1/6-7; V. 1/6; A. 3/5; C. 19.

Body elongate and moderately compressed. The dorsal profile slightly arched, ventral profile almost straight. Body depth 4.77-7.27 (5.83) in SL. Caudal peduncle short; its least height 1.00-1.33 (1.10) in its length. Anus immediately in advance of anal fin. Head moderately deep; its length 3.85-5.81 (4.95) in SL., snout rounded, 2.25-3.33 (2.73) in HL., eye rather small covered by skin, situated before middle of head, 2.50-5.00 (3.48). Nostrils situated before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital distinctly convex; its width 2.00-5.00 (3.25) in head. A small bifid sub-orbital spine below each eye, their bases inserted slightly before eye: latero-caudal process small, its tip extending up to middle of eye, the longer mediocaudal process extends to posterior border of eye. Mouth small, inferior, moderately large, with thick lips; barbels six, two rostrals close together near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, all short but well developed, longer than orbit. Mental lobes well developed, divided into anterior and posterior parts, anterior shorter and lobulous, posterior longer, flap-like divided into three barbel-like extensions (Text fig. 2 D). Gill opening extending to above base of pectoral.

Scales : Small, with eccentric focal area, imbricate, present all over body. On the head scales are in patches, below and behind eye and upper part of operculum; scales absent on the vertex. On the ventral side scales extend anteriorly beyond isthmus. 25-30 rows of scales between back and anal fin. Lateral line absent.

Fins : Dorsal short, its origin somewhat nearer to base of caudal than to tip of snout. Ventrals small, its origin opposite to that of dorsal or slightly behind or before the origin of dorsal, not extending to anal opening. Anal short behind dorsal. Pectoral rounded. Caudal truncate. Distance from tip of snout to dorsal origin 1.67-1.92 (1.83) in SL; from tip of snout to ventral origin 1.82-2.02 (1.89); from pectoral to ventral origin 2.83-3.43 (3.13); from ventral to anal 3.39-4.23 (3.72); length of longest pectoral ray 4.48- 7.47 (6.51); of ventral 5.50-9.30 (7.25); of dorsal 4.95-7.83 (6.02); of anal 5.16-7.75 (6.68); length of dorsal base 6.78-13.43 (8.72); length of anal base 8.91-14.50 (11.24); length of caudal fin 2.85-5.00 (4.20).

Measurement in precent of HL : Length of snout 31.58-44.44 (37.15); diameter of eye 20.0-33.33 (29.28); width of interorbital 10.0 - 25.0 (14.93).

Measurements in percent of SL : Length of head 17.20-25.97 (20.34); depth of body 13.75-20.63 (17.33); least depth of caudal peduncle 10.98-15.87 (12.72); length of caudal peduncle 11.76-15.87 (13.94); distance from snout to dorsal origin 51.02-59.74 (54.51); from snout to origin of ventral 49.43-56.82 (52.89): from pectoral to ventral origin 29.17-35.29 (32.03); from origin of ventral to anal 23.66-29.55 (26.97); length of pectoral 13.39-22.34 (15.60); of ventral 10.75-18.18 (14.00); base of dorsal 7.45-14.74 (11.73); base of anal 6.90-11.22 (9.06); length of caudal fin 11.76-15.87 (13.94).

Colouration : Colouration highly variable, differing with age, and sex. In young there are a series of 10-12 dark grey spots on the side. With growth these spots tend to fuse forming a continuous band in males extending almost to caudal base. In female this band has at least anteriorly, a number of closely set big round spots, more or less confluent. In both sexes upper surface above the margin of eye is intensively dark. Between the dorsal dark zone and the lateral stripe there is a light zone, strickled with dark brown pigmentation; similar pigmentation occurs below the lateral stripe as well. These zones of pigmentations are much better developed in females; while in some males they are entirely absent. A black ocellus above the middle of base of caudal fin. Dorsal and caudal with numerous rows of closely set but irregularly disposed dark spots; a few on anal and pectoral.

Day's figure of *L. guntea* (Pl. CLV, fig.4) corresponds to the colour of the female, and that of *bulgara* (Pl. CLVI, fig. 12) to the male.

Sexual dimorphism : In male both paired fins, especially pectoral are longer than in females and the inner ray of pectoral ossified. Day (1878) has noticed osseous inner ray employed for "digging into sand" but failed to note that it exists only in males.

Affinities : This species is most closely related to *L. berdmorei* but is easily separated from it by its distinctive colouration, the dark lateral band extending from snout to base of caudal,especially noticeable in male and the numerous rows of closely set dark spots on the caudal fin, (a series of 10-18 brown spots on the sides of body and 4-7 "V" shaped black cross bands on caudal fin in *L. berdmorei.*). The mental lobes of the two species are markedly different (see Text fig. 2 D, 3 H).

Range : India : Brahmaputra, Ganges and Indus drainages along the Himalaya, and the drainages along the Satpura- Vindhyas. Bangladesh. Pakistan.

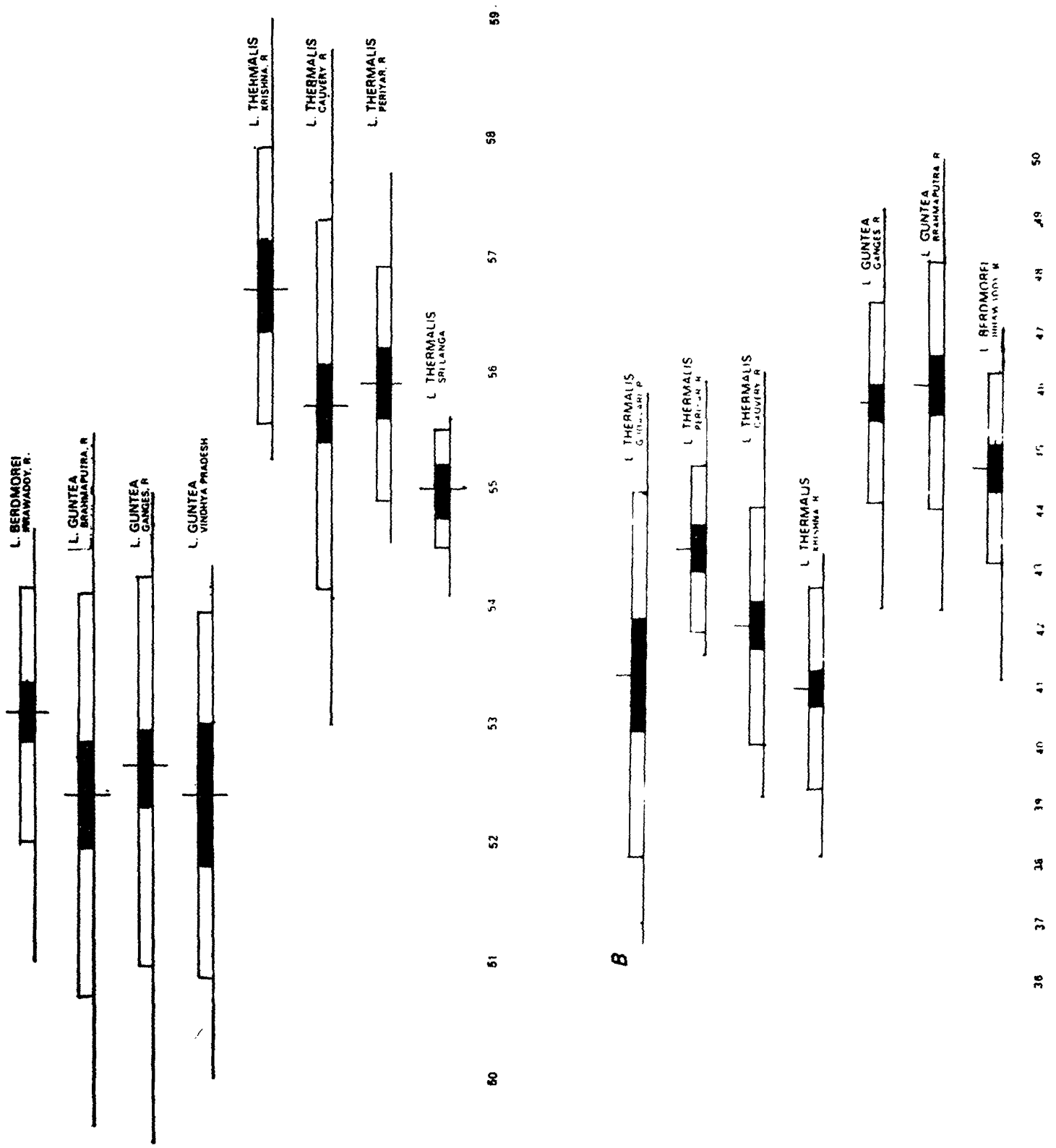
Material examined : Type: *Lepidocephalus dibruensis* Sen. Holotype, ZSI FF 1203, Dibru river, Guijan, Assam. In the Zoological Survey of India, Calcutta.

Other material : India :Assam: 5, ZSI F 11931/2, Tangla, Dist. Darrang. 7, ZSI uncatalogued. 6, SRS/ZSI, uncatalogued, Lake Chandubi, Coll. S.C.Day, July 1973. 9, SRS/ZSI, uncatalogued. 4, ZSI/ERS 20973, Ratanpur, Dist. Kamrup. 2,ZSI/ERS, Latmati, Dist. Kamrup, Coll. T.V. Darlong & Party, 8.5.1987. 14. SRS/ZSI, uncatalogued, Silchar. 3, SRS/ZSI, uncatalogued, Haripani, 20 km North of Goalpara, Coll. A.G.K. Menon, 15.4.1985. Bihar: 1,ZSI, uncatalogued, Bachi Village 20 miles North of Tillaya Dam site, Hazaribagh , Coll. A.G.K.Menon, 26.3.1952. Madhya Pradesh: 3, ZSI F 1592/2, Thapti river at Devker, 18.2. 1949. 2, ZSI F 2272/2, Banjar river, Manki Dist. Balaghat. 2, ZSI F 2391, Pandava hills, Vindhya Pradesh. 2, uncatalogued, Aasun river, 28 km North of Gwalior, 10.6.1989. 1, uncatalogued, Mahanadi river, Durg, Coll D.N. Saxena, 12.5.1989. 5, uncatalogued, streams in Betul, Coll. D.N. Saxena, 4.6.1989. 1, ZSI F 6238/2, Kosini Talao M.P.Survey. Meghalaya: 6, ZSI/ERS uncatalogued, Daindubi forest, 9 kms South of Dudhani, Garo hills. Punjab: 1, ZSI F 2560, 1, uncatalogued, Dineshpur (Gadarpur) purchased, 15.11.1985. 1, uncatalouged, Hoshiarpur, Coll. K.K.Tandon. Rajasthan: 14, ZSI uncatalogued, Mewar, Prasad stream,station No. 8, Coll. B.N.chopra & M.L. Roonwal, 18, 19, 21.10.1941. Tripura: 4, ERS/ZSI F 3024, Coll. Subalsingh. Uttar Pradesh: 10, ZSI F 1460/2, Ghagra river, Katharinian ghat, Dist. Baraich. 14, ZSI, uncatalogued, Sarada river, Tanakpur, Coll. A.G.K. Menon, 4.3.1949. 16, ZSI F 1479/2, Bhabhakhan Village, Parera, Gonda. 4, ZSI uncatalogued. West Bengal: 18, SRS/ZSI, uncatalouged, Karala river at Jalpaiguri town, Coll. A.G.K. Menon, 12.4.1985. 8, SRS/ZSI, uncatalogued, Mahanand river, Siliguri, Coll. A.G.K. Menon, 9.4.1985. Bangladesh: 6, reg. No. 13419, Jessore. 1, Reg. No. 2561, Kushtia, 29.4.1987. Nepal: 5, uncatalogued, Katmandu.

9. **Lepidocephalus thermalis** (Valenciennes) (Figs. 1-8; Pl. V, 3-5; Pl. VIII).

1846. *Cobitis thermalis* Valenciennes (in C & V), *Hist. Nat. Poiss*, **18**:78 (Type locality:hot springs of Kanniya, E.P., Sri lanka).

1849. *Cobitis carnaticus* Jerdon. *Madras J. Litt. Sci.*, **15**:331.



Graph 1. *Lepidocephalus guntea* compared with *L. thermalis* and *L. berdmorei*. A. Preventral distance in SL in percents. B. Distance between ventral and anal fins in distance between pectoral and anal fins in percent.

1849. *Cobitis mysorensis* Jerdon, *Madras J. Litt. Sci.*, 15:332.

1849. *Cobitis rubripinnis* Jerdon, *Madras J. Litt. Sci* 15:333.

1854. *Cobitis thermalis*, Bleeker, *Ver Batavia Gen* ., 25:70.

1864. *Lepidocephalichthys thermalis*, Bleeker, in *Verh. Holland. Maatch. Haarlem, Cyprin.& Cobit. Ceyl*; p.6 tab. 1, fig. 1.

1864. *Lepidocephalichthys thermalis*, Gunther, *Cat. Fish. Brit. Mus.*, 7:364 (Ceylon; Southern India).

1865. *Platacanthus agrensis* Day, *Proc. Zool. Soc. Lond.*, p. 269 (Type locality : Trichur).

1869. *Lepidocephalichthys thermalis* Day. *Proc. Zool. Soc. Lond*; p. 383.

1875. *Platacanthus agrensis* Day, *Fish Malabar*, p. 204, pl. 14, fig. 1.

1878. *Lepidocephalichthys thermalis*, Day, *Fish. India.* p. 610, pl. 155, fig. 3.

1889. *Lepidocephalichthys thermalis*, Day, *Faun. Brit. Ind. Fish.* 1 : 221 (South India, Malabar coast, Wynaad and Ceylon).

1952. *Lepidocephalus thermalis*, Deraniyagala, *Color. Atlas Vert. Ceylon.* p. 47 (Common in Ceylon and found upto Kandy)

1962. *Lepidocephalus thermalis*, Mendis and Fernando, *Bull. Fish. Res. Stn. Ceylon*, **12** : 107, fig. 12.

1968. *Lepidocephalus thermalis* Banarescu and Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.*, **25** : 346 (Poona, N. Canara and Nilgiris)

1981. *Lepidocephalus (Lepidocephalichthys) thermalis*, Tilak and Husain, *Rec. Zool. Surv. Occ. Paper*, No. 32 : 12, figs. 5, 6 (Revision).

Diagnosis: A small, considerably more elongate lepidocephalid with origin of dorsal distinctly before that of ventrals, and considerably nearer caudal base than tip of snout. Generally 10-12 spots along the side of body; caudal with 4 'V'- shaped bands and a black spot on caudal base. Confined to the Peninsular India including Sri Lanka.

Description :Based on 25 specimens 26.0-52.20 mm SL from Wynaad, and the base of Nilgiris in the Cauvery system.

D 3/6; P. 1/6-7; V. 1/6; A 3/5; C. 16

Body relatively more elongate with compressed caudal peduncle. the dorsal

profile is slightly arched, except on head where it is depressed, ventral profile almost straight. Body depth 4.71-7.27 (5.77) in SL. Caudal peduncle short; its least height 1.00-1.50 (1.22) in its length. Anus immediately in front of anal fin. Head moderately deep; its length 4.13-5.06 (4.53) in SL., snout rounded, 2.20-3.17 (2.60) in HL; eye rather small covered by skin, situated before middle of head, 2.60-4.67 (3.63). Nostrils situated immediately before eye, contiguous anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital convex, its width 1.75-4.00 (2.52) in head Two bifid small sub-orbital spines below each eye, their bases inserted slightly before eye, latero-caudal process smaller, tip of longer medio-caudal process extends upto middle of eye. Mouth small, barbels six, two rostral close together near apex of snout,maxillary and maxillo-mandibular pairs near angle of mouth, all well developed but short, almost as long as orbit. Mental lobes well developed, lobes divided into anterior and posterior parts, anterior longer, somewhat barbel-like extending beyond posterior flap-like part, flap-like portion without any barbel-like extensions (Fig. 2B). Gill opening extends to above base of pectoral.

Scales : Small, with eccentric focal area, imbricate, present all over body. On head a small patch of scales, behind suborbital spine. Scales absent on vertex. On the ventral side scales extend anterior to pectoral base only. 30-37 rows of scales between back and anal fin.

Fins : Dorsal short; its origin nearer caudal base than tip of snout. Ventral origin slightly behind the origin of dorsal not extending to anal opening. Anal short behind dorsal. Pectoral falciform. Caudal truncated or slightly emarginate with pointed corners. Distance from tip of snout to dorsal origin 1.71 - 2.00 (1.86) in SL, from tip of snout to ventral origin 1.70-1.88 (1.80); from pectoral to ventral origin 2.73-4.50 (3.05); from ventral to anal 3.53-4.71 (4.13); length of longest pectoral ray 4.26-6.96 (5.57); of ventral 5.78-9.00 (7.25); of dorsal 5.06-6.92 (6.15); of anal 5.40-9.20 (7.14); length of dorsal base 6.82-10.22 (8.40); length of anal base 8.33-15.33 (11.46); length of caudal fin 6.22-9.63 (7.53).

Measurements in percent of HL : Length of snout 31.85-45.46 (38.85); diameter of eye 20.0-38.46 (27.84); width of interorbital 11.76-23.81 (17.80).

Measurements in percent of SL : Length of head 19.78-25.0 (22.24); depth of body 13.75-22.86 (17.48); least depth of caudal peduncle 9.83-12.86 (11.04); length of caudal peduncle 10.39-16.07 (13.45); distance from snout to dorsal origin 50.00-58.44 (53.87); from snout to origin of ventral 53.13-58.75 (55.75); from pectoral to ventral origin 22.22-36.67 (33.09); from origin of ventral to anal 21.25-28.36 (24.32); length of pectoral 14.37-23.46 (18.19); of ventral 11.11-17.31 (13.89); base of dorsal 9.87-14.67 (12.07); base of anal 6.52-12.00 (9.04); length of caudal fin 10.39-16.07 (13.45).

Colouration: Body pale coloured; a series of 11-14 small more or less squarish spots on back; a row of 18 to 15, usually 10-12, small rectangular or slightly roundish spots on sides, from opercle to base of caudal. Two or three longitudinal zones of

pigmentation between dorsal and lateral spots. A black spot on caudal base. Sides of head with small round spots; a well marked dark stripe from eye to snout. Dorsal with a few rows of light spots; caudal usually with four "V" bands; other fins pale or with light spots (See figures from various drainages for ecophenotypic colour variations).

Sexual dimorphism : Same as in *L. guntea.*

Size: The largest size examined 58.0 mm SL

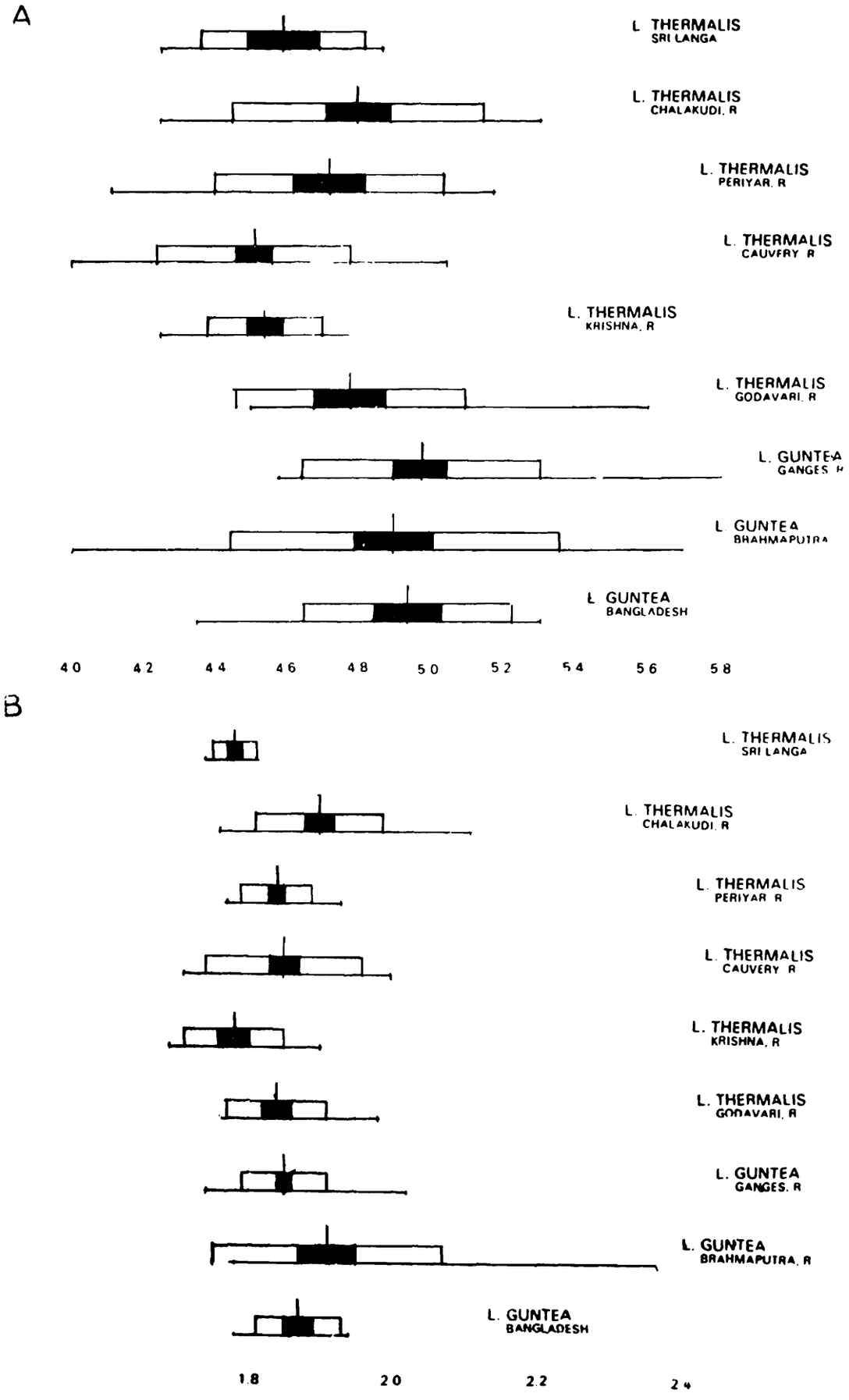
Affinities: This species is closely related to *L. guntea* though they are apparently well separated geographically. The two can be differentiated by their colouration and in the distance between the ventral and the anal fins in that of pectoral to anal fins (2.4 times *versus* 2.2 times in *guntea*; see Graph. 2).

Range: Peninsular India and Sri Lanka.

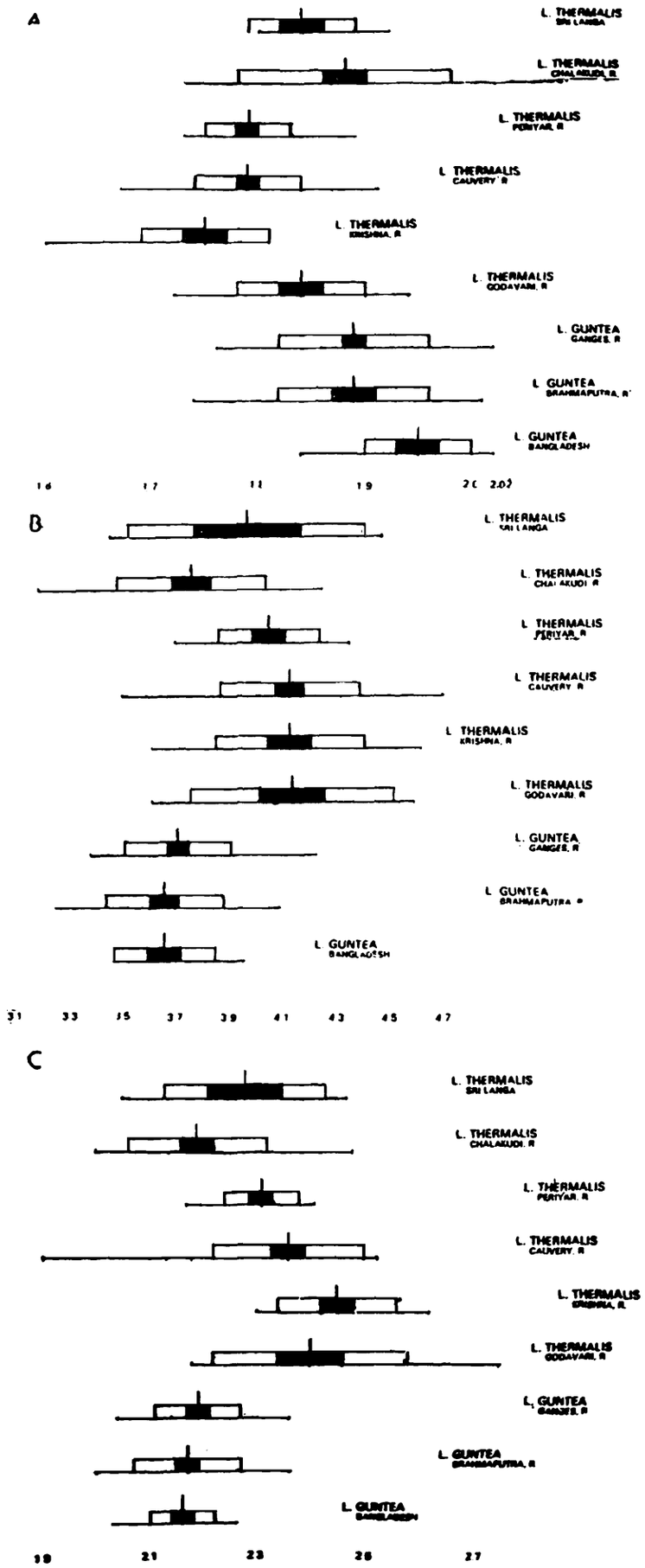
Geographical variation: See Graphs.

