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VOL. II

**TELEOSTOMI : CLUPEIFORMES, BATHYCLUPEI-
FORMES, GALAXIIFORMES, SCOPELIFORMES
AND ATELEOPIIFORMES**

BY

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EDITOR'S NOTE

The present volume comprising the five orders Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes and Ateleopiformes, is the second in the *Fauna of India* series on Fishes by the late Dr. K. S. Misra. These fishes are of considerable interest in Indian waters to merit a separate volume.

Clupeoid fishes play a significant role in fisheries throughout south-east Asia, but past mis-identifications have rendered some otherwise valuable biological data less useful. Though Francis Day's descriptions in the *Fauna of British India* series on Fishes, published in 1889, are still useful, many diagnostic features essential to modern clupeoid systematics were not dealt with. I hope that the present volume fulfills these shortcomings and that this work shall be welcomed by both the ichthyologist and the fishery biologist. I am aware that a good amount of critical work on this group of fishes has been published in recent years. The types of Bleeker, Richardson, Lacépède, Cuvier and Valenciennes, Steindachner and Francis Day have been studied only recently by P.J.P. Whitehead and his collaborators. The text of the present volume was, however, written many years ago, hence partly to alleviate the position, references to the recent important nomenclatural changes and additions of new taxa have been given as footnotes.

Dr. K. S. Misra was fortunate in having his initial training under the eminent ichthyologist Dr. Sundar Lal Hora. Dr. Misra expired in March 1969 after a successful career at the Zoological Survey of India. Unfortunately, he could not see the proof of this volume and the task of correcting it was undertaken with the help of my colleagues in the Publication Division.

INTRODUCTION

This volume, being the second edition of the *Fauna of British India* series on Fishes by Dr. F. Day, is the second series under the *Fauna of India* on Pisces; the volume deals with five orders, Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes and Ateleopiformes, and comprises 169 species (including 6 subspecies) belonging to 28 families and 78 genera. In Day's volume 68 species belonging to three orders Clupeiformes, Galaxiiformes and Scopeliformes consisting of 5 families and 21 genera, are recorded. The increase in number of species as compared to species mentioned in Day's volume is due to the later works on the collections* made by R.I.M.S. "Investigator" (Marine Survey : 1884—1926); "Valdivia" (1898—1899); H.E.M.S. "Mabahiss" (John Murray Expedition : 1933—1934) and the Chilka Lake Survey (1913 and 1915).

The classification adopted is after L. S. Berg's "Classification of fishes both recent and fossil" *Trav. Inst. Zool. Acad. Sci. U. S. S. R.*, Leningrad, 5, pp. 87—517, figs. 1—190, 1940.

The keys are artificial and not strictly phylogenetical. They are purely regional in application and deal only with species, genera, families and other higher taxonomic categories treated in this volume. A running field key for the identification of the 169 species (including 6 subspecies) of the orders Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes and Ateleopiformes is given at the end.

Subspecies, species and genera are numbered in Arabic numerals; families, superfamilies, orders and superorders and classes in capital Roman numerals while subgenera, subfamilies, suborders and subclasses in small Roman numerals; their numbers are serially in continuation with the first volume of the series. Arabic or Roman numerals precede the respective systematic categories.

*For details regarding the cruises of the important marine ships, vide, *Fauna of India*, Pisces, I, p. viii (1969).

Classes and orders are in All Caps Roman; subclasses and suborders in all Caps Italics; superfamilies and families in Cap and Small Caps Roman; subfamilies in Cap and small Caps Italics; genera, subgenera, species and subspecies in Antique while occurring above synonymies, and genera and subgenera in Antique while occurring in keys.

The species under each genus have been arranged alphabetically. In the synonymies the first is the original reference with the type locality, and as far as possible the name of the institution where the type is deposited is given; others are with respect to the confines of the Indian region and beyond. A selection of other references which are important is also given. Relevant vernacular names of the species are given along with the standardised Indian vernacular names wherever available, below the specific synonymy.

Descriptions of the species are based mostly on those by F. Day and A. Alcock, and wherever necessary either after original authors or on specimens available in the collections of the Zoological Survey of India. As regards illustrations those copied from other works are duly acknowledged in the legends of the text-figures and plates. In this connection special thanks are due to Messrs Veb Gustav Fischer Verlag, Jena for their kind permission to reproduce the following illustrations from their valuable publication entitled "Deutsche Tiefsee-Expedition" Valdivia 1898-1899 : "Die Tiefsee-Fishche" by Dr. A. Brauer, 1906—1908; pl. iv. figs. 1, 2, 3; pl. vi. figs. 2, 3, 6 and text-figures, 5a, 6a, 15, 27, 30, 41, 43, 46, 47, 64, 68, 72, 116, 127, 138, 144 and 163.

The total number of species dealt with in this volume is 169 (including 6 subspecies), consisting of 85 littoral, 3 land-locked, exotic and 81 bathypelagic species. All the littoral or semipelagic species are in the 20°C. isotherm. Out of the 81 bathypelagic species, 48 are in 20°C. and 21 in both 20°C. and 12°C. isotherms. Of the remaining 10 species and 2 subspecies, one species, *Nansenia graenlandicus* (Reinhardt) is restricted to 20°C. isotherm and beyond 6°C. isotherm in the arctic zone; five species, *Goniichthys coccoi* (Cocco), *Malacosteus niger* Ayres, *Argyropelecus hemigymnus* Cocco, *A. aculeatus* V. and *Sternoptyx*

diaphana Herm. are distributed in 20°C., 12°C., and 6°C. isotherms, while two species, *Cyclothone acclinidens* Garman and *Idiacanthus fasciola* Ptrs. have been recorded in 20°C. and 12°C isotherms and beyond 6°C. in the antarctic zone; one subspecies, *Cyclothone signata signata* Garman and one species *Argyropelecus olfersii* (C.) are distributed in 20°C., 12°C. and 6°C. isotherms and beyond 6°C. in the arctic zone; *Argyropelecus sladeni* Regan is restricted to 20°C. isotherm and beyond 6°C. in the antarctic zone, while another subspecies, *Cyclothone microdon microdon* Gthr. is remarkable in having been recorded from 20°C., 12°C. and 6°C. isotherms and beyond 6°C. both in the arctic and antarctic zones. One landlocked species and 2 subspecies are exotic and freshwater viz., *S. levenensis* Walker, *Salmo gairdneri gairdneri* Richardson and *S. trutta fario* L. These have since a long time, been introduced into the cold climates of the Indian region and are known to breed successfully, subject to snowfall, at altitudes ranging from 2438—2743 m. (8000—9000 ft.) above the sea level and never below it.

Out of the total 166 (including 4 subspecies) littoral and bathypelagic species, 33 are endemic to the Indian region, the rest 133 occurring beyond the Indian region. All the endemic species are in the 20°C. isotherm. Of the 33 endemic species, 16 are littoral, viz., *Ehirava fluviatilis* Deraniyagala, *Stolephorus malabaricus* (Day), *Gudusia