Material examined: Type: None

Other material: Andhra Pradesh: 20, SRS/ZSI uncatalogued, Andiri river, Kurnool, Kurnool forest survey 1982-83, Coll. T.S. N. Murthy 1.1.1983. Karnataka: 2, ZSI F 12381/1, Tunga river, Shimoga, 27, ZSI uncatalogued, Kabini river at Nanjangud, station No. 20, Coll. K.C. Jayaram Krishnan & Party, 14.10.1975. 5, ZSI F 12380/1, Bhadra river, Dist. Shimoga. Kerala: 7, SRS/ZSI F 563, Mullar, Thekkadi Expedition Coll. Mathew & Party, 23.2.1981. 42, SRS/ZSI F 549, Cheriyakaniam, Thekkadi Expedition, Coll. Dr. R.S. Pillai, 15.2.1981. 2, SRS/ZSI F 560, East Cheriyakaniam, Thekkadi Expedition, Coll. R.S. Pillai, 17.2.1981. 34 (male), SRS/ZSI, uncatalogued, Trichur, Coll. Thobias. 150 (Female), SRS/ZSI, uncatalogued, Trichur, Coll. Thobias. 52, SRS/ZSI, uncatalogued, Kyppenchery, Sultan Battery, Dist - Wyanaad, Coll. G.U. Kurup & Party, 16.2.1974. 8, ZSI F 864/2, Pasuparai, Pierumedu. 1, SRS/ZSI uncatalogued, Padripalam, Dist - Waynaad, Coll. A.G.K. Menon & Nahar, 13.3.1982. 1, SRS/ZSI uncatalogued, Pananram river, Dist - Wayanad, Coll. A.G.K. Menon & Nahar, 15.3.1982. 1, SRS/ZSI uncatalogued, Chedleth, Dist. Wyanaad, Coll. R.S. Pillai & Party 19.10.1976. Maharashtra: 7, WRS/ZSI P.655, Kamshet, Poona, Coll. R.N. Chopra, 13.8.1970. 17, WRS/ZSI P. 656, Kamshet Poona, Coll. R.N.Chopra, 3.9.1970. 34, WRS/ZSI P.657, Trimbak, Dist. Nasik, Coll. M.B.Rao, 16.10.1973. 12, WRS/ZSI P.658, Paud, Poona, Coll. R.S. Lamba, 6.11.1969. 3, WRS/ZSI P.766, Mulamutha river Poona, Coll. R. N. Chopra, 22.4.1964. 3, WRS/ZSI P.767, Mula river Poona, Coll. R.N. Chopra, 20.5.1964. 6, WRS/ZSI P.768, Paud, Poona, Coll. R.N.Chopra, 10.12.1969. 3, WRS/ZSI P.769, Koudi, Poona, Coll. B.S.Lamba, 10.1.1969. 1, WRS/ZSI P.770, Khed, Poona, Coll. R.N. Chopra, 3.10.1970. 5, WRS/ZSI P.772, Sindh colony, Aundh Road, Poona, Coll. B.S. Lamba, 11.9.1964. 5,WRS/ZSI P.773, Shinde wadi, Poona, Coll. R.N. Chopra,



Graph 2. *Lepidocephalus thermalis* compared with *L. guntea*. A. Head length in SL. B. Pre-dorsal distance in SL.



Graph 3. *Lepidocephalus thermalis* compared with *L. guntea*. A. Pre-ventral distance in SL. B. Distance between ventral and anal fins in SL. C. Distance between ventral and anal fins in distance between pectoral and anal fins.

31.12.1969. 3, WRS/ZSI P.774, Kamthadi, Poona, Coll. B.S.Lamba, 19.2.1969. 1, WRS/ZSI P.775 Kamthadi, Poona, Coll. R.N. Chopra, 23.7.1970. 3, WRS/ZSI P.776, Pand Poona, Coll. R.N. Chopra, 8.5.1969. 2, WRS/ZSI, P.777, Kamthadi, Poona, Coll. K. R. Rao, 29.5.1969. 45, WRS/ZSI P.779, Telegoan, Poona, Coll. K. R. Rao, 4.11.1970. 2, WRS/ZSI, P.780 Khed Poona, Coll. K.R. Rao, 19.11.1971. 3, WRS/ZSI P.786, Kamthadi, Poona, Coll. B.S.Lamba, 20.2.1969. 2. WRS/ZSI P.787, Telegoan, Poona, Coll. K.R. Rao, 4.11.1970. 56, WRS/ZSI P.788, Pirangut, Poona, Coll. K. R. Rao, 16.11.1971. 15, WRS/ZSI P.709, Paud, Poona, Coll. K. R. Rao, 6.8.1970. 10, WRS/ZSI P.792, Pirangut, Poona, Coll. K.K.Rao 26.10.,1970. 3, WRS/ZSI P.798, Kamthadi, Poona, Coll. R. N. Chopra, 24.7.1969. 43, WRS/ZSI uncatalogued, Aurangabad, Coll. Jadav. Tamil Nadu: 19, SRS/ZSI, uncatalogued, Mulli river, Coimbatore, Coll. A.G.K. Menon, 27.10.1982. 1, ZSI uncatalogued, Stream in Rockwood Estate, Nellakkota, Nilgiris, Coll. S. Rajan, March 1959. 42, SRS/ZSI F 2058, Pudukottai Road, Tanjore, Coll. G. Thirumalai& Party, 5.5.1986. 11, SRS/ZSI, uncatalogued, Keeripittan Odai, 4km on Sengal theri road, Coll. M. Vasanth & Party, 9.2.1986. 4, P.430, Bodi, Palani Hills, Coll. G.U. Kurup & Party, 21.2.1972. 160, SRS/ZSI uncatalogued, confluence of Kumda with Bhavani river at Attikadavu, Nilgiris, Coll. A.G.K. Menon, 26.10.1980. 5, SRS/ZSI, uncatalogued, Bhavani Sagar, Dist. Coimbatore. 2, SRS/ZSI uncatalogued, Chemmanchei Tank, Navalur Dist. Chengelput , Coll. K. Illango, 21.8.1982. 3, SRS/ZSI uncatalogued, Cauvery river, Coll. K.G. Sivaramakrishnan, July, 1989.

10. **Lepidocephalus coromandelensis** sp. nov.
(Fig.7, Pl. IV and Fig.1, Pl. VI; Figs. 2 G. H. & 4)

Diagnosis: A medium sized, somewhat more elongated leptocephalid than *L. guntea* (depth of body more than 6 times in SL; depth less than 6 times in *L. guntea*), with origin of ventral placed somewhat before that of dorsal (distance between tip of snout and ventral origin 1.75-1.97 times in SL *versus* 1.8-2.02 in SL in *L. guntea*).

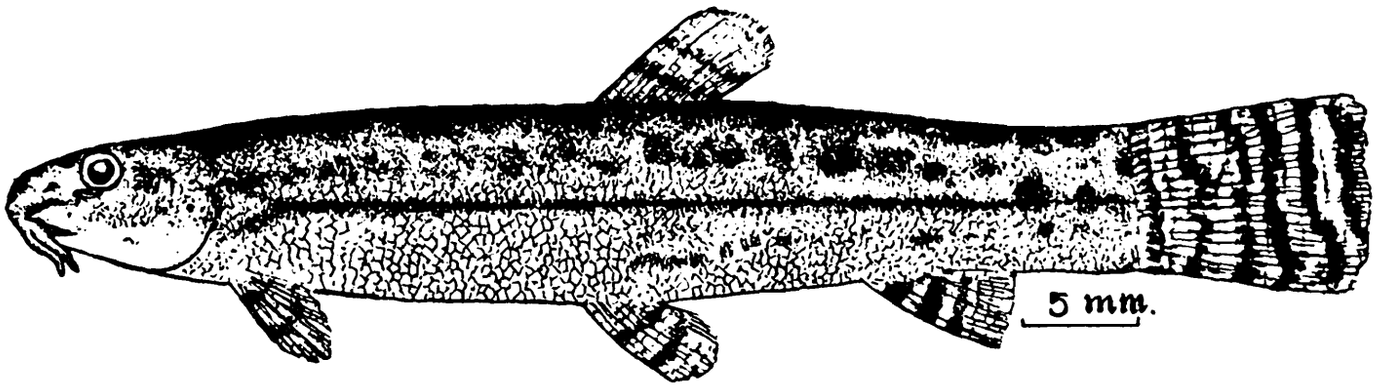
Description: Based on 23 specimens 37.5-52.0 SL from Araku valley, Andhra Pradesh.

D. 3/6; P.1/6-7; V.1/6; A. 3/5; C.19.

Body relatively more elongate with compressed caudal peduncle. The dorsal profile almost straight except on head where it is depressed; ventral profile almost straight. Body depth 5.2-7.25 (6.28) in SL. Caudal peduncle short; its least height 0.89-1.75 (1.26) in its length. Anus immediately in front of anal fin. Head moderately deep; its length 4.56-6.50 (5.53) in SL; snout rounded, 1.50-3.17 (2.34) in length of head; eye rather small, covered by skin, situated before middle of head, 2.40-4.00 (3.28). Nostrils situated before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital flat; its width 1.20-3.00 (1.87) in head. Two bifid sub orbital spines below each eye, laterocaudal process small; longer medio-caudal process extending to middle of eye. Mouth small, inferior, moderately large, with thick lips;

barbels six, two rostral near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, all shorter than orbit. Mental lobes well developed, divided into anterior and posterior parts, anterior shorter and lobulous, posterior flap-like with 4-5 short barbel-like extensions (Text fig. 2 H.). Gill opening extends to above base of pectoral.

Scales : Small, with eccentric focal area, imbricate, present all over body. On head scales are in patches, below and behind eye and upper part of operculum; absent on vertex. On the ventral side scales extend anteriorly beyond isthums. 25-30 rows of scales between back and anal fin. Lateral line absent.



Text Fig. 4 Lateral view of *Lepidocephalus coromandelensis* sp. nov. from Araku Valley, A.P.,50.5mm SL.

Fins: Dorsal short; its origin slightly nearer to caudal base than to tip of snout. Ventrals slightly in front of insertion of dorsal, not extending to anal opening. Anal short behind dorsal. Pectoral rounded. Caudal truncate. Distance from tip of snout to dorsal origin 1.74-1.93 (1.83) in SL; from tip of snout to ventral origin 1.8-1.94 (1.85); from pectoral to ventral origin 2.65-3.21 (2.94); from ventral to anal 2.58-4.17 (3.51); length of longest pectoral ray 4.33-7.38 (6.51); of ventral 5.47-8.20 (6.80); of dorsal 4.17-6.86 (5.13); of anal 4.95-8.42 (6.26); length of dorsal base 7.14-11.0 (8.81); length of anal base 7.64-13.41 (11.28); length of caudal fin 3.73-6.25 (4.50).

Measurements in percent of HL: Length of snout 31.58-66.67 (43.71); diameter of eye 25.0-41.67(30.98); width of interorbital 15.0-41.67 (30.99).

Measurements in percent of SL: Length of head 15.38-21.95 (18.23); depth of body 13.79-18.81 (16.6); least depth of caudal peduncle 9.30-15.00 (11.48); length of caudal peduncle 10.67-17.11 (14.25); distance from snout to dorsal origin 51.82-57.32 (54.81); from snout to origin of ventral 51.49-55.63 (54.05); from pectoral to ventral origin 31.11-37.78 (34.14); from origin of ventral to anal 24.0-38.82 (28.74); length of pectoral 13.54-23.08 (15.59); of ventral 12.20-18.27 (14.83); base of dorsal 9.09-14.00 (11.46); base of anal 7.69-13.10 (9.12); length of caudal fin 16.0-26.83 (22.62).

Colouration: A continuous dark band extending from the centre of the snout and ending in a black ocellus above the middle of base of caudal fin. Dorsal and caudal with rows of close-set dark spots. Other fins without any markings.

Sexual dimorphism: In males inner ray of pectoral ossified.

Size: The largest specimen examined 57.0 mm SL

Affinities: This form is quite closely related to *L. guntea*, but readily separated by its elongated body, the ventral origin located distinctly in front of the dorsal origin, and its distinctive colouration.

Holotype: SRS/ZSI No. F.3369, from Araku Valley, Andhra Pradesh, India, collected by T. Venkateswarlu.

Paratypes: SRS/ZSI No. F3370; 22 specimens, from 37.5 to 52.0 mm SL taken with the holotype.

Other material: India: Andhra Pradesh: 1, SRS/ZSI uncatalogued, Baeputta, Coll. T. Venkateswarlu, 1.10.1973. 1, SRS/ZSI uncatalogued, Krishna river at Barrage, Vijayawada, Coll. T Venkateswarlu, 6.10.1973. 1, SRS/ZSI uncatalogued, Korapur, Araku Valley, Coll. T. Venkateswarlu, 10.4.1979.

11. **Lepidocephalus menoni** Pillai and Yazdani (Fig. 6-7, Pl. VI)

1968. *Lepidocephalus berdmorei*, Banarescu and Nalbant (nec Blyth), *Mitt. Hamburg. Zool. Mus. Inst.* 65:347, 348, pl.11, fig. 23 (Janali river at Raimora, Assam and Kaziranga, Mikir hills, Assam).

1976. *Lepidocephalichthys menoni* Pillai and Yazdani, *J. Zool. Soc. India*, 26(1-2): 13, text fig. 1 (Type locality : Someswari river at Baghmara, Garo Hills, Meghalaya) (description based on juvenile specimens).

1976. *Lepidocephalichthys goalparensis* Pillai and Yazdani *J. Zool. Soc. India* 26 (1-2); 15, text. fig. 2 (Type-locality: Dudhnoi, Goalpara, Assam)

1976. *Lepidocephalichthys annandalei*, Yazdani (nec Chaudhuri) *Newsl. Zool. Surv. India*, 2(2):55 (Kaziranga Wild Life Sanctuary, Assam).

1976. *Lepidocephalichthys annandalei*, Yazdani (nec Chaudhuri), *J. Bombay nat. Hist. Soc.* 73 (3) : 535-536.

1978. *Lepidocephalus caudofurcatus* Tilak and Hussain, *Matsya*, 3:60-63, figs. 1-3 (Type -locality: Kalapani nala, Rishikesh, Dist. Dehra Dun; Sailani river Beharigarh, Dist. Saharanpur and Gangan river near Moradabad, Dist. Moradabad, U.P.).

1981. *Lepidocephalus (Lepidocephalichthys) goalparensis*, Tilak and Hussain, *Rec. zool. Surv. India*, Occ. Paper No.32 : 21, figs. 15, 21E (Assam, India).

1981. *Lepidocephalus (Lepidocephalichthys) caudofurcatus*, Tilak and Hussain, *Rec. zool. Surv. India*, Occ. Paper No. 32 : 24, Figs. 10 B, C, 14C, D, 16-18, 20 D, 21 D (Northern India).

Diagnosis : A moderately elongate, laterally compressed lepidocephalid loach with dorsal fin inserted distinctly before middle of body; its origin nearer to tip of snout than to caudal base. Dorsal ridge with 7-10 saddle-shaped dark bands, 7-14 large rectangular blotches on the sides; dorsal and caudal with 4-5 black bands.

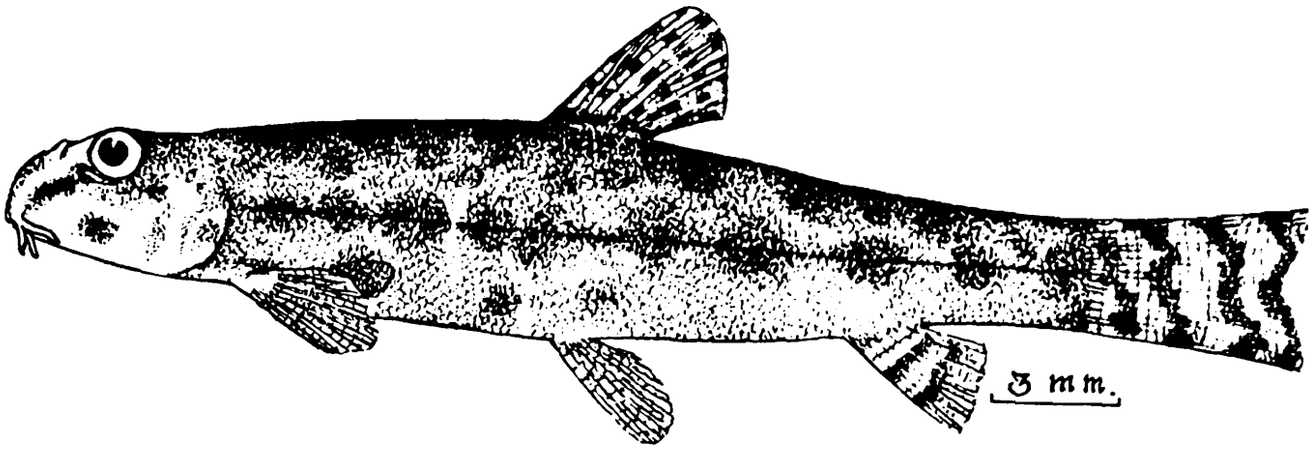
Description : Based on 5 specimens 31.00-52.00 mm SL from Assam including the holotype (Dudhoni, Goalpara),

D.2/6; P.1/7; V. 1/6; A. 3/5; C.16.

Body elongated and laterally compressed. The dorsal profile slightly arched; it rises from the tip of snout to dorsal origin, behind which it slopes down to caudal base; ventral profile less arched or almost straight. Body depth 4.95-5.67 (5.30) in SL. Caudal peduncle short; its least height 1.46-1.74 (1.62) in its length. Anus immediately in front of anal fin. Head moderately deep; its length 4.00-4.52 (4.27) in SL., snout blunt 2.40-3.08 (2.76) in length of head; eyes large, covered by skin, situated superiorly before middle of head, 3.14-4.35 (3.75). Nostrils situated before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Interorbital flat; its width 5.75-8.00 (7.23) in head. A bifid suborbital spine below each eye, their bases inserted slightly before eye, laterocaudal process small, the longer curved mediocaudal process extending to middle of eye. Mouth small, inferior, with thick lips, barbels six, two rostral placed at distance, near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, rostral short, maxillary and maxillo-mandibular subequal, shorter than orbit. Mental lobes well developed, divided into anterior and posterior parts, anterior lobulous, as long as the posterior flap-like part; posterior flap-like part not divided into barbel-like extensions (Text fig. 2 F). Gill opening extend to above base of pectoral.

Scales : Small, minute, with eccentric focal area, imbricate, present all over body, on head scales present below and behind eye and upper part of operculum, contiguous with scales of lateral and ventral sides, scales extend anteriorly beyond isthmus, absent on vertex. 25-30 rows of scales between back and anal fin. Lateral line absent.

Fins : Dorsal short, its origin nearer to tip of snout than caudal base. Ventrals slightly behind insertion of dorsal, not extending to anal opening. Anal short behind dorsal. Pectoral falcate, shorter than head, extending half way to ventral, ventral shorter than pectoral, not reaching anal opening. Anal not reaching base of caudal. Caudal emarginate, with last few rays on both sides elongated. Distance from tip of



Text Fig.5. Lateral view of *Lepidocephalus menoni* Pillai and Yazdani from Saharanpur, U.P., 25.5 mm SL.

snout to dorsal origin 2.06-2.37 (2.15) in SL., from tip of snout to ventral origin 1.92-2.02 (1.95); from pectoral to ventral origin 3.19-3.69 (3.44); from ventral to anal 3.59-3.81 (3.68); length of longest pectoral ray 4.95-6.00 (5.45); ventral 6.12-6.98 (6.51); of dorsal 4.95-6.13 (5.40); of anal 6.50-8.55 (7.16); length of dorsal base 6.8--8.73 (7.27); length of anal base 9.6-12.38 (10.90); length of caudal fin 4.30-5.67 (4.89).

Measurements in percent of HL : Length of snout 32.43-41.67 (36.55); diameter of eye 22.97-31.82 (27.01); width of interorbital 12.50-17.39 (14.04).

Measurements in percent of SL : Length of head 22.12-25.00 (23.45); depth of body 17.65-20.20 (18.94); least depth of caudal peduncle 8.73-11.11(9.94); length of caudal peduncle 15.16-16.67 (12.67); distance from snout to dorsal origin 42.16-48.49 (46.65); from snout to origin of ventral 49.42-52.08 (51.18); from pectoral to ventral origin 27.08-31.31 (29.16); from origin of ventral to anal 26.26-27.88 (27.17); length of pectoral 16.67-20.20 (18.44), of ventral 14.33-16.35 (15.42); base of dorsal 11.46-14.71 (13.88); base of anal 8.08-10.42 (9.26); length of caudal fin 17.65-23.23 (20.64).

Colouration : Ground colour of body pale. Back marked with 7-8 saddle shaped dark bands and extending downwards from these bands are 7-12 large vertical rectangular patches separated from each other by a distance of their own width. Area between the lateral patches and the back speckled with dark dots. Dorsal and caudal fins with 4-5 dark "W" shaped bands. A black spot at base of upper part of caudal fin. Pectoral, ventral and anal without markings.

Sexual dimorphism : In males pectoral and ventral fins longer and inner ray of the pectoral ossified.

Affinities : This species is closely related to *Lepidocephalus guntea* from which

it can be easily separated by the position of its dorsal fin, (origin of dorsal fin distinctly nearer to tip of snout than to caudal base, nearer to caudal base than to tip of snout in *L. guntea*). Colouration of *L. menoni* is also distinctive of the species (*c.f. guntea*).

Range : India :Along base of Eastern Himalayas, westwards in the Gangetic system as far as Dehra-dun and Saharanpur, U.P., and Garo and Jainthi Hills, Meghalaya.

Material examined : *Type: Lepidocephalus goalparensis* Pillai and Yazdani. Holotype: 31.0 mm SL; ERS/ZSI 519, Dudhnoi, Goalpara, Assam. *Lepidocephalus menoni* Pillai & Yazdani, Paratypes: 2, ERS/ZSI 552, Someswari river at Bagmara, Garo Hills, Coll. G.M. Yazdani 18.2.1971.

Other material : India: Assam: 36, ERS/ZSI 8809, Kalahat, Dist. Dhubi. 6, ZSI uncatalogued, Lake Chandubi, Coll. S.C.Day. 12, ERS/ZSI 3641, Kaziranga. 3, ERS/ZSI 3760, Baguri, Kaziranga. 2, ERS/ZSI 20973, Ratanpur, Dist. Kamrup. 1, ZSI uncatalogued, Rainona, Goalpara, Coll. I.M. Hambug. Meghalaya:4, ERS/ZSI uncatalogued, Dawki. 2, ERS/ZSI uncatalogued, 6 km South of Duahnai, Garo Hills, Coll. R.S. Pillai and G.M. Yazdani, 10.4.1971. 3, ERS/ZSI 3503 , Dawki, Muklapur Road,Jainthi Hills. Uttar Pradesh: 4, NRS/ZSI uncatalogued, Sailani river Amanatgarh, Dist. Saharanpur, Coll. Raj Tilak, 24.1.1986. 5,NRS/ZSI uncatalogued, Saharanpur, Coll. Raj Tilak, 11.10.1984.

12. **Lepidocephalus annandalei** (Chaudhuri)
(Fig. 3, Pl. VI)

1912. *Lepidocephalichthys annandalei* Chaudhuri, *Rec. Indian Mus.*,7:442, pl. 40, fig. 3, 3a, 3b,. (Type locality: Mahananda river at Siliguri and Tista river, near Jalpaiguri, W. Bengal).

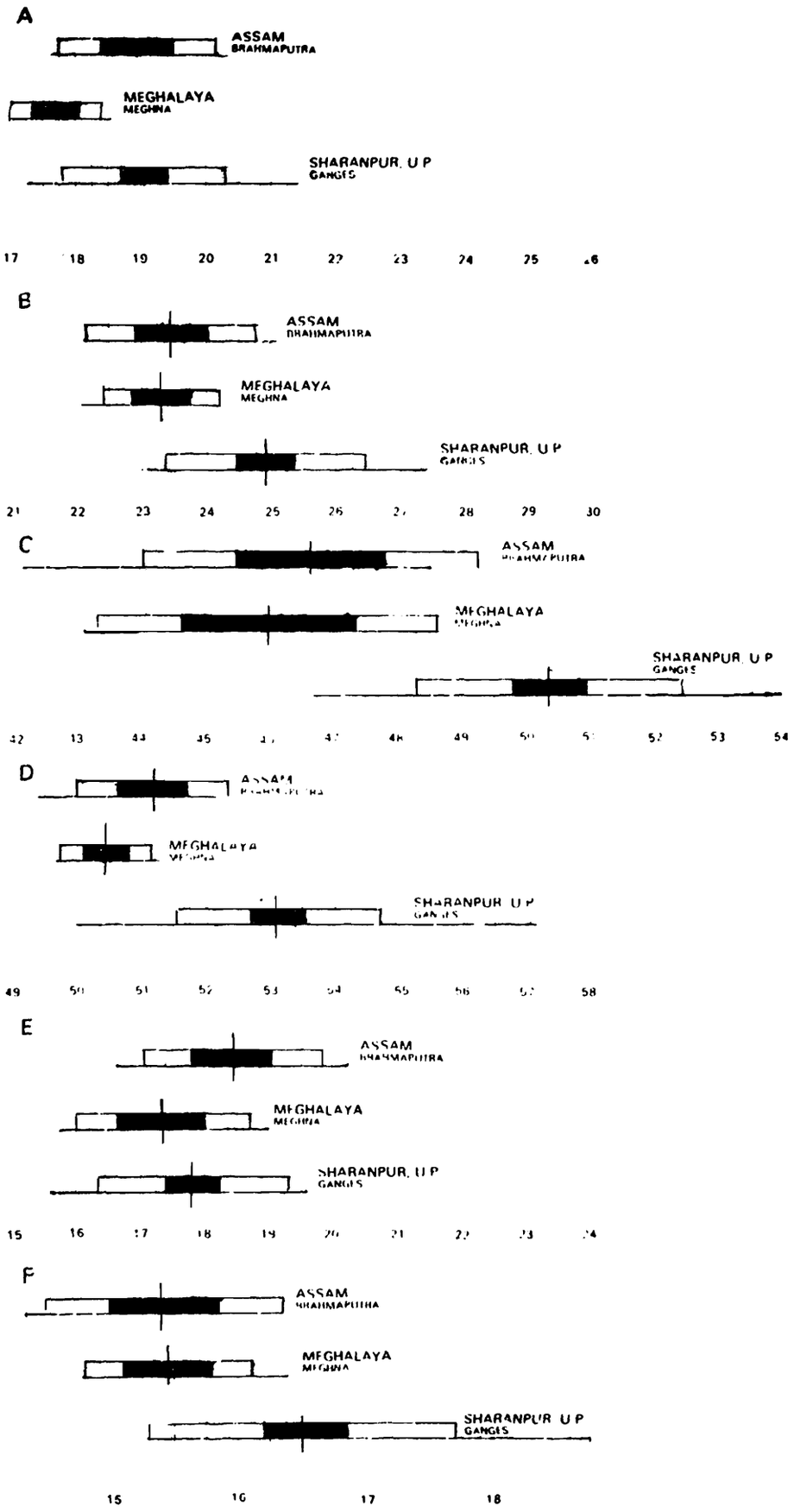
1937. *Lepidocephalichthys annandalei*, Shaw and Shebbeare, *J. Asiat. Soc. Beng.*, 3:67 (Panchenai River, near Matighara, N. Bengal).

1974. *Lepidocephalus guntea*, Menon (in part), *Inld. Fisheries Soc. India.* special publication, p. 58.

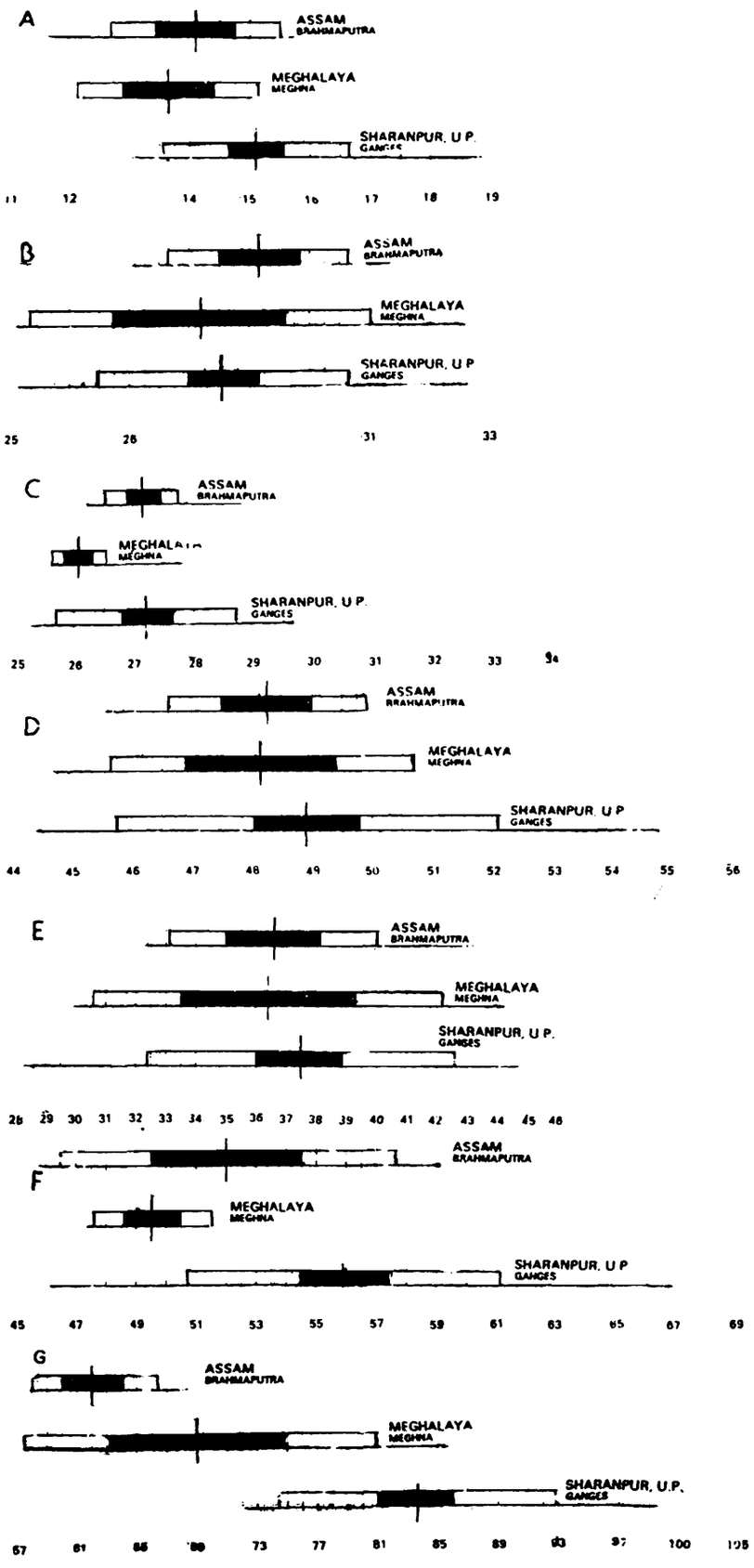
1977. *Lepidocephalus annandalei*, Tilak and Hussain, *Newsl. Zool. Surv. India.* 3 (6):408 (Sailani river, Dist. Saharanpur; Kalapani stream, Rishikesh, Dist. Dehra Dun; streams in Dist. Lakhimpur, U.P.).

1981. *Lepidocephalus (Lepidocephalichthys) annandalei*, Tilak and Hussain, *Rec. zool. Surv. India*, Occ. Paper No. 32:16, Figs. 10-14 (Northern India).

Diagnosis : A somewhat elongated lepidocephalid with dorsal fin inserted distinctly behind middle of body; its origin equidistant between anterior margin of orbit and caudal base; about 10 short transverse bars on dorsal ridge, a series of



Graph 4. Species of *Lepidocephalus menoni* A. Body depth in SL in percents. B. HL in SL in percents. C. Pre-dorsal distance in SL in percents. D. Pre-ventral distance in SL in percents. E. Pectoral fin length in SL in percents. F. Ventral fin length in SL in percent.



Graph 5. Species of *lepidocephalus menoni* A. Anal fin length in SL. in percents. B. Distance between pectoral and ventral fins in SL. in percent. C. Distance between ventral and fins in SL. in percents.D. Distance between ventral and anal fins in distance between pectoral and anal fins in percents. E. Snout in HL in percents. F. Post-orbital length in HL in percents. G. Height of caudal peduncle in percents.

10-11 short patches along the side, the caudal with two "V" shaped bands and two black spots.

Description : Based on 19 specimens, 28.0-41.0 mm SL from Mahananda river bolow Siliguri.

P. 1/6-7; V. 1/6; A. 2/5; C. 16-18

Body somewhat elongated with compressed caudal peduncle. The dorsal profile is slightly arched, ventral profile almost straight. Body depth 5.0-6.0 (5.49) in SL. Caudal peduncle short; its least height 1.14-1.57 (1.34)in its length. Anus immediately in front of anal fin. Head moderately deep; its length 3.67-4.38 (4.01) in SL., snout rounded 2.43-3.50 (2.87) in HL., eye rather small covered by skin, situated before middle of head, 3.00-5.00 (4.07). Nostrils situated immediately before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital flat, its width 7.0-20.0 (10.64) in head. A bifid sub orbital spine below each eye; their bases inserted slightly before eye, laterocaudal process small, the longer mediocaudal process extending upto middle of eye. Mouth small, inferior, moderately large, with thick lips; barbels six, two rostrals, close to each other near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth; all minute, shorter than orbit. Mental lobes well developed, divided into anterior lobulous part and posterior flap-like portion; lobulous part, divided into a smaller lobule in its anterior part; flap-like portion without barbel-like extensions (Text fig. 3 D). Gill opening extending to above base of pectoral.

Scales : Small, circular with eccentric, wide focal area, imbricate, present all over body. On the head scales are present only behind eye and upper part of operculum; absent on vertex. On the ventral side scales extend anteriorly beyond isthmus. 25-28 rows of scales between back and anal fin.

Fins: Dorsal short; its origin nearer to caudal base than to tip of snout, equidistant between anterior margin of orbit and base of caudal. Ventrals on the same line of insertion as dorsal, or slightly behind that of dorsal not extending to anal opening. Anal short, behind dorsal. Pectoral rounded. Caudal notched. Distance from tip of snout to dorsal origin 1.75-1.88 (1.81) in SL; from tip of snout to ventral origin 1.81-2.00 (1.90); from pectoral to ventral origin 2.95-3.73 (3.30); from ventral to anal 3.63-4.22 (3.94); length of longest pectoral ray 5.00-6.50 (5.77); of ventral 6.0-8.86 (7.08); of dorsal 5.31-6.89 (5.97); of anal 6.0-9.33 (7.16); length of dorsal base 7.22-9.50 (8.66); length of anal base 7.50-11.71 (9.78); length of caudal fin 3.33-4.63 (3.99).

Measurements in percent of HL : Length of snout 28.57-41.18 (35.23); diameter of eye 20.0-29.41 (25.02); width of interorbital 5.0-14.28 (10.43).

Measurements in percent of SL : Length of head 22.85-27.27 (25.03); depth of body 16.66-20.00 (18.27); least depth of caudal peduncle 10.76-16.66 (14.02);length of

caudal peduncle 9.23-11.66 (10.49); distance from snout to dorsal origin 53.22-57.14 (55.32); from snout to origin of ventral 50.0-55.38 (52.77); from pectoral to ventral origin 26.78-33.92 (30.47); from origin of ventral to anal 23.68-27.53 (25.42); length of pectoral 15.38-20.0 (17.38); of ventral 11.29-16.67 (14.24); base of dorsal 10.53-13.85 (11.62); base of anal 8.54-13.33 (10.37); length of caudal fin 21.62-30.00 (25.36).

Colouration : Ground colour of body pale. Along the dorsal ridge a series of about 10 very short transverse bars, each about a third of the breadth of the interspace; below the dorsal ridge, body is variegated with brown patches of specks, above the lateral line and along it, a series of about 10-11 short black patches with equal interspaces; dorsal side of head, snout, orbital and opercular regions stippled with brown dots. Colour of caudal fin very distinctive with two brown "V" shaped bands and two intensively black spots surrounded by a yellow patch, one at caudal base slightly above middle line and another about two times in size of the first, near end of caudal before notch. Paired and anal fins immaculate.

Sexual dimorphism : In males inner ray of pectoral ossified.

Affinities : The species is closely related to *L. guntea* but easily separated by the position of the dorsal fin located very much nearer to caudal base than to tip of snout, and the distinctive clouration of its caudal fin marked by two "V" shaped bands and two intensely coloured black spots.

Range : India:Mahananda and Tista drainages, along the base of Darjeeling Himalayas in North Bengal and streams in Saharanpur and Dehra-Dun in the Gangetic plains of U.P.

Material examined: Type: Lepidocephalichthys annandalei Chaudhuri. Syntypes: 3.F 5593/1 to 5595/1, River Mahananda, Siliguri, Coll. Annandale, 17.12.1911; in the Zoolgical Survey of India, Calcutta.

Other material : India: West Bengal:1, ZSI F 7295, Tista river, Jalpaguri, base of eastern Himalayas, 3.6.1911. 14, ZSI uncatalogued, Mahananda river, below Govt. Saw Mill, siliguri, Coll. A.G.K. Menon. 14 ZSI uncatalogued, Mahananda river, Siliguri.

13. **Lepidocephalus berdmorei** (Blyth)
(Fig. 2, Pl. VI ; Fig. 6, Pl. VIII)

1860. *Acantopsis berdmorei* Blyth, *J. Asiat. Soc. Bengal., Sci.*, 29:168 (Type locality:Moulmein, Tenasserim Province, Burma).

1869. *Cobitis berdmorei*, Day, *Proc. Zool. Soc. Lond.*, P. 550 (Pegu).

1890. *Lepidocephalichthys berdmorei*, Vinciguerra, *Ann. Mus. Genova, (2)* 9:341 (Mandalay; Meetan Tenasserim)

1893. *Lepidocephalichthys berdmorei*, Boulenger, *Ann. Mag. Nat. Hist.*, (6) 12:198 (Taunggyi, S. Shan State).

1918. *Lepidocephalichthys berdmorei*, Annandale, *Rec. Indian Mus.*, 14 :43 (Inle Lake, S. Shan State.

1921. *Lepidocephalus berdmorei*, Hora, *Rec. Ind. Mus.*, 22:196 (Manipur).

1929. *Lepidocephalichthys berdmorei*, Prasad and Mukherji, *Rec. Indian Mus.*, 31:191 (Myitkyina and Indawgyi Lake).

1931. *Lepidocephalichthys berdmorei*, Hora, *Rec. Indian Mus.*, 33: 2 (Rangoon).

1934. *Lepidocephalichthys berdmorei*, Hora and Mukherji, *Rec. Indian Mus.*, 36:123 and 353 (Repiu and Gaunphpo, S. Shan State; Nawng Kyawk tank and Nam Me Hsai Stream, Kengtung State).

1936. *Lepidocephalus berdmorei*, Suvatti, *Index Fish* Siam, p. 60 (Mekong).

1937. *Lepidocephalus berdomeri*, Koumans, *Zool Meded*; 30:63 (Takuapa, West Peninsular Thailand).

1945. *Lepidocephalus octocirrhus*, Smith (nec van Hasselt), *Bull. US. Nat. Mus.*, 188:294 Java, Sumatra and Burma (Java, Sumatra excluded).

1945. *Lepidocephalus berdmorei*, Smith, *Bull. U.S. Nat. Mus*; 188 :295 (Peninsular and Northern Thailand).

1948. *Lepidocephalus guntea birmanicus* Rendhal, *Ark. f. Zool.* 40A, N:07:64, figs. 30, 34 (Burma:Myitkyna, Shweli Kynung, Maymyo, Taunggyi, Inle-lake, Yado, Karennigebirage, Mekane, Kawkareik, Meetan).

1950. *Lepidocephalus berdmorei*, Suvathi, *Faun. Thailand*, p. 215.

1981. *Lepidocephalus (Lepidocephalichthys) berdmorei*, Tilak, *Rec. Zool. Surv. Ind.*, Occ. Pap. No.32:14, figs. 7 (Figure of Holotype), 8 and 9 (Figure of Day's pl. 153, fig. 3).

Diagnosis: A lepidocephalid with origin of dorsal much nearer base of caudal fin than tip of snout, equidistant between caudal base and end of operculum. Ventrals inserted in front of dorsal origin; about 40 rows of scales between base of anal and back; a row of 10-18 spots on sides; irregular smaller spots between back and lateral spots; a large black spot on caudal base; caudal with 4-7 "V" shaped bands; dorsal with 4 rows of black spots.

Based on 17 specimens 37.0-80.0 mm SL from Manipur.

Body comparatively more elongated with compressed caudal peduncle. The dorsal profile is slightly arched, ventral profile, almost straight. Body depth 5.00-6.09 (5.50) in SL. Caudal peduncle short; its least height 0.93-1.22 (1.01) in its length. Anus immediately in front of anal fin. Head moderately deep, its length 4.00-5.39(4.75) in SL, snout rounded, 2.10-3.00 (2.61) in HL., eye rather small covered by skin, situated before middle of head, 3.50-5.33 (4.12). Nostrils situated immediately before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital,short, convex; its width 3.67-8.18 (4.84) in head. A bifid sub-orbital spine below each eye, their bases inserted slightly before eye, laterocaudal process small, its tip extend upto middle of eye, the longer mediocaudal process terminating almost at posterior border of eye. Mouth small, inferior,moderately large, with thick lips; barbels six, two rostrals close together near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, all well developed, longer than orbit. Mental lobes well developed,divided into anterior lobulous and posterior flap-like parts, lobulous part shorter, subdivided into two lobules,longer flap-like portion divided into three barbel-like extensions. Gill opening extending to above base of pectoral.

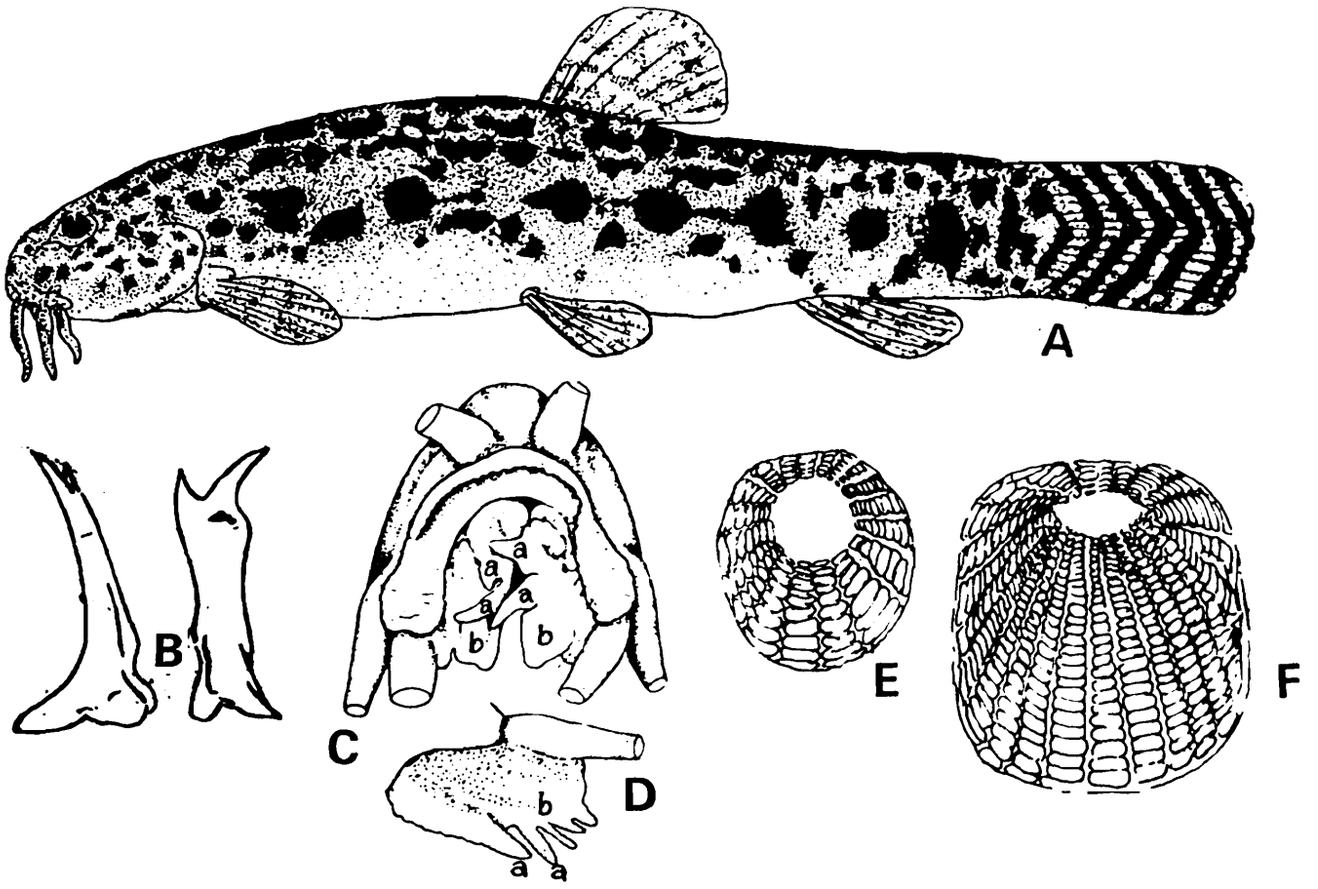
Scales : Small, longer than broad with eccentric focal area, imbricate, present all over body. On the head scales are in patches, below and behind eye and upper part of operculum; no scales on vertex. On the ventral side scales extend anteriorly beyond isthmus. 40 rows of scales between back and anal fin.

Fins : Dorsal somewhat high; its origin nearer caudal base than tip of snout, placed behind ventrals; ventrals inserted in front of origin of dorsal, not extending to anal opening. Anal short behind dorsal. Pectoral rounded. Caudal truncate. Distance from tip of snout to dorsal origin 1.67-1.84 (1.74) in SL; from tip of snout to ventral origin 1.76-1.96 (1.87); from pectoral to ventral origin 2.78-3.22 (3.03); from ventral to anal 3.38-4.08 (3.75); length of longest pectoral ray 5.55-7.84 (6.56); of ventral 6.17-8.37 (7.32); of dorsal 5.40-7.57 (6.38); of anal 6.17-8.31 (7.21); length of dorsal base 7.40-11.75 (9.98); length of anal base 10.33-14.90 (12.39); length of caudal fin 3.08-5.52 (4.33).

Measurements in percent of HL : Length of snout 33.33-47.62(38.52); diameter of eye 18.75-28.57 (25.2); width of interorbital 12.22-27.27 (21.37).

Measurements in percent of SL : Length of head 18.55-25.0 (21.19); depth of body 16.42-20.0 (18.23); least depth of caudal peduncle 11.29-14.18 (12.75); length of caudal peduncle 11.36-15.69 (13.47); distance from snout to dorsal origin 54.38-59.82 (57.54); from snout to origin of ventral 51.01-56.76 (53.49); from pectoral to ventral origin 31.07-36.04 (33.06); from origin of ventral to anal 24.51-29.63 (26.74); length of pectoral 12.75-18.02 (15.39); of ventral 11.95-16.22 (13.75); base of dorsal 8.9-13.51 (10.13); base of anal 6.71-9.68 (8.16); length of caudal fin 18.12-32.43 (23.55).

Colouration : Back light brown; a row of 10-18 round brown spots on sides; between back and the lateral spots a row of smaller spots; a black spot on base of caudal much bigger than that of *L. guntea*; caudal with 4-7 "V" shaped bands; dorsal



Text Fig. 6A. Lateral view of *Lepidocephalus berdmorei*(Blyth) B. Suborbital spine (After Rendahl, 1984) C.& D. Ventral view of mouth showing the mental lobes. E. Subdorsal scale. F. Scale from side of head.

with 4 rows of black dots; anal, pectoral and ventrals with a few spots; round spots on head. No stripe from eye to tip of snout.

Sexual dimorphism : Same as in *L. guntea.*

Size : Largest specimen examined 80.0 mm SL

Affinities : This species is most closely related to *L. guntea* (See paragraph on affinities under L. guntea).

Range : Manipur, Burma and Thailand.

Material examined : Type: Acanthopsis berdmorei Blyth. Holotype: ZSI/F 2647/1 Pegu, Burma, Coll. Major Berdmore; in the Zoological Survey of India, Calcutta.

Other meterial: India: Manipur: 1,SRS/ZSI uncatalogued, Kanglatombich, 29.10.1945. 21, SRS/ZSI uncatalogued, Coll. A.G.K. Menon, March, 1986. 1,ZSI F 9387, Manipur Valley. 1,ZSI F 9388/1, Manipur Valley. 4,ZSI F 9389/1, Manipur Valley. 2, ZSI F 9408, Manipur Valley. Meghalaya: 1.ERS/ZSI 20620,12km. from Nongstoin on Syrkon road, West Khasi Hills. Thiland: 12, USNMNH/109750, Siam S.E. Chantabun river, Thailand, Coll. Boy Scout, 29 Jan. 1940. 4, USNMNH/109732. 2, USNMNH/ 107906. Malaysia: 2, USNMNH/ 101200, River plus, E. Perak, Malaysia, 12.11.1935.

14. **Lepidocephalus micropogon** (Blyth)

1860. *Acantopsis micropogon* Blyth, *J. Asiat. Soc. Beng.* Sci., 29:168 (Type locality: Tenasserim Province, Burma).

1877. *Lepidocephalichthys berdmorei*, Day (nec Blyth), *Fish. India*, p. 610, pl. 153, fig. 3 (Moulmein in Burma where it is common).

1889. *Lepidocephalichthys berdmorei*, Day (nec Blyth), *Fauna. Brit. Ind. Fish.*, 1:221.

1948. *Lepidocephalus berdmorei* Rendahl (nec Blyth), *Ark. f. zool*; 40A. No. 7:76, fig. 34B, 35- 39 (Middle and South Burma: Mandalay, Pegu, Rangoon and Tenasserim).

Diagnosis : A small lepidocephalid loach with dorsal profile considerably elevated; origin of dorsal somewhat nearer to tip of snout than to caudal base; ventral on same line of insertion as dorsal; lobulous part of mental lobes less differentiated from posterior flap-like part; posterior flap-like part without any barbel-like projections. Body pale mottled with brown and a series of spots along lateral line; caudal furcate with 4 oblique dark cross bands.

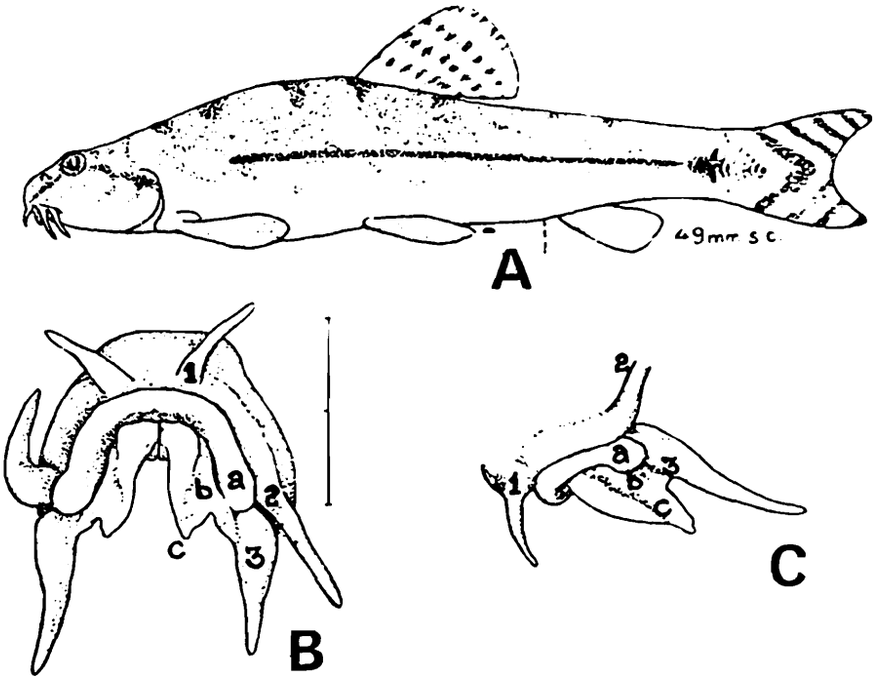
Description : Based on 6 specimens 46.00-57.5mm SL from Pegu, Burma (after Rendahl, 1948)

D.3/6; A.3/5; P.1/7; V.1/6; C.16

Body elongate with compressed caudal peduncle. The dorsal profile is considerably elevated, ventral profile less arched. Body depth 4.46-4.81 (4.63) in SL. Caudal peduncle short; its least height 8.47-9.62 (8.95) in its length. Anus immediately in front of anal fin. Head moderately deep; its length 4.31-4.61 (4.48) in SL, snout rounded, 2.6-3.0 (2.81) in HL, eye rather small, covered by skin, situated before middle of head 4.2-5.0 (4.61). Nostrils situated immediately before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Inter-orbital convex, its width 4.8-6.3 (5.30) in head. A bifid sub orbital spine below each eye, their bases inserted slightly before eye, the latero - caudal process small, the longer medio caudal process terminates before posterior border of eye. Mouth small, inferior, moderately large, with thick lips; barbels six, two rostrals close together near apex of snout,

maxillary and maxillo-mandibular pairs near angle of mouth, all short but distinct, longer than orbit. Mental lobes less differentiated into anterior lobulous and posterior flap-like parts, flap-like part without barbel-like extensions. Gill opening extend to above base of pectoral.

Scales : Small oval with eccentric focal area, imbricate, present all over body and nape. On the head scales are in patches, below and behind eye and upper part of operculum. 25-30 rows of scales between back and anal fin.



Text Fig.7. A. Lateral view of *Lepidocephalus micropogon*(Blyth). B. Ventral view of head showing mental lobes(After Rendahl. 1948)

Fins : Dorsal long, somewhat nearer to tip of snout than to caudal base. Ventrals on the same line of insertion as dorsal not extending to anal opening. Anal short, behind dorsal. Pectoral rounded. Caudal furcate. Distance from tip of snout to dorsal origin 1.81-2.01 (1.93) in SL; from tip of snout to ventral origin 1.91-2.04 (1.96); from pectoral to ventral origin 3.33-3.75 (3.56); from ventral to anal 3.33-3.60 (3.46); length of longest pectoral ray 5.62-6.37 (6.02); of ventral 5.81-6.54 (6.25); length of dorsal base 7.35-8.55 (7.78); length of anal base 8.36-12.75 (10.25).

Measurements in percent of SL : Length of head 21.7-23.2 (22.35); depth of body 20.8-22.4 (21.61); least depth of caudal peduncle 10.4-11.8 (11.19); length of caudal peduncle 12.2-14.9 (13.62); distance from snout to dorsal origin 49.8-55.1 (51.90); from pectoral to ventral origin 26.7-30.0 (28.15); from origin of ventral to anal 27.8-30.0 (28.06); length of pectoral 15.7-17.8 (16.64); of ventral 15.3-17.2 (16.02); base of dorsal 11.7-13.6 (12.88).

Colouration : Body pale, mottled with light ashy-brown; a series of ten transverse oval light spots along the lateral line; a black one at base of tail. Caudal

fin marked with four oblique dark cross-bands; dorsal with four transverse black dots; other fins immaculate.

Sexual dimorphism : None

Size : Largest specimen recorded by Rendahl 59.0 mm SL.

Affinities : This species is quite close to *L. berdmorei* but readily separated by the poorly developed mental lobes, the forked caudal and the distinctive colouration. The origin of dorsal fin in *L. berdmorei* is situated backwards, directly posterior to ventrals (cf. *L. micropogon*).

Range : Burma:Myitkyina, Mandalay, S.Shan States, Pegu, Rangoon and Tenasserim.

Remarks : Rendahl (1948) apparently overlooked the original description of *Acantopsis micropogon* by Blyth and mistook *micropogon* for *berdmorei* and erected a new subspecies *L. guntea birmanicus* for Blyth's *Acantopsis berdmorei*. Rendahl's *L. guntea birmanicus* is synonymous with *L. berdmorei* (Blyth).

2. The *irrorata* Complex

15. **Lepidocephalus irrorata** (Hora)

(Fig. 1, Pl. VII)

1921. *Lepidocephalichthys irrorata* Hora, *Rec. Indian Mus.*, 22:196, pl. 9, figs. 5, 5a, 6b. (Type locality: Loktak Lake, Manipur)

1968. *Lepidocephalus irrorata*, Banarescu & Nalbant, *Mitt. Hamburg, Zool. Mus. Inst.*, 65:348 (Kaziranga, Mikir Hills, Assam)

1981. *Lepidocephalus irrorata*, Tilak and Hussain, *Rec. zool. Surv. India*, Occ. Paper, No.32:27, figs. 19, 21F. (Assam, Manipur).

Diagnosis : A small lepidocephalid fish with dorsal origin considerably behind ventrals, nearer to caudal base than to tip of snout; ventral origin equidistant between snout and caudal base. Mental lobes well developed; anterior lobulous part barbel-like posteriorly; flap-like part without barbel-like extensions (fig. 3 B). Body speckled with black dots; a series of fine dark spots along side; sides of head and back of body with numerous transverse streaks.

Description : Based on 20 specimens 26.0-37.0 mm SL from Manipur. Small fish with slightly compressed body. Dorsal profile is slightly arched, ventral profile almost straight. Body depth 5.08-6.05 (5.50) in SL. Caudal peduncle short; its least height 1.36-1.89 (1.64) in its length. Anus immediately in front of anal fin, placed in slightly

raised papilla. Head depressed; its length 4.36-5.42 (4.94) in SL. Snout rounded 2.19-3.27 (2.73)in HL; eye minute, covered by skin, situated before middle of head 4.07-5.86 (4.97). Nostrils situated immediately before eye, contiguous anterior with a raised flap. Inter-orbital convex; its width 1.81-3.15 (2.28) in head. A bifid sub-orbital spine below each eye, their bases inserted slightly before eye, laterocaudal process small, longer mediocaudal process extend to middle of eye. Mouth small, inferior , semicircular with thick lips; barbels six, two rostrals somewhat near to each other, near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, well developed, longer than orbit. Mental lobes well developed, divided into anterior and posterior portions, anterior longer, barbel-like posteriorly; posterior flap-like part without barbel-like extensions (Fig. 3. B). Gill opening small, not extending to above base of pectoral.

Scales : Minute with large, eccentric focal area, imbricate, present all over body; scales present on vertex and sides of head and ventrally extend anterior to isthmus. 21 rows of scales between back and anal fin.

Fins : Dorsal short, less than depth of body below it; its origin is considerably behind the origin of ventrals and is much nearer caudal base than tip of snout. Ventral origin equidistant between tip of snout and caudal base. Anal short, behind dorsal. Pectoral lanceolate. Caudal lunate. Distance from tip of snout to dorsal origin 1.69-1.87 (1.80) in SL; from tip of snout to ventral origin 1.34-2.15 (1.95); from pectoral to ventral origin 3.00-3.70 (3.33); from ventral to anal 3.75-4.63 (4.14); length of longest pectoral ray 5.46-7.46 (6.50); of ventral 6.15-8.32 (7.04); of dorsal 4.65-6.43 (5.38); of anal 5.78-8.29 (6.76); length of dorsal base 8.53-12.9 (10.62); length of anal base 10.07-13.64 (11.95); length of caudal fin 4.67-6.13 (5.40).

Measurements in percent of HL : Length of snout 30.58-45.54 (36.83); diameter of eye 17.6-24.55 (20.32); width of interorbital 15.97-25.96 (21.04).

Measurements in percent of SL : Length of head 18.43-22.58 (20.26); depth of body 16.53-19.68 (18.20); least depth of caudal peduncle 10.37-12.82 (11.33); length of caudal peduncle 16.31-21.41 (18.65); distance from snout to dorsal origin 53.47-58.96 (55.35); from snout to origin of ventral 46.43-52.92 (50.50); from pectoral to ventral origin 27.03-33.33 (30.11); from origin of ventral to anal 21.59-27.37 (24.31); length of pectoral 13.4-18.24 (15.49); of ventral 12.01-16.25 (14.31); base of dorsal 7.75-11.73 (9.47); base of anal 7.33-9.93 (8.43); length of caudal fin 16.31-21.41 (18.65).

Sexual dimorphism : Males with inner rays of pectoral ossified.

Colour : Pale olivaceous, densely speckled with black dots, a series of fine dark spots along side; on back of body and head dark specks aggregate into a large number of black bars; a dark streak from eye to snout. Dorsal, anal and caudal fins with numerous narrow dark transverse bars; pectoral and ventral whitish.

Size : Largest specimen examined 37.0 mm SL

Affinities : This species is outstanding mainly due to its small size, maximum size being about 50 mm, the far backwardly placed dorsal, the scaled vertex, and a characteristic colouration. In these characters *L. irrorata* is closer to the Indonesian *L. macrochir* and *L. octocirrhus* than to any Indian species.

Range : India: Manipur and Assam.

Remarks : Nalbant (1963) recognised two subgenera under the genus *Lepidocephalus* bleeker: *Lepidocephalus* and *Lepidocephalichthys*, the main differences being the presence of scales on vertex and the dorsal and ventral fins placed in the posterior half of body in *Lepidocephalus* and the absence of scales on vertex and the dorsal and ventrals being situated in a more advanced position in *Lepidocephalichthys*. The vertex is naked in all the Indian and Indo-chinese species except in *L. irrorata* and the Indonesian species *L. macrochir* and *L. octocirrhus* (= *hasselti*).

Material examined : Type: Lepidocephalichthys irrorata Hora. ZSI F 9904/1, Manipur Valley; type not traceable in the Zoological Survey of India, Calcutta, Collections.

Other material : India: Manipur: 137, SRS/ZSI uncatalogued, Coll. A.G.K. Menon, March 1986.

Genus 4. **Enobarbichthys** Whitley, 1931

1870. *Jerdonia* Day, *Proc. Zool. Soc. London.* P.700 (Type: *Platacanthus maculatus* Day Preoccupied in Mollusca and Aves).

1931. *Enobarbichthys* Whitley, *Rec. Aust. Mus., Sydney.* **18**:107.

1963. *Madrassia* Nalbant, *Trav. Mus. Hist. Inst.*, **4**:360.

1968. *Enobarbichthys*, Banarescu & Nalbant, *Mitt. Hamburg Zool. Mus. Inst.*, **65**:343. (Review).

Diagnosis : Body elongate and moderately compressed; abdomen rounded. Head short, conical; snout acute; mouth small, sub-inferior, transverse; eyes small superior; lips thick, fleshy, continuous at angle of mouth; barbels three pairs. Scales small, distinct. An erectile bifid suborbital spine. Dorsal fin inserted ahead of ventral, over posterior half of pectoral fin, thirty-one rays (28 branched); anal with eight rays (5 branched); caudal emarginate. Lateral line complete.

Distribution : India:Madras.

16. **Enobarbichthys maculatus** (Day) (Pl. X).

1867. *Platacanthus maculatus* Day, *Proc. Zool. Soc. London*, P. 914 (Type locality: Madras, India)

1870. *Jerdonia maculata* Day, *Proc. Zool. Soc. London.* P. 700 (New genus proposed to accommodate *P. maculatus* Day).

1872. *Jerdonia maculata* Day, *J. Asist. Soc. Beng.*, **42** (2):179 (Description).

1877. *Jerdonia maculata*, Beaven, *Handbook Freshw. Fish India*, P.113 (Diagnosis after Day).

1878. *Jerdonia maculata*, Day, *Fish. Ind;* P. 611, pl. 154, fig. 6.

1889. *Jerdonia maculata*, Day, *Faun. Brit. Ind. Fish.* 1:223, fig. 82.

1931. *Enobarbichthys maculatus*, Whitely, *Rec. Aust. Mus.* **18**:107 (Nomenclatorial change)

1960. *Enobarbichthys maculatus*, Silas, *Mar. biol. Ass. India,* **2** (1):89 (Redescription).

Diagnosis : A small-sized sting-loach with a distinctly long dorsal fin having 31 rays.

Description : Based on holotype in the British Museum (Nat. Hist.), No.68.10.27.36, collected from Madras, India.

D.3/28; P.5/1 (fused ray); V.1/7; A.3/5; C.21.

Body elongate and moderately compressed. The dorsal profile is slightly arched, ventral profile almost straight.Body depth 5.43 in SL. Caudal peduncle short; its least height 0.70 in its length. Anus immediately in front of anal fin. Head short, its length 4.75 in SL; snout blunt, 2.67 in length of head; eye rather small situated before middle of head, 4.00. Nostrils situated immediately before eye, contiguous, anterior with a raised tube,posterior without a raised rim, oval. Inter-orbital strongly convex; its width 4.57 in head. A bifid sub orbital spine below each eye; their bases inserted slightly before eye, anterior prong small, longer prong terminates before posterior border of eye,. Mouth small, inferior, with thick lips; six barbels, two rostral close together near apex of snout, maxillary and maxillo-mandibular pairs near angle of mouth, all short.

Scales : Minute, oblong, markedly longer than broad; with eccentric focal area, imbricate, present all over body. Lateral line complete.

Fins: Dorsal long; its origin nearer to tip of snout than to caudal base; ventrals commencing below the middle of the dorsal, extending to anal opening when pressed.

Anal long behind dorsal extending well beyond the caudal base; pectoral falciform. Caudal rounded. Distance from tip of snout to dorsal origin 2.24 in SL from pectoral to ventral origin 3.23; from ventral to anal 4.00; length of longest pectoral ray 5.07; of ventral 5.85; of dorsal 5.63; of anal 6.33; length of dorsal base 2.87; length of anal base 8.44; length of caudal fin 3.80.

Measurements in Percent Of HL. : Length of snout 37.50; diameter of eye 25.0; width of inter-orbital 22.0.

Measurements in Percent Of SL. : Length of head 21.05; depth of body 18.42; least depth of caudal peduncle 13.0; length of caudal peduncle 9.0; distance from snout to dorsal origin 45.0; from snout to origin of ventral 55.0; from pectoral to ventral origin 31.0; from origin of ventral to anal 25.0; length of pectoral 20.0; of ventral 17.0; base of dorsal 35.0; base of anal 12.0; length of caudal fin 26.0.

Sexual dimorphism : Inner pectoral ray ossified in the Holotype (male).

Colouration : "Greyish, becoming dirty white below the centre of the body. A dark line passes from the eye to the centre of the tail. Along its first half are six black spots, whilst the whole extent of the back is irregularly lineated. Fins yellowish. Dorsal with four darkish bands along it. Caudal with three bands and a black margin. A black mark at the base of the tail with a small one above and another below it" (Day 1867).

Size : Holotype, only specimen avaliable, 38.0 mm SL

Affinities : This is a very distinctive form and readily separated by its long dorsal fin with 31 rays. The scale characteristics and the bifid suborbital spine point to its close affinity to *Lepidocephalus* than to any other genus of the Cobitidae. (Silas, 1960)

Range : India : Madras.

Remarks : "When at rest it usually remained on the sand or rock supported by its two pectoral and anal fins, its abdomen not touching the ground. When frightened, it burrowed under the sand with great rapidity. It consumed animal or vegetable food differently and grew considerably while in confinement" (Day 1867 b).

Material examined: Type: Platacanthus maculatus Day. Holotype : BMNH No.68.10.27.36, in British Museum London, collected from Madras, India.

Genus 5. **Acanthophthalmus** Van Hasselt, 1824.

1823. *Acanthophthalmus* van Hasselt, *Alg. Konst. Letterbode*, 2:132 (Type: *Acanthophthalmus faciatus* Van Hasselt, monotypic.)

1968. *Acanthophthalmus*, Banarescu & Nalbant, *Mitt. Hamburg Zool. Mus. Inst*; 65:343 (Review).

Diagnosis : Body elongate or anguilliform, laterally compressed or sub-cylindrical. Small head, with inferior mouth. Six barbels; 2 rostrals, 2 maxillary and 2 maxillo-mandibular. Mental lobes well developed, with or without posterior flap-like portion; lobulous part simple or subdivided into lobules. Dorsal between ventral and anal. Ventral situated on second half of body. Caudal truncated. Scales minute, slightly imbricated, nearly rounded with large central focal area. Head naked. Lateral line absent or short, not extending upto pectoral length.

Distribution : Freshwaters of Indo-Australian Archipelago, Malaya, Burma, Singapore, Thailand, Bangladesh and India.

Key to species of genus *Acanthophthalmus*

1.	Dorsal situated far backwards between ventral and anal fins; lobulous part of mental lobes not sub-divided into lobules.	2
	Dorsal not situated far backards; its origin in the vertical from root of inner ventral ray; lobulous part of mental lobes subdivided into three lobules at its anterior end	*A. longipinnis* (Manipur)
2.	Body elongated, its depth less than 10 (7.8) times in SL., mental lobes without flap-like portion	*A. pangia* (Assam-Bengal, Manipur)
	Body much elongated; its depth more than 10 (10.35) times in SL., mental lobes with flap-like portion	*A. goaensis* (Goa)

17. **Acanthophthalmus pangia** (Ham.)
(Fig. 2, pl. VI)

1822. *Cobitis pangia* Hamilton, *Fish Ganges*, pp. 355, 394 (Type locality: North eastern parts of Bengal)

1839. *Cobitis cinnamomea* McClelland, *Asiat. Res.*, pp. 304, 435, pl. 51, fig. 5.

1839. *Canthophrys rubiginosus* Swainson, *Nat. Hist. Fish.*, 2:310.

1846. *Cobitis pangia*, Valenciennes (in C & V.), *Hist. Nat. Poiss.*, **18**:75.

1853. *Cobitis pangia*, Bleeker, *Verh. Bat. Gen.*, **25**:70.

1860. *Pangia cinnamomea*, Blyth, *Proc. Asiat. Soc. Beng;* p. 169.

1860. *Apua fusca* Blyth, *J. Asiat.Soc.Beng;* **29**:169 (Type locality : Tenasserim).

1868. *Acanthophthalmus pangia*, Gunther (in part), *Cat. Fish. Brit. Mus;* 7:370 (Bengal. Java and Sumatra excluded).

1868. *Apua fusca*, Gunther, *Cat. Fish. Brit. Mus.*, 7:371.

1869. *Apua fusca*, Day, *Proc. Zool. Soc. Lond.*, p. 349

1878. *Acanthophthalmus pangia*, Day, *Fish. India*, p. 610, pl. 155, fig. 5.

1878. *Apua fusca*, Day, *Fish. India*, p. 611, pl. 155, fig. 5.

1889. *Acanthophthalmus pangia*, Day, *Faun. Brit. Ind. Fish;* 1:222.

1889. *Apua fusca*, Day, *Faun. Brit. Ind. Fish;* 1:228.

1916. *Acanthophthalmus pangia*, Weber and de Beaufort (in part), *Fish. Indo-Austrl-Arch.*, **3**:31 (Burma and Northeast Bengal. Sumatra and Java excluded).

1921. *Acanthophthalmus pangia*, Hora, *Rec. Indian Mus.*, **22**:197 (Manipur).

1937. *Acanthophthalmus pangia*, Shaw and Shebbeare, *J. Asiat. Soc. Beng.*, **3**:65 text fig. 61 (Sivoke, N. Bengal)

1974. *Acanthophthalmus pangia*, Menon, *Inl. Fisheries Soc. India*, special publication, p. 50.

Diagnosis : A nonbanded less elongated acanthophthalmid loach; its body depth 7.80 (6.32-10.21) times in SL., dorsal origin situated in the second third of body. mental lobes not differentiated into lobulous and flap-like parts, posterior flap-like part being absent (cf. *A. goaensis*).

Description : Based on 10 specimens, 34.0-55.0 mm SL. from Imphal river, Manipur.

D.3/6; P.1/8-9; V.1/6; A. 3/5; C.16-17.

Body elongated and strongly compressed; its depth 6.32-10.21 (7.89) in SL. Caudal peduncle long,slightly tapering in depth; its least depth 1.23-2.54 (1.62) in its

length. Anus immediately in advance of anal fin.

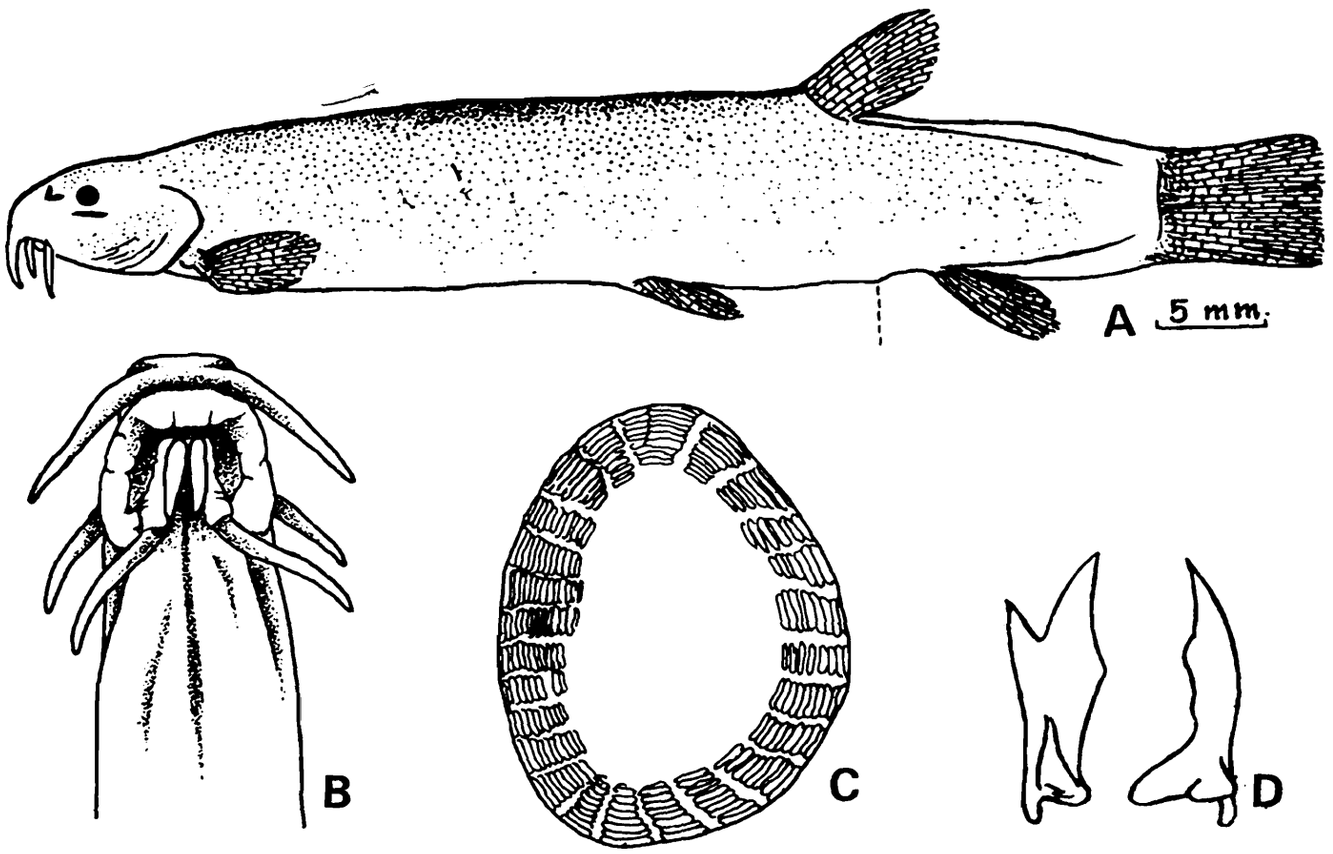
Head small, moderately deep and compressed, 5.45-7.05 (6.31) in SL. Snout prominent, rather pointed, 2.30-3.49 (2.88) in HL. Eye small, covered by skin, smaller than inter-orbital width, situated in the anterior half of head. Nostrils on each side close together, situated immediately before eye, anterior with a rasied tube, posterior without a raised rim, oval shaped. Interorbital strongly convex; its width 2.11-3.00 (2.58) in head. A bifid interorbital spine, on each side, below eye, their bases inserted below anterior border of eye, laterocaudal process small, posterior longer mediocaudal process extending to about posterior rim of eye. Mouth small, inferior, maxillary not reaching to vertical from anterior border of eye. Three pairs of barbels, well developed, rostral pair close together near apex of snout, maxillary and maxillomandibular pairs near angle of mouth, subequal, about third in head length. Lips thick, mental lobes not differentiated into lobulous and flap-like parts; the lobulous part forms two fleshy contiguous oblong prolongations on each side of symphysis; posterior flap-like portion absent. Gill opening restricted, extending to opposite uppermost rays of pectoral fin.

Scales : Minute, slightly imbricate, round with large central focal area; absent on head. Lateral line absent.

Fins : Dorsal placed far backwards, in the second third of body; its origin nearer to ventral origin than that of anal. Distance from tip of snout to dorsal origin 1.42-1.60 (1.51) in SL; distance from origin of dorsal to caudal base 2.72-4.03 (3.06).Ventrals nearer to caudal base than to tip of snout; distance from tip of snout to ventral origin 1.63-1.86 (1.77) in SL; from pectoral to ventral origin2.12-2.70 (2.39); from ventral to anal 3.69-5.13 (4..21); length of longest pectoral ray 9.73-12.59 (11.12); of ventral 12.77-19.43 (14.11); of dorsal 9.78-13.60 (11.68); of anal 10.86-20.87 (14.09); length of dorsal base 12.18-16.59 (14.11); length of anal base 13.5-18.33 (16.13); caudal shorter than head, entire; its length 6.80-10.6 (8:14). in S.L.

Measurements in Percent of HL : Length of snout 28.66-43.48 (35.29); diameter of eye 8.85-13.37 (11.36); width of interorbital 12.88-19.57 (15.34).

Measurements in Percent of SL : Length of head 14.18-18.36 (15.93); length of snout 4.25-6.82 (5.63); diameter of eye 1.33-2.45 (1.82); width of interorbital 1.98-3.07 (2.44); length of maxillo mandibular barbel 2.19-4.32 (3.17); depth of body 9.8-15.65 (12.93); width of body 5.88-9.32 (7.20);least depth of caudal peduncle 6.35-11.85 (8.94); length of caudal peduncle 9.58-16.84 (13.98); distance from snout to dorsal origin 62.45-70.29 (66.41); distance from dorsal origin to caudal base 24.81-36.73 (33.08); distance from pectoral origin to ventral origin 37.09-47.21 (42.08); distance from base of ventral to anal origin 19.49-27.08 (24.01); length of longest pectoral ray 7.94-10.27 (9.04); of ventral 5.15-7.83 (7.22); of dorsal 7.35-10.23 (8.66); of anal 4.79-9.20 (7.49); length of dorsal fin base 6.03-8.21 (7.17); length of anal fin base 2.35-7.41 (5.63); length of the caudal fin 9.43-14.71 (12.54).



Text Fig.8. A. Lateral view of *Acanthophthalmus pangia* (Ham.), 50.0mm SL. B. Ventral view of head showing the mental lobes, enlarged. C. Subdorsal scale, much enlarged. D. Suborbital spine, much enlarged.

Sexual dimorphism : Males have a longer second pectoral ray.

Colouration : Brownish yellow without any markings.

Size : Largest specimen examined 59.0 mm SL

Affinities : The closest relative of *A. pangia* appears to be *A. goaensis*. *A. pangia* differs from *goaensis* in its deeper body (7.89 *versus* 10.3 in SL); and in the lack of the flap-like portion of the mental lobes.

Range : India : North-eastern Bengal, Assam and Manipur. Bangladesh. Burma.

Remarks : Some individuals of this species have, others have not, a pair of pelvic fins (see Hora, *Nature*, Sept. 20th, 1930; p.435). Day alotted these two forms

to separate genera, *Acanthophthalmus* (with pelvics) and *Apua* (without pelvics). Hora found the form without pelvics among the debris at the bottom of still pools and the form with pelvics in swift water of pebbly streams. He therefore suggested that the two forms may be correlated with their habitats. Weber and de Beaufort (*op. cit*) regarded *Acanthophthalmus javanicus* Bleeker as a synonym of *A. pangia. A. javanicus* is quite a distinct species from *A. Pangia* (Smith, 1940 :299). The mental lobes of *A. pangia* lack the flap-like portion characteristic of *A. javanicus* and *A. goaensis*.

Meterial examined : Type : None.

Other mateiral: India : Manipur: 2,ZSI F 4303/2, Imphal river, Coll. A.G.K. Menon and party, 20.2.1953. 4, Imphal, Coll. A.G.K.Menon, 1986. 10, Imphal stream,5 miles from Thanga Island. Coll. Manipur Survey, 23.2.1920. 2, ZSI uncatalogued, Sevoke stream Railway bridge, base of Eastern Himalayas. Coll. S.L. Hora, 7.6.1930. 25, Imphal market, Coll. A.G.K. Menon, March 1986. *Burma*: 1, ZSI F 11131/1, Meetan, Genova museum exchange. 14, ZSI F 10897/1 Sankha, a large hill stream, midway between Kamaing and Megaung Myitkyina Dist., Upper Burma.Coll. B.Chopra, 25.12.1926. 1, ZSI 2590, Mandalay, Purchased from Dr. F. Day.

18. **Acanthophthalmus goaensis** Tilak
(Text Fig. 9A-C)

1972. *Acanthophthalmus goanensis* Tilak, *J. Inld. Fish. Soc. Ind.*, 4:61 (Type locality:Colem River, Goa).

Diagnosis : A non-banded much elongated acanthophthalmid loach; its body depth more than 10 times in SL; dorsal origin situated in the 2nd third of body: mental lobes well differentiated into a lobulous part and a posterior flap-like part (cf. *A. Pangia*).

Description : Based on one specimen 31.0 SL from Goa, India.

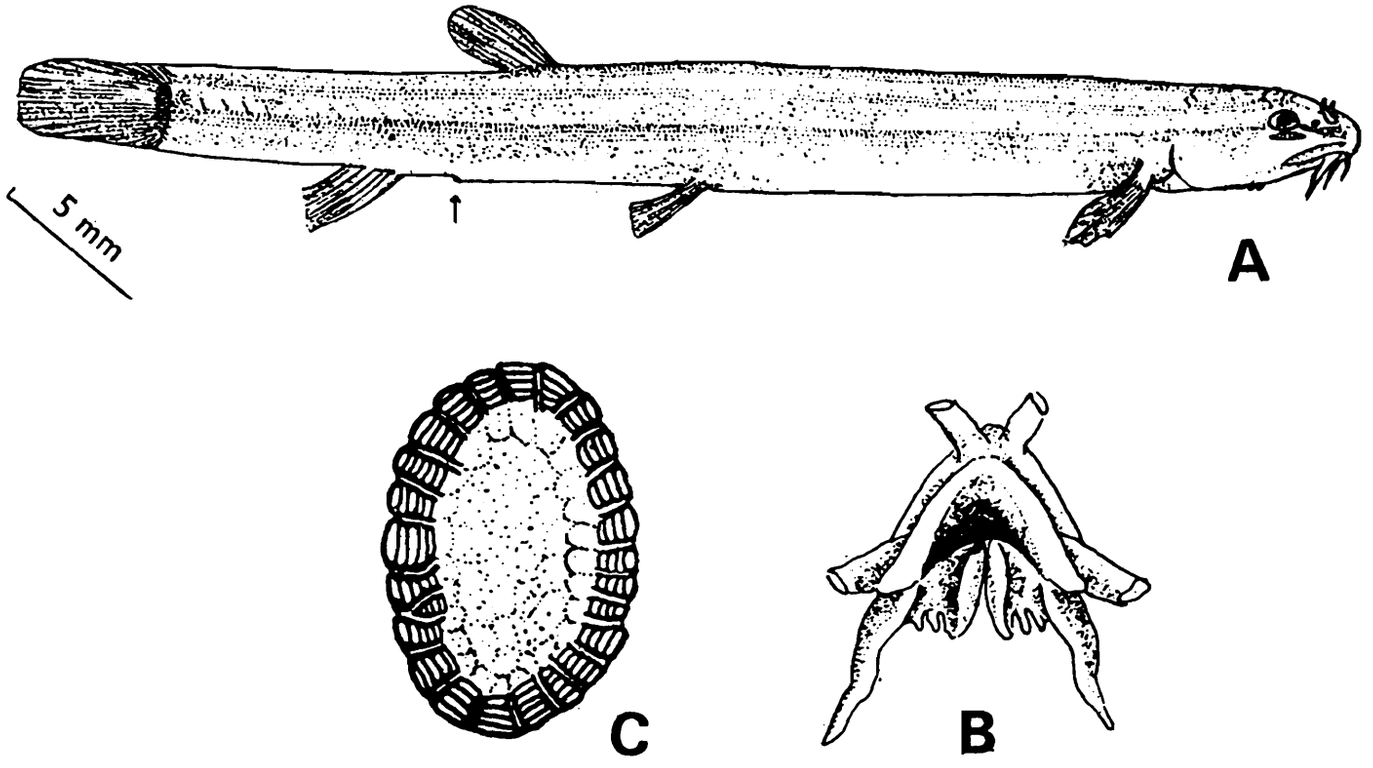
D.3/6; P.1/6; V. 1/4; A. 3/5; C.16-17.

Body elongated and compressed, its depth (10.33) in SL. Caudal peduncle long, slightly tapering in depth, its least depth 2.5 in its length. Anus immediately in advance of anal fin.

Head small, moderately deep and compressed, 6.20 in SL. Snout prominent, rather pointed, 3.33 in HL. Eye small, covered by skin and smaller than interorbital width, situated in the anterior half of head. Nostrils on each side close together, situated immediately before eye, anterior with a raised tube posterior without a raised rim, oval shaped. Interorbital strongly convex, its width 10.0 in head. A bifid suborbital spine, on each side, below eye, their bases inserted below anterior border of eye, laterocaudal process small; its tip extending beyond posterior border of eye,

mediocaudal process longer terminating beyond posterior rim of eye. Mouth small, inferior, maxillary not reaching to vertical form anterior border of eye. Three pairs of barbels, well developed, rostral pair close together near apex of snout; maxillary and maxillo-mandibular pairs near angle of mouth, equal, about third in head length. Lips thick, mental lobes well developed into a fleshy oblong lobulous part and a posterior flap-like part (Text Fig. 9B). Gill opening restricted, extending to opposite uppermost rays of pectoral fin.

Scales : Small, slightly imbricate, round with large central focal area. Absent on head. Lateral line absent.



Text Fig. 9. A. Lateral view of *Acanthophthalmus goaensis* Raj Tilak. B. Ventral view of head showing the mental lobes. C. Suborbital scale (After R. Tilak. 1972)

Fins : Dorsal placed far backwards, in the second third of body., its origin nearer to ventral origin than to that of anal. Distance from tip of snout to dorsal origin 1.55 in SL., distance from origin of dorsal to caudal base (3.1). Ventral nearer to caudal base than tip of snout; distance from tip of snout to ventral origin (1.63) in SL., from pectoral to ventral origin (2.21); from ventral to anal (6.02); length of longest pectoral ray (12.40); of ventral (15.50); of dorsal (8.86); of anal (6.89); length of dorsal base (15.50); length of anal base (15.50). Caudal shorter than head, slightly emarginate; its length (6.20) in standard length.

Measurements in Percent of HL : Length of snout 30.0, diameter of eye 20.0; width of interorbital 10.0.

Measurements in Percent of SL : Length of head (16.13)., length of snout (4.84)., diameter of eye (3.23)., width of interorbital (1.61)., length of maxillo-mandibular barbel (4.84); depth of body (9.68); width of body (8.06); least depth of caudal peduncle (6.45); length of caudal peduncle (16.13); distance from snout to dorsal origin (64.52); distance from dorsal origin to caudal base (32.26); distance from pectoral origin to ventral origin (45.16); distance from base of ventral to anal origin (16.13); length of longest pectoral ray (8.06) of ventral (6.45); of dorsal (11.29); of anal (14.52); length of dorsal fin base (6.45); length of anal fin base (6.45); length of the caudal fin (16.13).

Sexual dimorphism : None

Colouration : Ground colour of body yellowish brown; dorsal side of head reticulated with dark dots; three narrow dark bands run behind head, the mid dorsal streak terminating at base of dorsal, the other two lateral bands on the sides up to caudal base. Dorsal and caudal fins dusky, other fins immaculate.

Size : Known only from Holotype, 31.0 mm SL

Relationship : Very close to *A. pangia* (see remarks on affinities under *A. pangia*).

Range : India:Goa.

Meterial examined: Type: Holotype, NRS/ZSI uncatalogued, Coll. K.S. Pradhan and party, 16.4.1966.

19. **Acanthophthalmus longipinnis** sp. nov.
(Text Fig. 10A-C)

Diagnosis : A non banded elongated, strongly compressed acanthophthalmid loach; its body depth over 8 times in SL. Dorsal long; its origin in the vertical from root of inner ventral ray, placed in the middle of second third of body. Mental lobe well developed, the anterior lobulous parts long and tapering, flap-like part without barbel-like extension (Text Fig. 10C).

Description : Based on Holotype, 62.0 mm SL from Kharangpat Lake, 20 km south of Imphal, Manipur.

D.3/6; P.1/5/1 (fused); V.1/6; A. 3/5; C.16.

Body elongated and strongly compressed. Body depth 8.27 in SL. Caudal

peduncle long; its least height 1.67 in its length. Anus immediately in front of anal fin. Head moderately deep and compressed, its length 4.96 in SL. Snout steep, rounded, 3.13 in HL., eye rather small covered by skin, situated before middle of head, 5.00 in head. Nostrils on each side close together situated some distance before eye, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Interorbital strongly convex; its width 6.25 in head. A bifid suborbital spine below each eye, their bases inserted slightly before eye, laterocaudal process very small, longer mediocaudal process extending to a little beyond posterior border of eye. Mouth small, inferior, horse-shoe shaped with thick lips. Barbels six, all well developed, one pair rostral, close to each other, near apex of snout and two maxillary pairs, the longest,twice that of orbit. Mental lobes well developed, divided into anterior and posterior portions of equal length, anterior lobulous part tapering, posterior flap-like part without barbel-like projections (Text Fig. 10C). Gill opening extending to above base of pectoral.

Scales : Small, imbricate, present all over body and nape. Absent on head. About 20 rows of scales between back and anal fin. Lateral line absent.

Fins : Dorsal long, placed far backwards in the middle of second third of body; its origin in the vertical from the root of the inner ventral ray nearer caudal base than tip of snout. Ventrals long, not extending to anal opening. Anal long, much behind dorsal. Pectoral rounded. Caudal truncate. Distance from tip of snout to dorsal origin 1.77 in SL; from tip of snout to ventral origin 1.88; from pectoral to ventral origin 2.95; from ventral to anal 3.65; length of longest pectoral ray 5.17; of ventral 6.20; of dorsal 5.64; of anal 6.20; length of dorsal base 9.54; length of anal base 13.78; length of caudal fin 5.17.

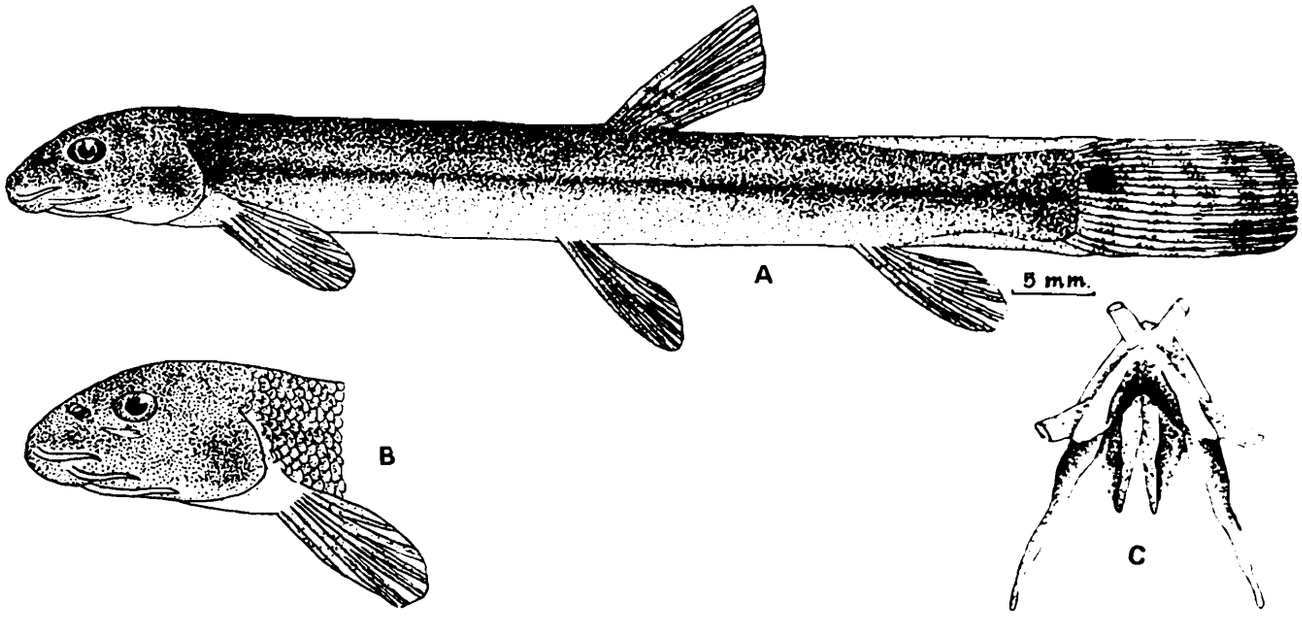
Measurements in Percent of HL : Length of snout 32.0; diameter of eye 20.0; width of interorbital 16.0.

Measurements in Percent of SL : Length of head 20.16; depth of body 12.10; least depth of caudal peduncle 9.68; length of caudal peduncle 16.13; length of snout 6.45; diameter of eye 4.03; width of interorbital 3.23; distance from snout to dorsal origin 56.45; from snout to origin of ventral 53.23; from pectoral to ventral origin 33.87; from origin of ventral to anal 27.42; length of pectoral 19.35; of ventral 16.13; base of dorsal 10.18; base of anal 7.26; length of caudal fin 19.35.

Sexual dimorphism : None.

Colour : Body yellowish-brown with a narrow black band running from behind head to caudal base; upper side of head and body dark brown, underside yellowish. Dorsal and caudal fins with a few dark bands; remaining fins dusky without any markings. A black ocellus above the middle of the base of the caudal fin, placed above the lateral black band.

Size : Only specimen examined, holotype, 62.0 mm SL



Text Fig.10. A. *Acanthophthalmus longipinnis* sp. nov., holotype, 62.0mm SL. Kharungpat Lake, Manipur. B. Head and anterior part of the same, enlarged. C. Ventral view of head showing mental lobes, enlarged.

Affinities : This is a distictive species not closely related to any other known form. In the other two species of the genus *Acanthophthalmus*, *A. pangia* and *A. goaensis* known from India the insertion of dorsal fin is distinctly behind that ventral, in the interspace between the ventral and anal fins; in the present species its origin is in the vertical from root of the inner ventral ray. It is also distinguished by its long fins and barbels.

Holotype: SRS/ZSI No. 3371, Kharungpat Lake, 20 km, south of Imphal, Manipur, Coll. A.G.K. Menon.

Genus 6. **Neoeucirrhichthys** Banarescu & Nalbant, 1968

1963. *Neoeucirrhichthys* Banarescu and Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.* 65:349 (Type: *Neoeucirrhichthys maydelli*, Monotypic).

Diagnosis : Body elongate and compressed, Mouth inferior, horse-shoe shaped; upper lip thick, slightly furrowed, not interrupted in middle. Lower lip strongly fringed, with a round median papilla at the angle of mouth. Lower lip not in continuation with the upper lip but with the thick skin in front of upper lip. Snout pointed; first pair of nostrils prolonged into a tube. Barbels absent, except a short rudiment of barbels at corner of mouth. A strong suborbital spine. Dorsal fin situated nearer to base of caudal than to tip of snout. Ventral slightly in advance; of dorsal origin; caudal emarginate. Scales imbricate on body; present on head. Lateral line short. Air bladder enclosed in a bony capsule.

Distribution : Janali River at Raimora, Goalpara district, Assam.

20. **Neoeucirrhichthys maydelli** Banarescu & Nalbant (Text Fig. 11A-E)

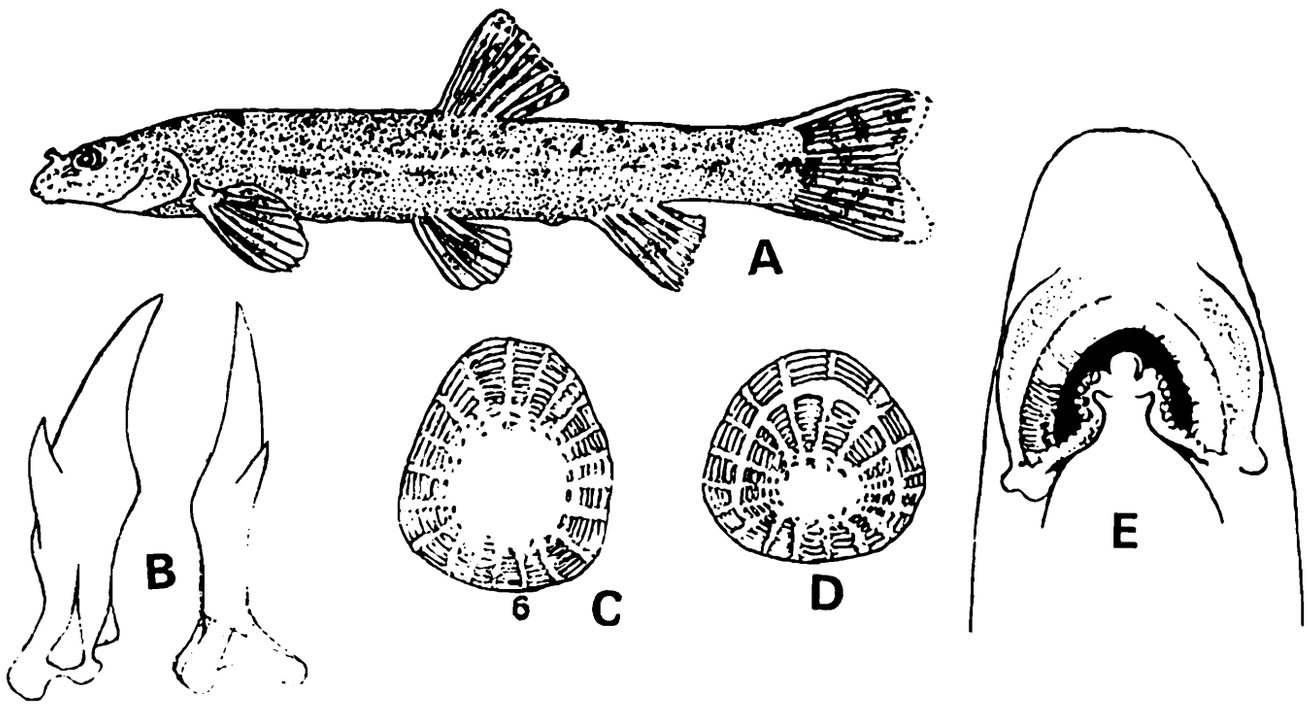
1968. *Neoeucirrhichthys maydelli* Banarescu & Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.,* **65** :349 (Type:locality:Raimora, Goalpara Dist., Assam)

Diagnosis : An elongated loach without barbels, pointed snout, and anterior nostrils well-developed, tube like upper lip thick and furrowed; lower lip with a round median papilla, not continuous with upper but with the thick skin in front of upper lip; no mental lobes; caudal emarginated. Light greyish with 12 small irregular spots on the sides., a few rows of spots on dorsal, caudal and pectorals.

Description : Based on the holotype, H.Z. Sml. 3609, 36.0 mm SL., from Janali River, at Raimora, Goalpara district, Assam. Small sized, elongated, with slightly compressed body of uniform depth; its depth 7.20 in SL. Caudal peduncle moderately long; its least height 2.60 in its length. Anus immediately in front of anal fin. Head rather small, compressed; its length 5.14 in SL. Snout pointed, rather short, 3.50 in H L, eye rather big and high, covered by skin, situated before middle of head, 4.67 in head. Nostrils some distance before eye, contiguous; anterior in a well developed tube, posterior without a raised rim, oval. Inter-orbital convex, smaller than eye; its width 7.00 in head. A bifid sub-orbital spine below each eye, their bases inserted slightly before eye, laterocaudal process much smaller, mediocaudal extending up to middle of eye. Mouth small, inferior, horse-shoe shaped, with thick upper lip slightly furrowed, not interrupted in middle. Skin in front of upper lip thickened, forming a duplicate upper lip. Lower lip strongly fringed, with a round median papilla at angle of mouth. Lower lip not in continuation with upper but with the duplicate upper lip. No rostral or maxillary barbel; a rudiment of maxillo-mandibular at corner of mouth. No mental lobes. Gill opening extending to above base of pectoral.

Scales : Small, with eccentric focal area, imbricate, present all over body. Head scaled; on the ventral side scales extend anterior to pectoral base only.

Fins : Dorsal short, its origin equidistant from front margin of eye and base of



Text Fig. 11. A. Lateral view of *Neoeucirrhichthys maydelli* Banarescu and Nalbant. B. Suborbital spine (after Banarescu and Nalbant. 1968). C. Scale from side of head. D. Subdorsal scale. E. Ventral view of mouth.

caudal, nearer to caudal base than to tip of snout. Origin of ventral slightly in front of the insertion of dorsal, not extending to anal opening. Anal short behind dorsal. Pectoral rounded. Caudal emarginate.

Distance from tip of snout to dorsal origin 2.00 in SL; from tip of snout to ventral origin 2.00; from pectoral to ventral origin 3.6; from ventral to anal 4.5; length of longest pectoral ray 9.00; of ventral 9.00; of dorsal 12.0; of anal 8.00; length of dorsal base 12.0; length of anal base 12.00.

Measurements in Percent of HL : Length of snout 28.57; diameter of eye 21.43; width of interorbital 14.29.

Measurements in percent of SL : Length of head 19.44; depth of body 13.89; least depth of caudal peduncle 6.94; length of caudal peduncle 18.06; distance from snout to dorsal origin 50.0; from snout to origin of ventral 50.0; from pectoral to ventral origin 27.78; from origin of ventral to anal 18.3; length of pectoral 11.11; base of dorsal 8.33; base of anal 8.33.

Sexual dimorphism : Rays of pectoral thickened and enlarged in male (holotype).

Colour : "Light grayish. 8 narrow and distinct medium spots on back. A row of 12 small, more or less triangular spots on each side of body. Minute spots vaguely arranged in two rows between dorsal and lateral spots. A blackish spot on caudal base, somewhat above the middle. A few rows of spots on dorsal, caudal and pectoral" (Banarescu and Nalbant *Op.cit.*)

Size : Only specimen examined, holotype, 36.0 mm SL

Affinities : The fish is unique amongst Cobitidae in having no barbels and in its peculiar shape of mouth, not related to any other known cobitid fish.

Range : Same as genus.

Material examined : Type: Holotype, ZMH 3609, Maydell, 16.2.1957.

Genus 7. **Somileptus** Swainson, 1839.

1839. *Somileptus* Swainson, *Nat. Hist. Fish*, 2:190 (as Somileptes, p.311). Type: *Somileptes bispinosa* Swainson, monotypic.

1863. *Somileptes*, Bleeker, *Atl. Ich.Cypr.* 3:3 (emended definition).

1868. *Somileptes*, Gunther, *Cat. Fist Brit. Mus.*, 7:636 (merged *Somileptes* with *Cobitis*).

1878. *Somileptes*, Day, *Fish India*, p. 608 (considered *Somileptes* as a distinct genus).

1968. *Somileptes*, Banarescu & Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.*, 65:343 (Review).

Diagnosis : Body stout, cylindrical, elongate, covered with conspicuous scales, except head. Snout with upper profile straight or slightly concave, covered with warty tubercles. Eye bulging, fairly large, superior, covered with skin. A bifid errectile suborbital, spine. Mouth small, inferior, horse-shoe shaped, lips fleshy, continuous, upper thickly papillated, lower globular at sides and granulated. Barbels six. Jaws and palate without teeth; pharyngeal teeth 10, small, slender, pointed or slightly hooked, arranged in single row. Dorsal fin inserted behind origin of ventrals; caudal entire, subtruncate or rounded. Scales large, 17 rows between lateral line and base of ventral fin, lateral line complete.

Sexual dimorphism : None.

Distribution : India: Rivers of Eastern Himalayas. Nepal.

21. Somileptus gongota (Ham.)
(Fig. 4, Pl. VI)

1822. *Cobitis gongota* Hamilton, *Fish Ganges,* pp. 351, 394 (Type locality : rivers of northern Bengal, towards the mountains)

1822. *Cobitis cucura* Hamliton, *Fish Ganges*, pp. 352, 394 (Type locality:R. Kosi).

1839. *Cobitis cucura*, McClelland, *Asiat. Res;* **19**:303, 434, pl. 51. fig. 2 (from Hamilton's Ms drawings)

1839. *Canthophrys albescens* Swainson, *Nat. Hist. Fish;* **2**:310.

1839. *Somileptes bispinosa* Swainson, *Nat. Hist. Fish;* **2**:311.

1839. *Cobitis oculata* McClelland, *Asiat. Res;* **19**:303, 433, p. 51, fig. 1

1846. *Cobitis amnicola* Valenciennes (in C & V.), *Hist. Nat. Poiss.,* **18**:70.

1853. *Cobitis gongota,* Bleeker, *Verh. Bat. Gen.,* **25**:70

1853. *Cobitis cucura* Bleeker, *Verh. Bat. Gen.,* **25**:73.

1868. *Cobitis gongota,* Gunther, *Cat. Fish Brit. Mus.,* **7**:368.

1868. *Somileptes gongota,* Bleeker, *Atl. Ich. Cypr.,* **3**:3.

1878. *Somileptes gongota,* Day, *Fish India.* p. 608 p. 155, fig. 2.

1889. *Somileptes gongota,* Day, *Faun. Brit. Ind. Fish.,* **1**:219, fig. 79.

1932. *Somileptes gongota,* Mukerji, *Rec. Indian Mus.,* **34**:125, pl. 15, figs. 1-4.

1937. *Somileptes gongota,* Shaw and Shebbeare, *J. Asiat. Soc. Beng.,* **3**:76, text. fig. 75 (gravelly and muddy streams of Terai and Duras, N. Bengal).

1968. *Somileptes gongota,* Srivastava, *Fish. East. Uttar Pradesh.* p. 63 (Sandy streams and rivers of teriai of Uttar Pradesh to Assam)

1968. *Somileptes gongota,* Banarescu & Nalbant, *Mitt. Hamburg. Zool. Mus. Inst.,* **65**:343.

1974. *Somileptes gongota*, Menon, *Inl. Fisheries Soc. India,* special publication, p. 56.

1985. *Somileptes gongota,* Menon, *J. Zool. Soc. India.* (Distribution).

Diagnosis : An elongate, cylindrical loach with swollen head, a long snout

covered with warty tubercles; large eyes near top of head; brownish with a variable pattern of dark cloudy irregular patches on side and transverse bars along the dorsum.

Description : Based on 7 specimens, 80.6 to 93.0 mm SL from Katmandu, Nepal (2), Krishnai, Goalpara (3); Doom dooma, Assam (1), Latchki River, Siliguri, Assam (1).

D. 3/8; P. 1/10; V. 1/6; A. 3/5; C.16 (excluding small compact rays).

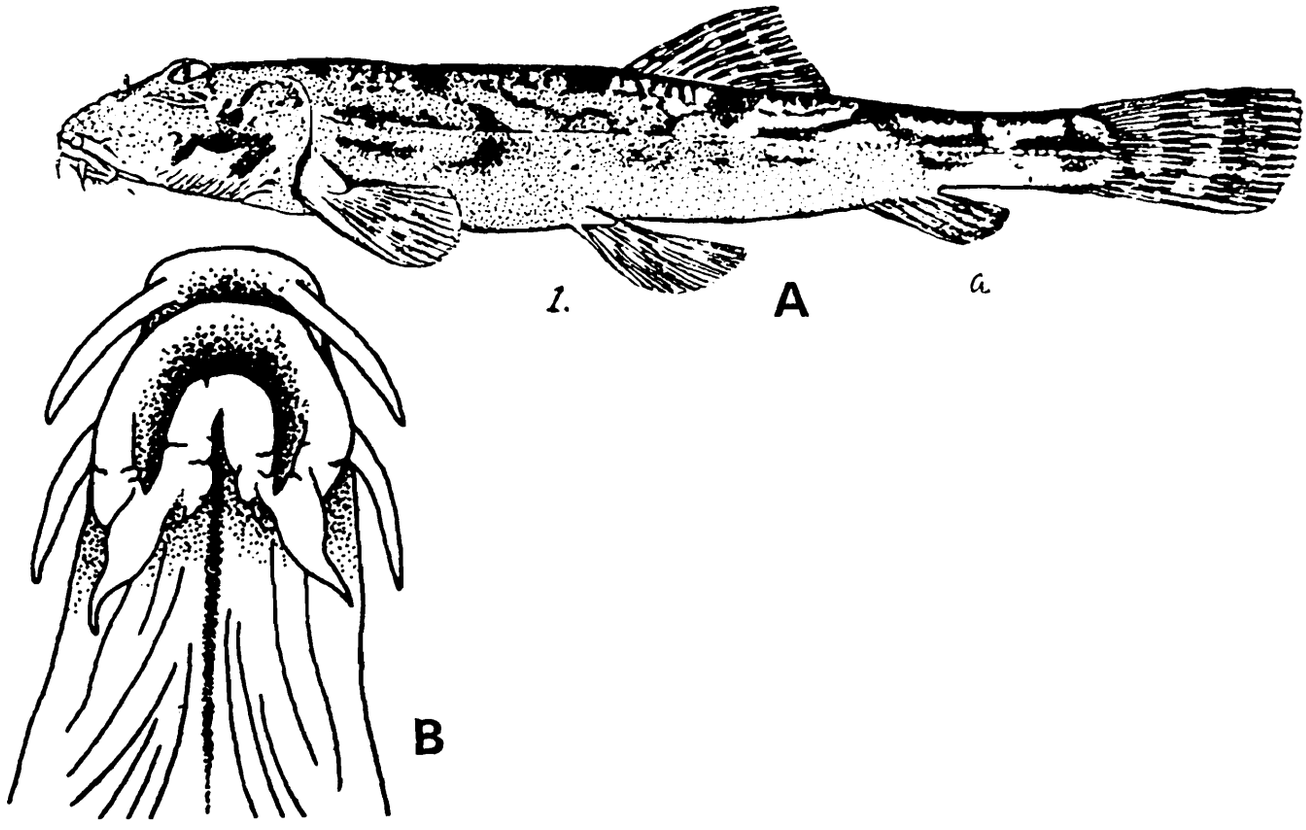
Body elongate, cylindrical, strongly built; dorsal profile of snout straight or slightly concave, arising abruptly to above the eyes; from this point it tapers gradually to caudal peduncle. Ventral profile uniformly curved. Body depth 6.20-7.39 (6.56) in SL. Caudal peduncle compressed, high, its least depth 1.53-2.05 (1.83) in its length. Anus slightly in advance of anal fin.

Head swollen, moderately long, longer than height of body, 3.56-4.11 (3.84) in SL. Snout elongated, upper edge concave, scarcely longer than the post-orbital length, 2.0-2.36 (2.11) in head, this and the rest of head covered with fine warty tubercles. Nostrils nearer to eye than to tip of snout, contiguous, anterior with a raised tube, posterior without a raised rim, oval. Mouth small, subterminal, arched, lips thick, upper more prominent, thickly papillated, protruding over lower lip. Lower lips crenulated in the middle, lobular at sides and granulated. Barbels six, two on snout, jaw extending nearly half way to below the eyes.Eye large close together near top of head, in the posterior half of head not visible from below ventral surface; its diameter 5.05-6.61 (5.80) in head. Interorbital narrow, convex; its width 6.61-10.51 (8.94) in head. Sub-orbitial spine small, bifid, reaching to below the middle of orbit.

Scales : Large, cycloid, embedded, present on body and nape, absent of head. 17 rows between lateral-line and base of ventral fin. Lateral line complete.

Fins : Origin of dorsal opposite to the root of the last ventral ray, nearer base of caudal than tip of snout. Origin of ventral in advance of that of dorsal. Pectoral shorter than head, extending more than half way to ventrals, ventrals slightly shorter than pectorals not touching anal opening. Anal fin when depressed reaching almost caudal base. Caudal entire, its length shorter than head. Distance from tip of snout to dorsal origin 1.68-1.90 (1.80) of SL., distance from tip of snout to ventral origin 1.89-2.12 (1.98), distance from origin of pectoral to ventral origin 3.52-4.43 (3.87); distance from base of ventral to anal origin 3.14-4.0 (3.46); length of the longest pectoral ray 5.32-7.19 (6.06); of ventral 5.87-6.64 (6.13); of dorsal 5.68-6.95 (6.36); of anal 6.88-7.90 (7.50); length of the dorsal fin base 7.75-9.71 (8.64); length of anal fin base 11.37-14.65 (13.65); length of caudal fin from mid base to tip of longest ray 4.11-5.60 (4.68).

Measurements in percent of HL : Length of snout 42.32-50.11 (47.50); diameter



Text Fig.12. A. Lateral view of *Somileptus gongota.* Swainson, from Goalpara, Assam. 95.0mm SL
B. Ventral view of head of same, much enlarged

of eye 15.13-19.78 (17.40); width of interorbital 9.51-15.12 (11.46).

Measurements in percent of SL : Length of head 24.34-28.08 (26.14); depth of body 13.52-16.13 (15.29); least depth of caudal peduncle 6.51-7.47 (7.07); length of caudal peduncle 11.45-15.28 (12.94); distance from snout to dorsal origin 52.75-59.62 (55.74); from snout to origin of ventral 47.25-53.03 (50.67); from pectoral to ventral origin 22.58-28.37 (25.99); origin of ventral to anal 25.0-31.87 (29.09); length of pectoral 13.9-18.81 (16.63); length of ventral 15.05-17.05 (16.35); base of dorsal 10.3-12.90 (11.62); base of anal 6.82-8.0 (7.43); length of caudal fin 10.99-24.36 (19.45).

Sexual dimorphism : None.

Colour : Body light brown, darker above, yellowish beneath. A variable pattern of dark cloudy irregualr patches along sides consisting of about five large brown blotches giving off vertical dark bands towards the back; two dark patches on each cheek. Fins yellowish, dorsal and caudal with dark spots arranged somewhat into more or less four regular transverse bands.

Size : Largest specimen examined 93.0 mm SL

Affinities : A very distinct form, thc only member of the genus not closely

related to any other species. This species is readily separated by its long and cylindrical body, swollen head, long snout and large bulging eyes..

Range : India : Assam and Meghalaya to Uttar Pradesh along base of Eastern Himalayas and Nepal.

Remarks : Inhabits muddy and generally gravelly streams along the base of the Eastern Himalayas and Nepal. Day (1876 & 1889) gives the distribution as from "Orissa through Bengal to Assam" and "Beerbhoon, Assam and Khasi Hills" respectively. The fish does not occur in Orissa, Beerbhoon or in the Lower reaches of the Ganges in India or Bangladesh. The Day's illustration of *Somileptus gongota* (pl 155 fig. 2) is not a faithful delineation of the species.

Material examined : Type : None

*Other material : India:*West Bengal:1,ZSI F 11113/1, Latchki river, Siliguri, Eastern Himalayas, Coll. G.E.Shaw. 2, SRS/ZSI uncatalogued, Jalpaiguri, Coll. A.G.K. Menon, 12.4.1985. *Assam:*1, SRS/ZSI uncatalogued, Kumsung reserve forest (Dindk.) 40 km of Doomdooma. 4, SRS/ZSI uncatalogued, Krishnai river, south of Goalpara. Coll. A.G.K. Menon, 14.4.1985. *Nepal*: 2,SRS/ZSI uncatalogued, Katmandu, Nepal, Coll. Jeevan Shrestha, 21.5.1982.

Genus 8. **Acantopsis** Van Hasselt, 1824.

1824. *Acantopsis* Van Hasselt, in Ferussac, *Bull. Sci. Nat;* 2:377 (Type:*Acantopsis dialyzona* Van Hasselt, monotypic).

Diagnosis : Much elongate, compressed. Head compressed, snout much elongate, mouth inferior, small. Barbels three pairs. Scales minute, none on head. A bifid preorbital spine between orbit and nostrils. Dorsal in advance of ventrals,its origin before ventrals. Anal short, far behind dorsal,caudal emarginate. Gill opening small slit ending above pectoral base.

Distribution : Indo-Australian Archipelago and South-eastern Asia.

22. **Acantopsis choirorhynchus** (Bleeker)
(Fig. 3; Pl. VII)

1803. *Acantopsis dialyzona* Vaillant, *Nouv. Arch. Mus. d' hist. nat.,* (3)5 : 100 (No description).

1823. *Acantopsis dialyzona,* Van Hasselt, *Alg. Konst-en Letterbode,* 2:133 (No description)

1852. *Acanthopsis biaculeata*, Ruppel, *Samml. des Senckenb. Mus.,* P. 28 (Name not published)

1854. *Cobitis choirorhynchus* Bleeker, *Nat. Tijdschr. Ned. Indie.,* 7:95 (Palembang, Sumatra)

1857. *Cobitis macrorhynchus* Bleeker, *Nat., Tijdschr. Ned. Indie.,* 7:95.

1857. *Cobitis macrorhynchus* Bleeker, *Act. Soc. Sc. Indo-Neerl* 2. Tiende Bijdrage Borneo, P.20.

1860. *Acanthopsis choirorhynchus* Bleeker, *Ichth. Arch. Ind. Prodr.,* 2. Cyprini, P. 66.

1860. *Acanthopsis dialyzona,* Bleeker, *Ichth. Arch. Ind. Prodr.,* 2. Cyprini, P. 67.

1863. *Acanthopsis choirorhynchus* Bleeker, *Atl. Ichth.,* 3:9.

1863. *Acanthopsis dialyzona,* Bleeker, *Atl. Ich.,* 3:9.

1868. *Acanthopsis choirorhynchus*. Gunther, *Cat. Fish Brit. Mus.,* 7:365.

1868. *Acanthopsis dialyzona,* Gunther, *Cat. Fish. Brit. Mus.,* 7:365.

1878. *Acanthopsis choirorhynchus,* Day, *Fish Ind.,* P. 608.

1889. *Acanthopsis choirorhynchus,* Day, *Faun. Brit. Ind.* Fish., 1:218.

1890. *Acanthopsis choirorhynchus,* Vinciguerra, *Ann. Mus. Cir. Genova,* (2) 9:342.

1903. *Acanthopsis choirorhynchu,* Boulenger, *Fasciculi Malayenses, Zoology.* Pt. 2:303 (Patani River).

1909. *Acanthopsis choirorhyanchus,* Popta, *Notes Leyden Mus.,* 27:204.

1916. *Acanthopsis choirorhynchus,* Weber and De Beaufort. *Fish. Indo-Austr. Arch.,* 3:25, Figs. 8 and 9.

1935. *Acanthopsis choirorhynchus,* Fowler, *Proc. Acad. Nat. Sci. Philadelphia,* 87:106, Figs. 35-42 (Khao Nam Poo).

1937. *Acanthopsis choirorhynchus,* Fowler, *Proc. Acad. Nat. Sci. Philadelphia,* 89:59 (Trang).

1945. *Acanthopsis choirorhynchus,* Smith, *Bull. U.S. Nat. Mus.,* 188:296 (Thailand).

1962. *Acanthopsis choirorhynchus,* Sherba, *Fish World,* London, P. 344, Fig:488.

Diagnosis : A cobitid species of grotesque appearance with very much elongated body and snout and compressed body. A bifid spine is situated in advance of the orbit between orbit and the nostrils.

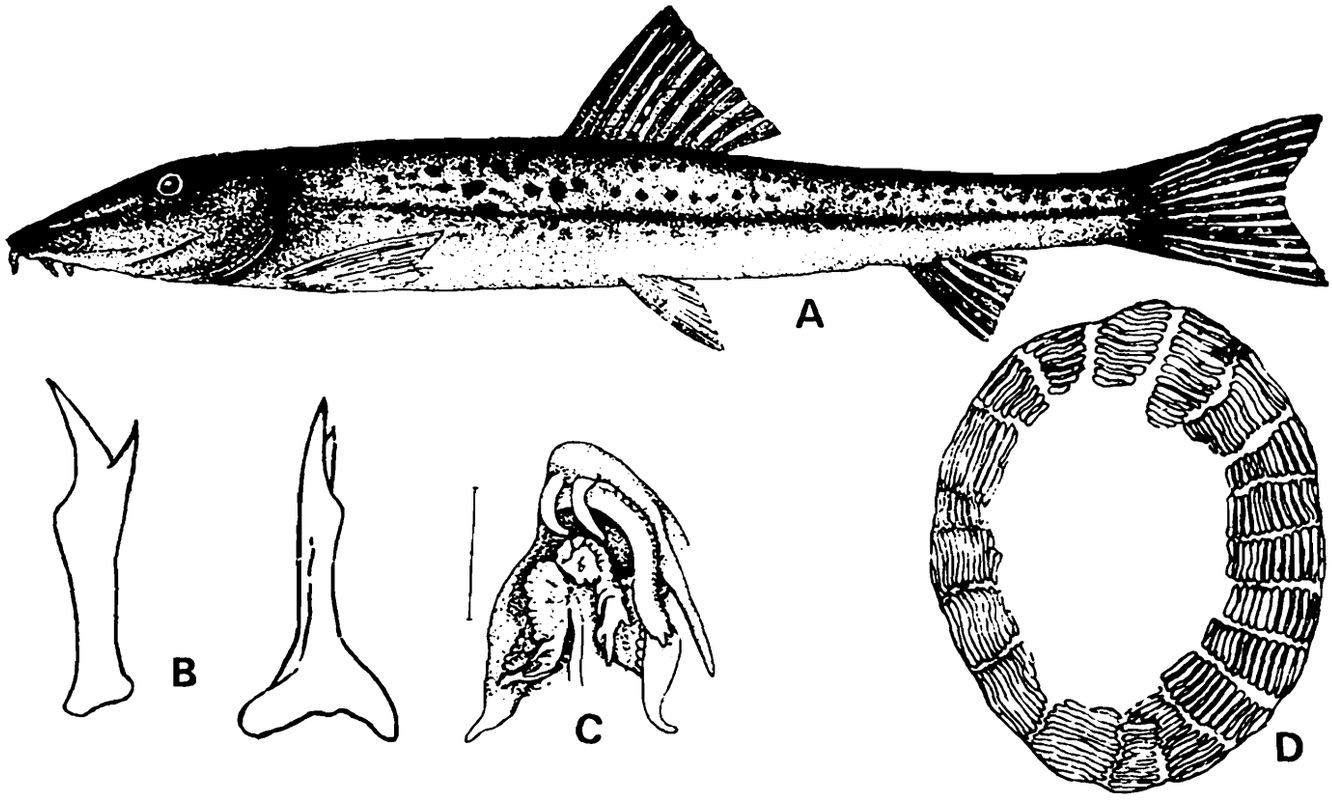
Description : Based on six specimens 63.0-127.15 mm SL, 5 from Irrawaddy river at Mandalay, 1 from Kunghein, Chindwin drainage, collected by Hapwood Upper Chindwin Expedition.

D.3/9; P.1/11; V.1/6; A.3/5; C.16-17

Body very much elongated and compressed rising from snout to occiput; its depth 11.18-15.0 (12.63) in SL. Caudal peduncle long, slightly tapering in depth; its least depth 2.74-3.97 (3.17) in its length. Anus immediately in advance of anal fin.

Head small, moderately deep and compressed, 4.05-4.62 (4.39) in SL. Snout much elongated, rather pointed, 1.44-1.66 (1.53) in HL. Eye small, covered by skin, larger than inter orbital width, situated high up in the last third of head, about 4.71-7.54 (6.09) in head. An erectile bifid spine situated between the nostrils and the orbit, in advance of orbit, on a level with its lower margin. Mouth small, inferior, a pair of rostral barbels close together at the end of snout, and a pair of separate barbels along each upper jaw, all short; lips thick, mental lobes well developed into two fleshy fringed prolongations on each side of symphysis. Gill opening restricted, extending to opposite uppermost rays of pectoral fin.

Scales : Minute, not imbricate, 25 rows between back and anal fin. No scales on vertex or other parts of head, lateral line complete.



Text Fig. 13 A. Lateral view of *Acantopsis choirorhynchus* (Blkr.) B. Preorbital spine (After Rendahl. 1948). C. Ventral view of head showing mental lobes, enlarged.

Fins : Dorsal origin midway between tip of snout and caudal base; it is slightly

in advance of ventral. Anal short, far behind dorsal, caudal emarginate, lower lobe distinctly longer. Distance from tip of snout to dorsal origin 2.01-2.31 (2.09) in SL., distance from origin of dorsal to caudal base 1.91-2.14 (2.02). Ventrals nearer caudal base than tip of snout; distance from tip of snout to ventral origin 1.81-1.91 (1.86) in SL., from pectoral to ventral origin 2.92-3.25 (3.09); from ventral to anal 3.69-4.47 (3.97); length of longest pectoral ray 6.03-6.75 (6.44); of ventral 7.88-9.67 (8.58); of dorsal 7.2-7.88 (7.54); of anal 8.55-10.24 (9.38); length of dorsal base 6.20-9.06 (7.77); length of anal base 10.31-14.07 (12.46); caudal shorter than head; its length 5.58-9.43 (7.55) in SL.

Measurements in Percent of HL: Length of snout 60.07-69.69 (65.81); diameter of eye 13.25-21.25 (16.92); width of interorbital 5.61-11.36 (8.84); length of maxillo-mandibular barbel 5.61-11.36 (8.24).

Measurements in Percent of SL: Length of head 21.67-24.70 (22.85); depth of body 6.67-8.95 (8.04); width of body 4.76-6.84 (6.02);least depth of candal peduncle 3.56-4.84 (4.29), length of caudal peduncle 10.61-17.91 (13.62); distance from snout to dorsal origin 43.33-49.63 (47.95); distance from dorsal origin to caudal base 46.72-52.35 (49.49); distance from pectoral origin to ventral base 30.74-34.21 (32.43); distance frrom base of ventral to anal origin 22.38-27.12(25.29); length of longest pectoral ray 14.83-16.59(15.57); of ventral 10.34-12.69(11.72); of dorsal 12.70-13.88 (13.29); of anal 9.76-11.70 (10.71); length of dorsal fin base 11.03-16.14 (13.15); length of anal fin base 7.11-9.70 (8.14); length of caudal fin 9.89-12.86 (11.38).

Sexual dimorphism: Males are smaller than females.

Colouration : Brownish with 12 bands across the back. A dark lateral line with a series of 8-12 round spots, disappearing with age. A black spot at upper base of caudal; two rows of blotches along dorsal and three across anal fins.

Size: The largest specimen examined 127.5 mm SL. It is known to grow about 300 mm in length in the hill streams of Burma.

Affinities: A distinctive species not closely related to any other know form.

Range: Same as genus.

Remarks: The general colour markings afford the fish concealment in clear, shallow streams and it burrows itself in the sand, when frightened.

Material examined: Type: None.

Other material: Burma: 1, ZSI F 13459/1 Kunghein, Chindwin drainage, Verney-Hopwood Upper Chindwin Expedition. 1, ZSI F 11622/1. Coll. S. Shan, 4, Cat. No. 2588, and 977, Mandalay, Coll. F.Day. 1, ZSI F 11127/1, Mandalay (Genova Museum exchange).

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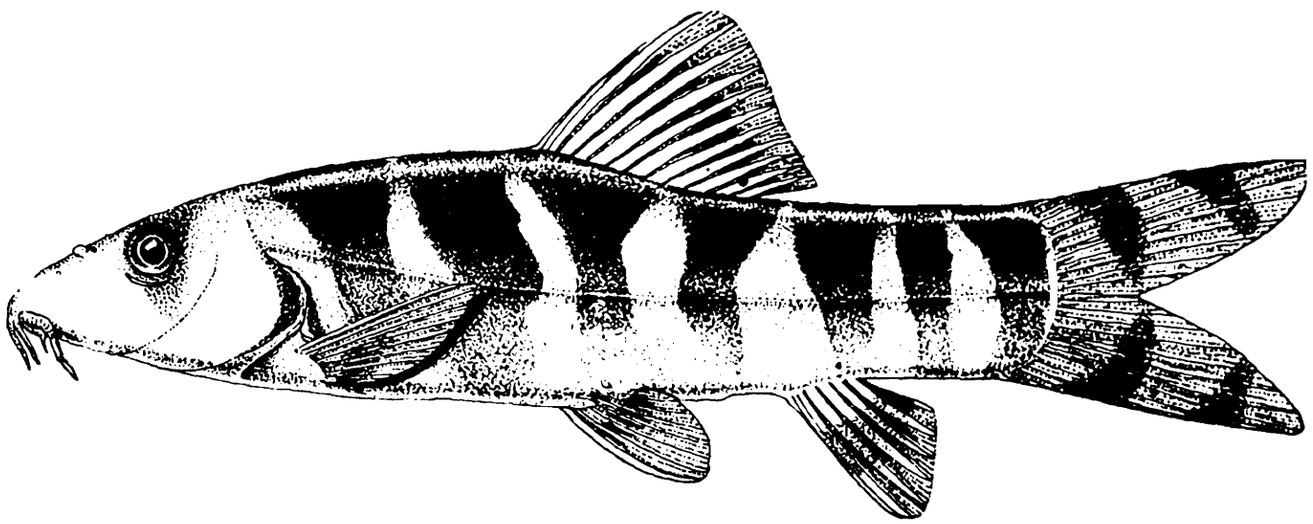
ADDENDUM

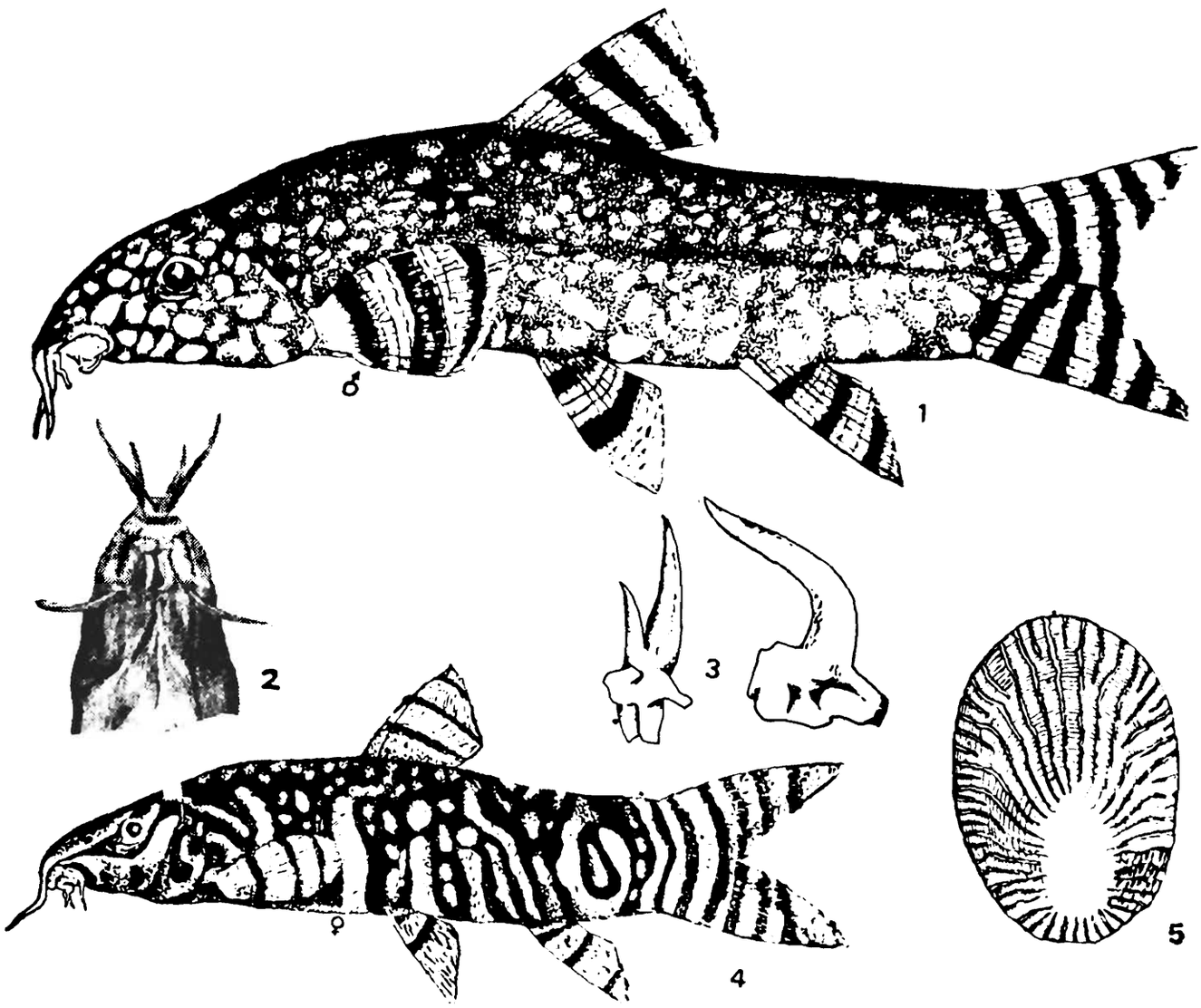
Subsequent to printing of the page proof my attention was drawn by Dr. T. Nalbant to the description of the following species from "Off Bombay Territory"



Botia macrolineata Teugels, Vas & Snoeks

Described by Teugels, Vas and Snoeks (*Cybium*, 1986) this species differs from *B. dario* (Ham.) by a greater number of dorsal branched rays (11., 9-10 in *dario*). In this respect thish fish is comparable with the group of *Botia hymenophysa*, *B. helodes* and somewhat with *B. reversa*.

MENON PLATE 1



Botia almorhae

Fig. 1 *Botia almorhae* Gray, Kosi, R., Almorha, U. P., 110 mm SL, breeding (Male).

Fig. 2 Ventral view of head of same to show mental lobels x 2.

Fig. 3. Suborbital spine of same, enlarged x 5.

Fig. 4. *Botia almorhae* Gray, Kosi R., Almorha, U. P., 148.0 mm SL. breeding (Female).

Fig. 5. Subdorsal scale of same, much enlarged x 65.

PLATE 2

The Botini of India

Fig. 1 Lateral view of *Botia almorhae* Gray, Almorha. 110 mm SL. breeding (Male).

Fig. 2. Ventral view of same.

Fig. 3. Dorsal view of same.

Fig. 4. Lateral view of *Botia almorhae* Gray, Kashipur, Nainital, 53 mm SL : breeding (Female).

Fig. 5. Lateral view of *Botia almorhae* Gray, Shalkha R, Chapra, Dist. Bihar, 47.0 mm SL. Young.

Fig. 6. Lateral view of *Botia almorhae* Gray, Shalkha R, Chapra, Dist. Bihar, 32.0 mm SL, Young.

Fig. 7 Lateral view of *Botia almorhae* Gray, Kali Gandaki R. Nepal, 140 mm SL, breeding (Male) (photo by Dr. David R. Edds).

Fig. 8. Lateral view of *Botia almorhae* Gray, Kali Gandaki R. Nepal, 68.0 mm SL, breeding (Male) (photo by Dr. David R. Edds).

Menon : Fauna of India : Cobitidae

MENON PLATE 2

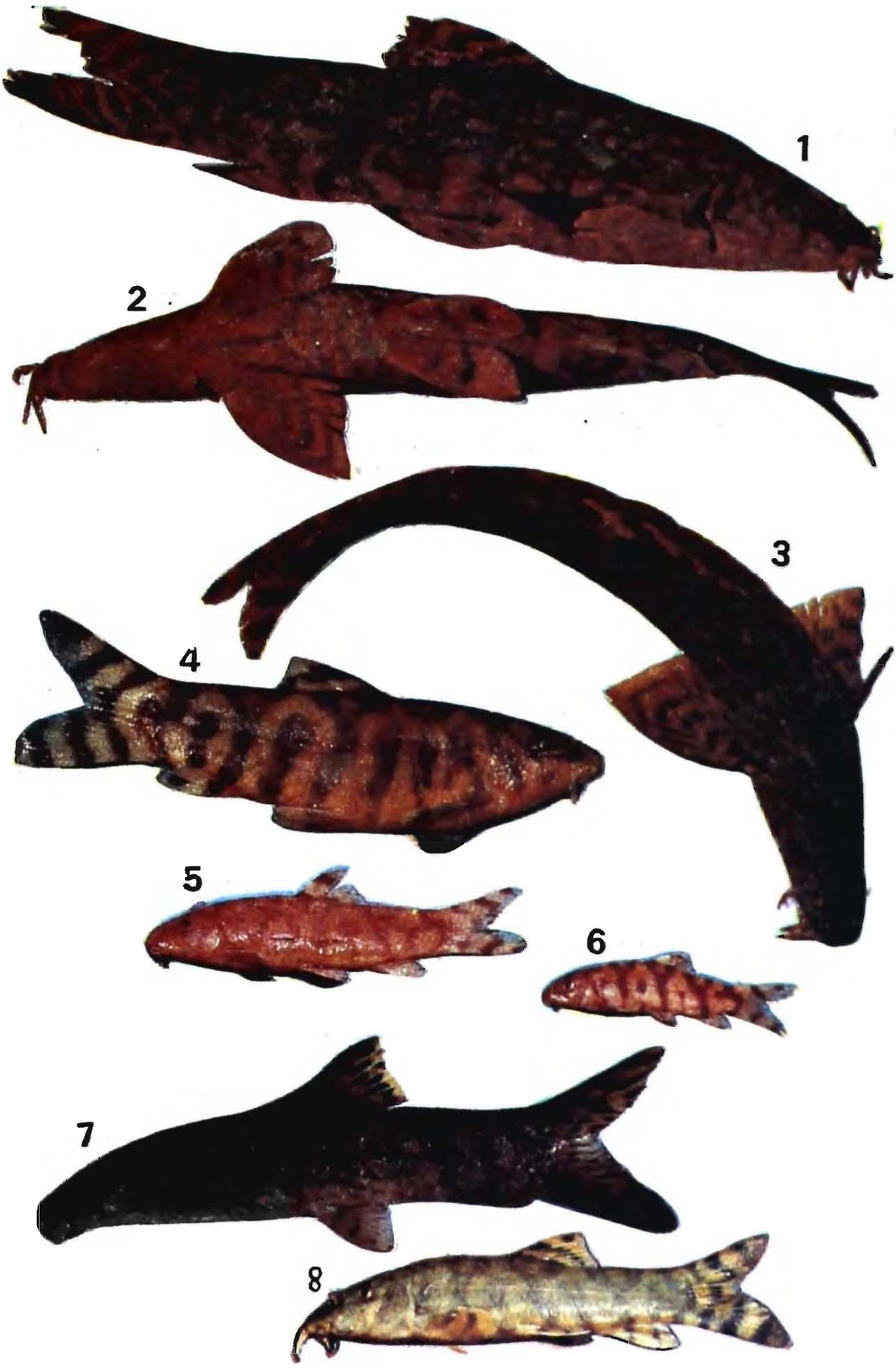


PLATE 3

The Botini of India

Fig. 1. Lateral view of *Botia birdi* Chaudhuri, Kashmir Valley, 101.0 mm SL (Male).

Fig. 2. Lateral view of *Botia birdi* Chaudhuri, Kashmir Valley, 113 mm SL, (Female).

Fig. 3. Ventral view of *Botia birdi* Chaudhuri, Kashmir Valley, 101.0 mm SL, (Male), to show short ventral not extending to anal opening.

Fig. 4. *Botia histrionica* Blyth. Manipur Valley, 117.0 mm SL.

Fig. 5. *Botia striata* Rao, Bhim R. Bhadravathy, Karnataka 78.0 mm SL.

Fig. 6. *Botia berdmorei* (Blyth), Manipur Valley, 57.0 mm SL.

Fig. 7. *Botia dario* (Ham) Goalpara, Assam. 88.0 mm SL.

MENON

PLATE 3

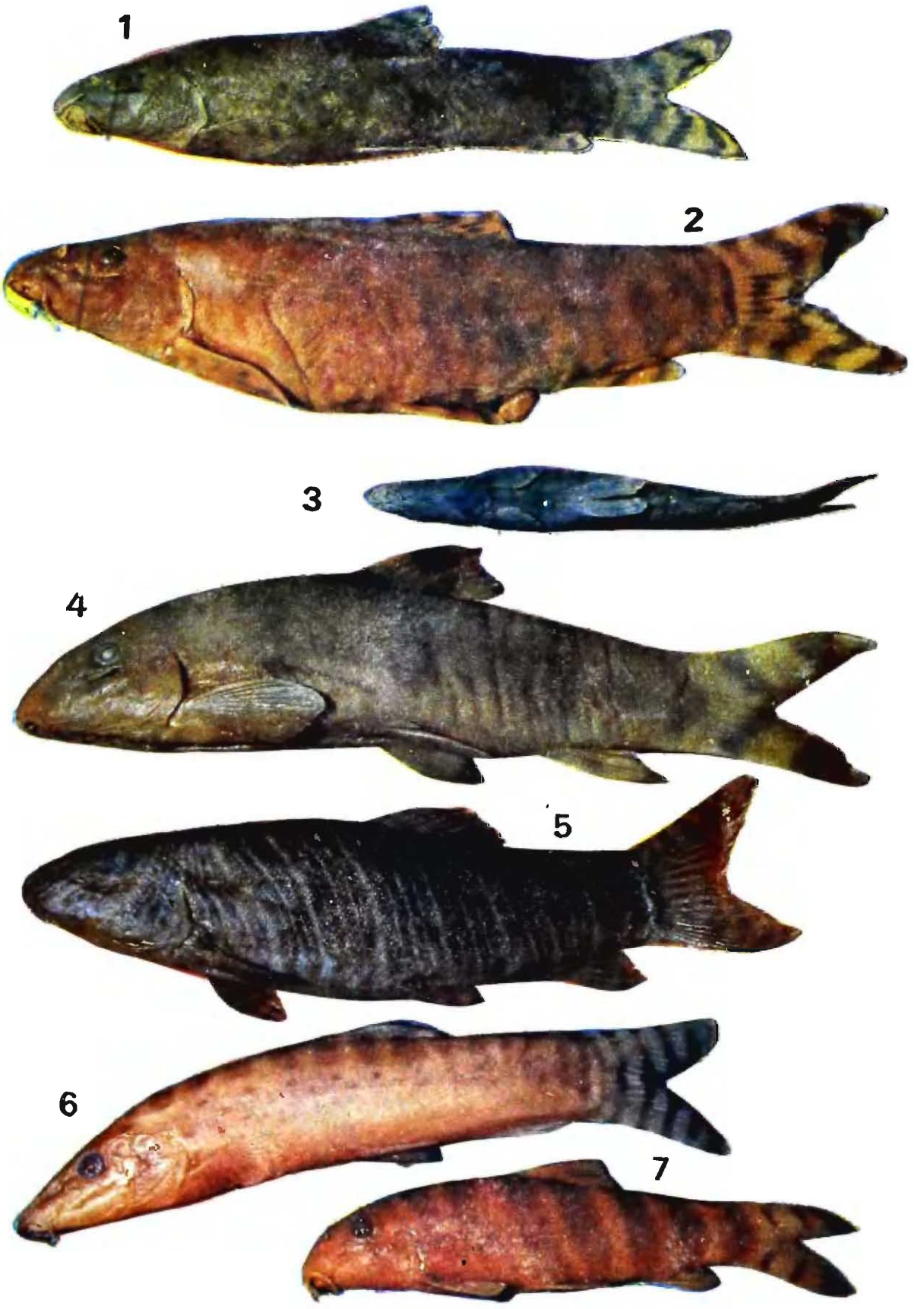


PLATE 4

Colour variation in *Lepidocephalus guntea* (Ham.) and *Lepidocephalas coromandelensis* sp. nov.

Fig. 1 *Lepidocephalus guntea* (Ham.) Kerala R., Jalpaiguri, West Bengal, (Tista drainage), 64.0 mm SL., enlarged, (Female).

Fig. 2. *Lepidocephalus guntea* (Ham.) Kerala R., Jalpaiguri. West Bengal (Tista drainage), 62.0 mm SL., enlarged.

Fig. 3. *Lepidocephalus guntea* (Ham.) Nepal, 60,0 mm SL., enlarged.

Fig. 4. *Lepidocephalus guntea* (Hamilton). R. Luni Mewar, Rajasthan, 44.5 mm SL., enlarged.

Fig. 5. *Lepidocephalus guntea* (Ham.) Gwalior, M. P. (Chambal drainage), 59.0 mm SL., enlarged

Fig. 6. *Lepidocephalus guntea* (Ham.) Vindhya range (Narmada drainage), 55 mm SL., enlarged.

Fig. 7 *Lepidocephalus goalparensis* Pillai & Yazdani, Dawki Stream Meghalaya, 33.5 mm SL., enlarged.

MENON

PLATE 4

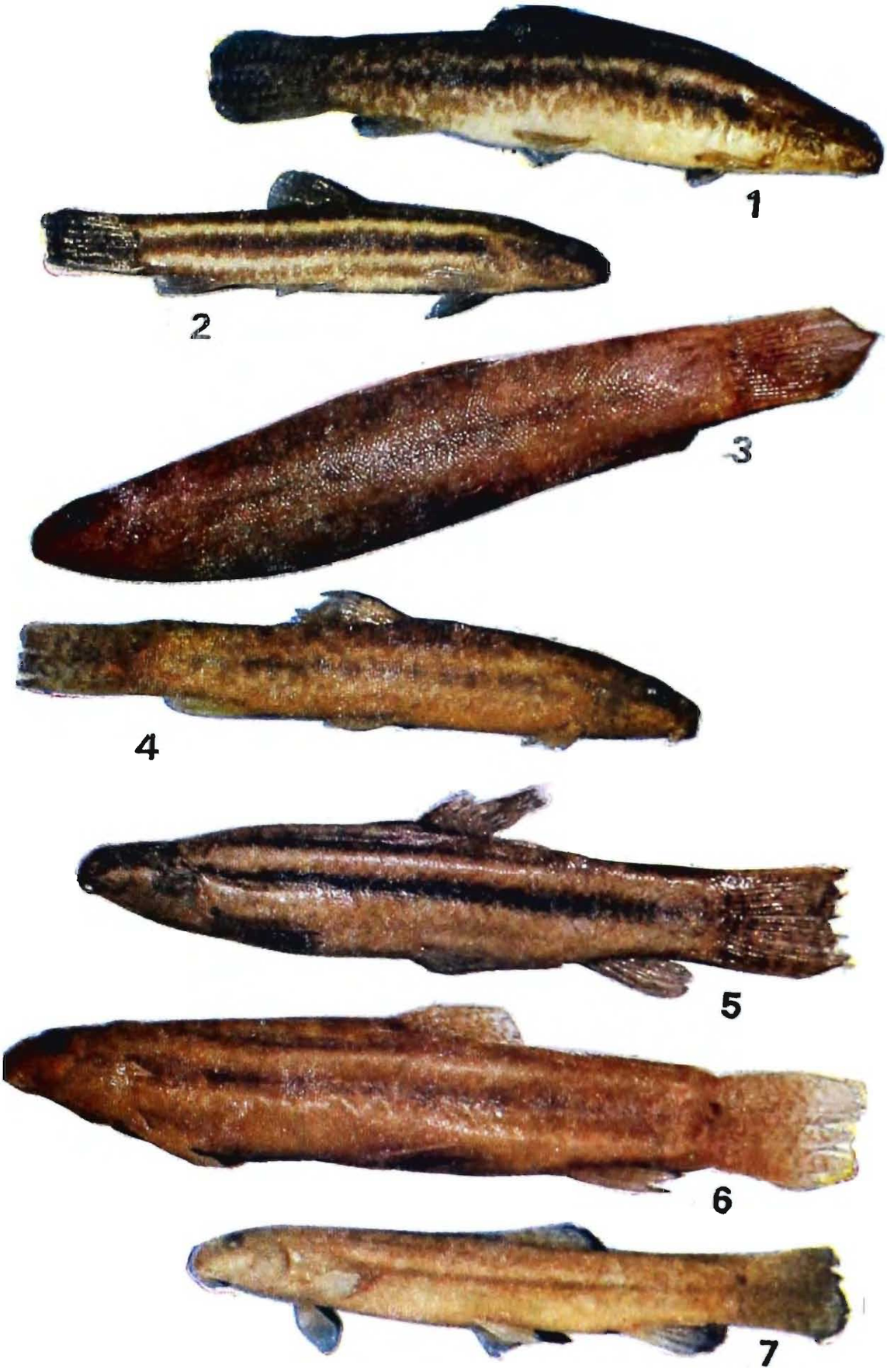


PLATE 5

Colour variation in *Lepidocephalus thermalis* (Val).

Fig. 1 *Lepidocephalus thermalis* (Val.) Nasik. Maharashtra (Godavari drainage), 20.0 mm SL., enlarged.

Fig. 2. *Lepidocephalus thermalis* (Val). Khed. Poona (Krishna drainages), 40.0 mm SL., enlarged.

Fig. 3. *Lepidocephalus thermalis* (Val.). Nallamalai, Karnool, (Krishna drainage), 35 mm SL., enlarged.

Fig 4. *Lepidocephalus thermalis* (Val.). Cauvery drainage, 40.0 mm SL., enlarged.

Fig. 5. *Lepidocephalus thermalis* (Val.). Mulli, Coimbator (Cauvery drainage), 49 mm SL., enlarged.

Fig. 6. *Lepidocephalus thermalis* (Val.). Trichur, Kerala (Chalakudy drainage), 49 mm SL., enlarged.

Fig. 7. *Lepidocephalus thermalis* (Val.). Thekkadi, Kerala (Periyar drainage), 50.0 mm SL., enlarged.

Fig. 8. *Lepidocephalis thermalis* (Val.). Kalakad, Tamil Nadu (Tambraparni drainage), 46.0 mm SL., enlarged.

MENON PLATE 5

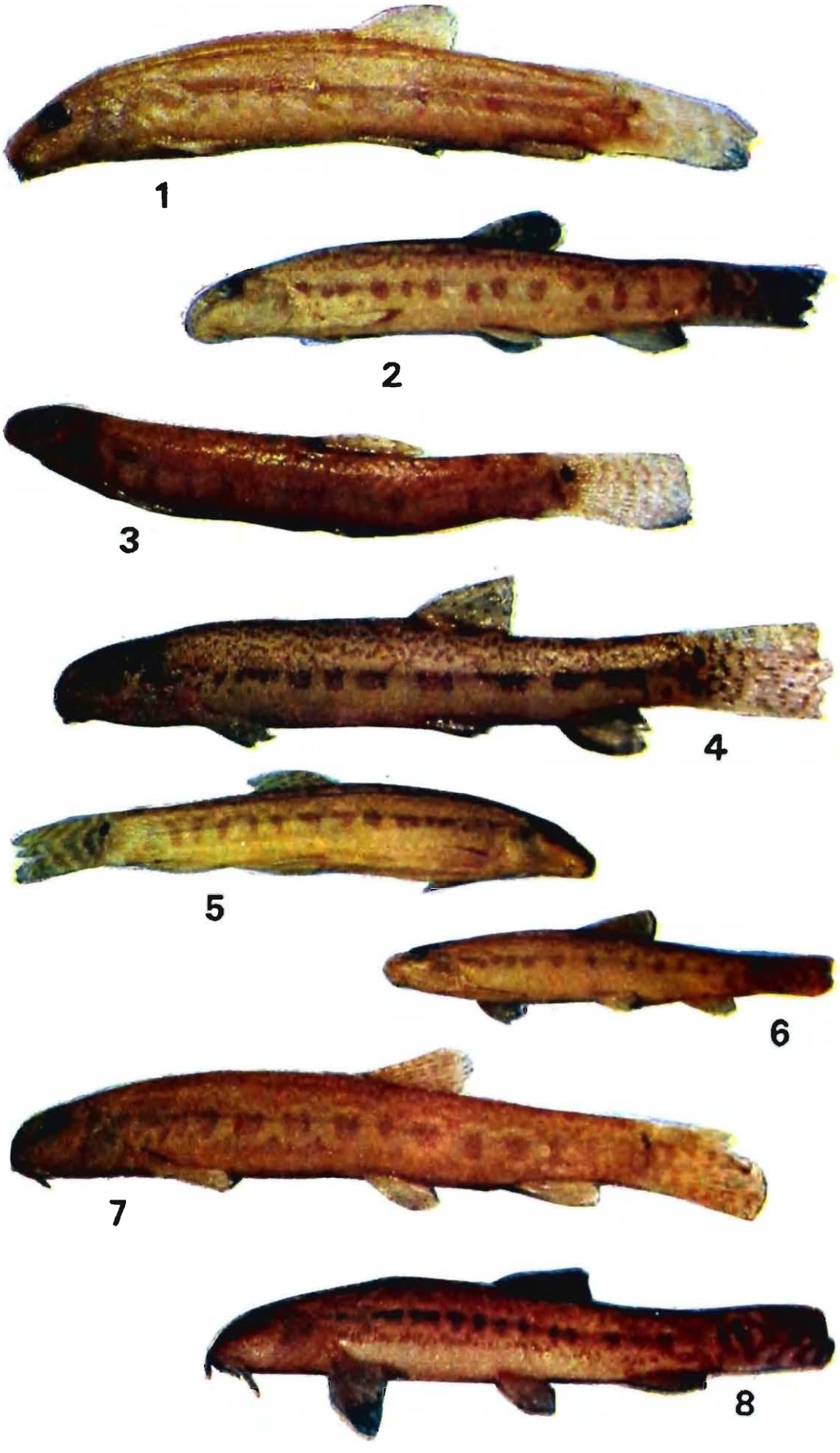


PLATE 6

The Cobitini of India

Fig. 1 *Lepidocephalus coromandelensis* sp. Araku Valley, Andhra Pradesh (Godavari drainage,) 51.0 mm SL.. enlarged.

Fig. 2. *Lepidocephalus berdmorei* (Blyth). Manipur (Chindwin drainage), 74.0 mm SL , enlarged.

Fig. 3. *Lepidocephalus annandalei* Chaudhuri, Mahananda R., Siliguri, W. Bengal, (Tista drainage), 33.0 mm SL., enlarged.

Fig. 4. *Somileptus gongota* Swainson, Goalpara, Assam (Brahmaputra drainage), 96.0 mm SL , enlarged.

Fig. 5. *Misgurnus anguillicaudatus* (Cantor). Yunnan, (Irrawaddy drainage) 74.0 mm SL., enlarged.

Fig. 6. *Lepidocephalus goalparensis* Pillai & Yazdani. Sailani R., Amanat Garh, Saharanpur Dist., U. P. 32 mm SL., enlarged.

Fig. 7. *Lepidocephalus goalparensis* Pillai & Yazdani, Dawki Stream Meghalaya, 33.5 mm SL., enlarged.

MENON PLATE 6

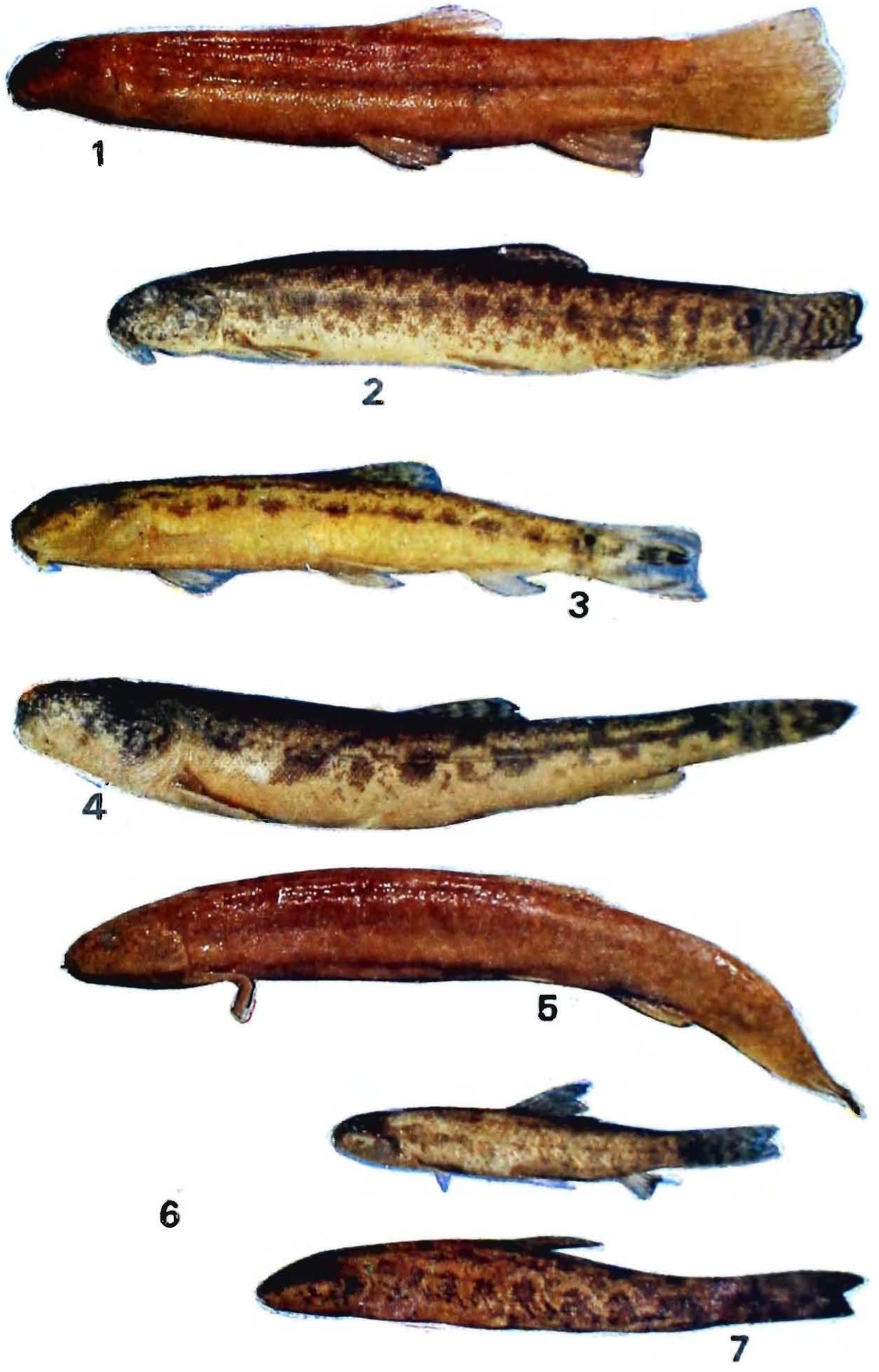


PLATE 7

The Botini and Cobitini of India

Fig. 1 *Lepidocephalus irrorata* Hora, Manipur, 26.0 mm SL. enlarged.

Fig. 2. *Acauthophthalmus pangia* (Hamilton). Maniupr, 35.0 mm SL, enlarged.

Fig. 3. *Acanthopsis cholrorhynchus* (Bleeker) S. Shan State, Burma, 55.0 SL, enlarged.

Fig. 4. *Acanthophthalmus longipinnis* sp. nov. Kharungpat Lake, 20.0 km., from Imphal, Manipur, 67.0 mm SL. enlarged.

Fig. 5. *Botia birdi* Chaudhuri Jhelum R, Srinagar, Kashmir Valley, ♂0.0 mm SL. enlarged.

Fig. 6. *Botia Birdi* Chaudhuri, Jhelum R. Srinagar, Kashmir Valley, 110,0 mm SL. enlarged Female.

Fig. 7 *Botia daria (Hamliton)*. Golapara Assam, 46.0 mmSL. enlarged.

Fig. 8. *Botia daria* (Hamilton). Goalpara Assam, 32.0 mm SL. Juvenile enlarged.

MENON PLATE 7

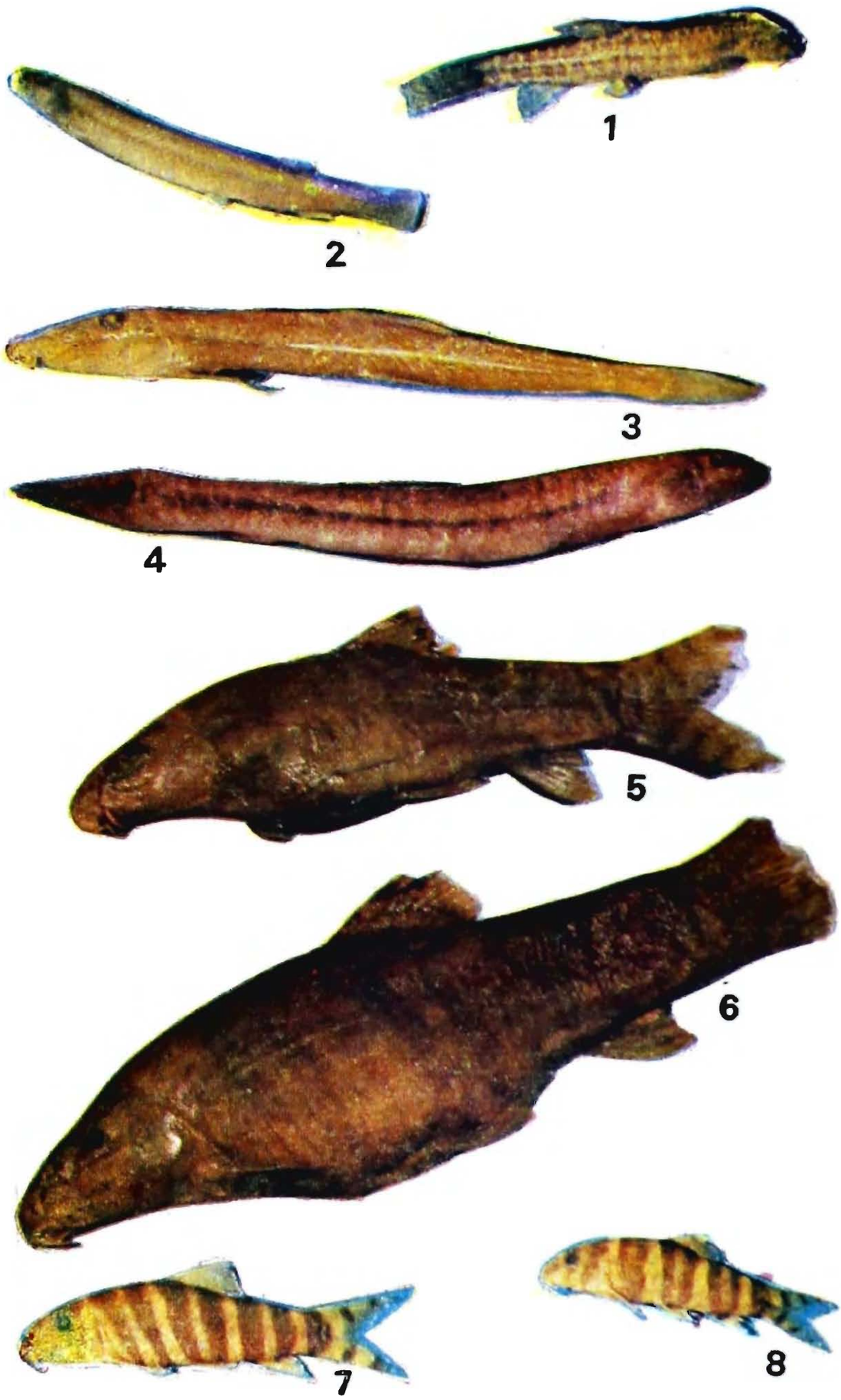


PLATE 8

Colour variation in *Lepidocephalus thermalis* (Val.). *L. guntea* (Ham.). & *L. berdmorei* (Blyth).

Fig. 1 *Lepidocephalus guntea* (Ham.). Karala R. Jalpaiguri, W. Bengal, 63.0 mm SL., enlarged O

Fig: 2. *Lepidocephalus guntea* (Ham.), Karala R. Jalpaiguri, W Bengal, 67.5 mm SL, enlarged O

Fig, 3. *Lepidocephalus thermalis* (Val.). Poeud, Poona, 45 0 mm SL, enlarged.

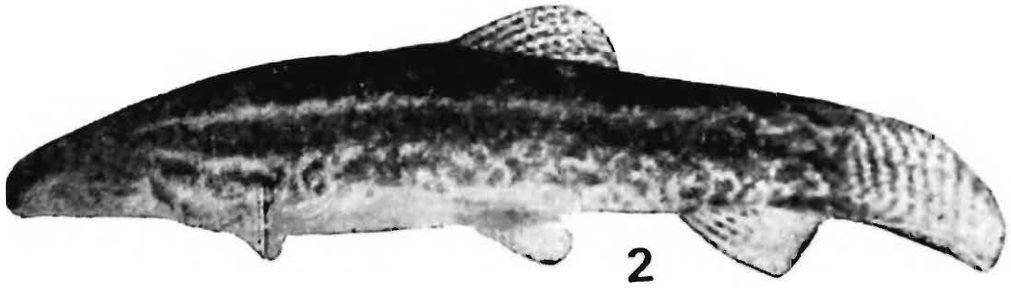
Fig. 4. *Lepidocephalus thermalis* (Val.). Mulli R , Mulli, Coimbatore Dist., 50.0 mm SL, enlarged.

Fig 5. *Lepidocephalus thermalis* (Val.) Sri Lanka, 32 0mm SL. enlarged.

Fig. 6. *Lepidocephalus berdmorei* (Blyth). S. Shan States, Burma, 47.0 mm SL. enlarged,

MENON PLATE 8

1



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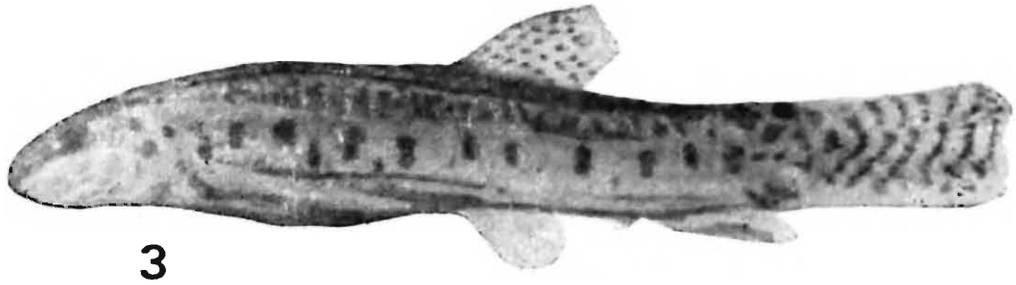

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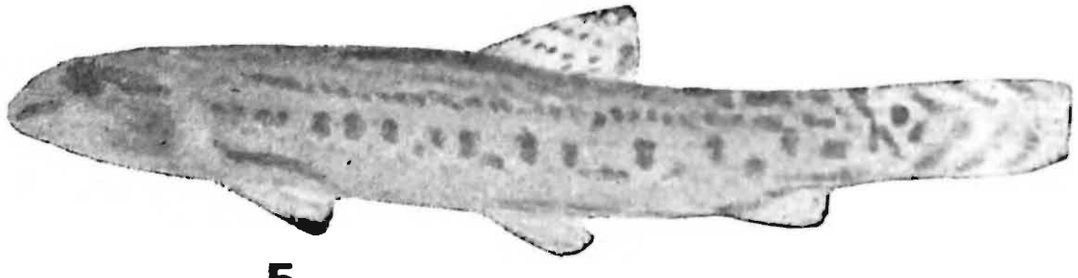

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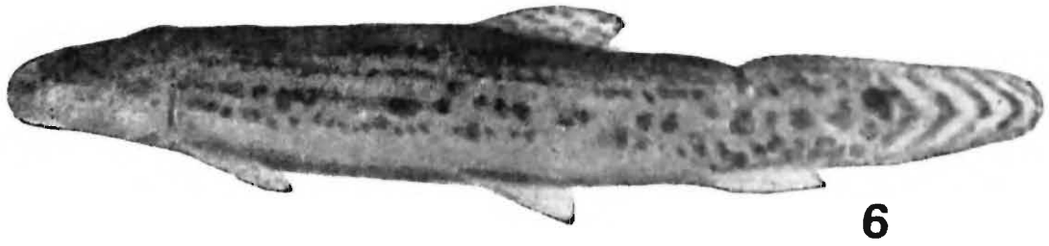

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PLATE 9

Colour variation in the Botini

Fig. 1 *Botia birdi* Chaudhuri. Kashmir Valley, 90.0 mm SL, enlarged.

Fig. 2. *Botia birdi* Chaudhuri. Kashmir Valley, 75.0 mm SL, enlarged Young.

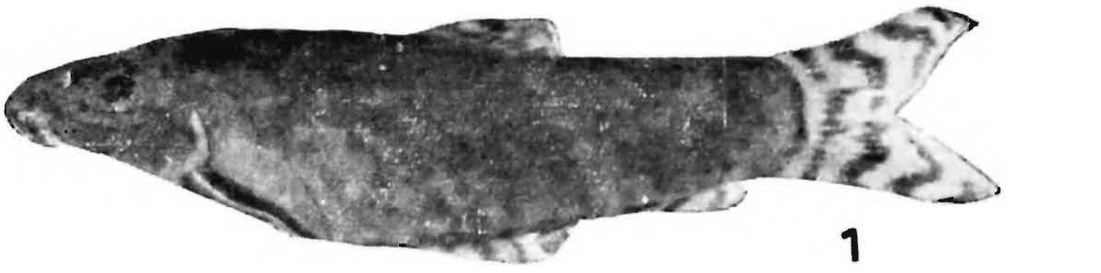
Fig. 3. *Botia histrionica* Blyth. Manipur, 82.0 mm SL, enlarged.

Fig. 4. *Botia dario* (Ham.) Goalpara, Assam, 67.0 mm SL, enlarged.

Fig. 5. *Botia berdomorei* (Blyth.) Manipur, 56.0 mm SL, enlarged.

Fig. 6. *Botia almorhae* Gray. Kosi R., Almora, 40.0 mm SL, enlarged, Young.

MENON PLATE 9



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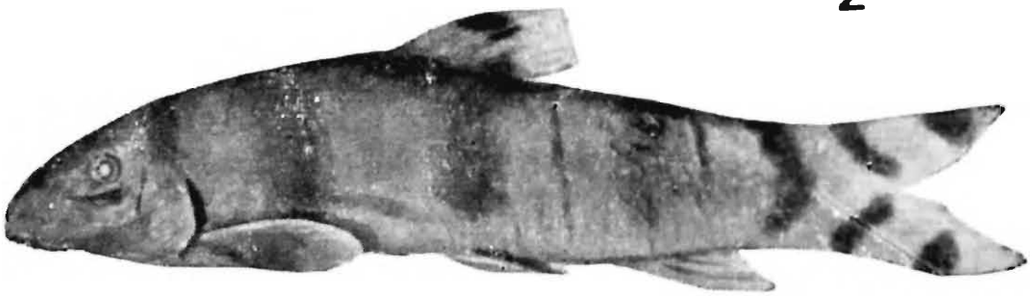
2



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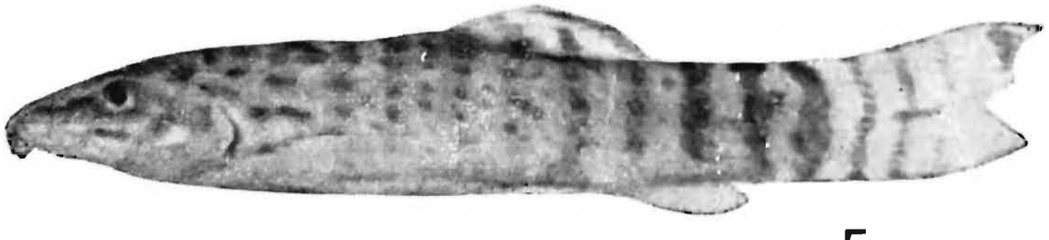

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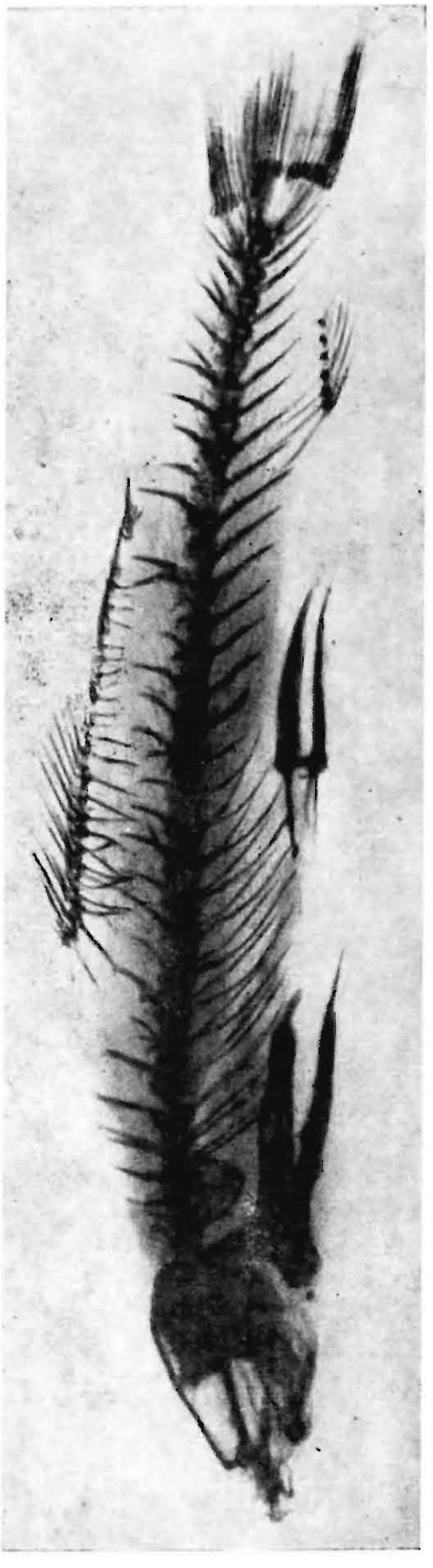
MENON

PLATE 10



Radiograph of *Enobarbichthys maculatus* Day holotype.
BM No. 68.10.27.36.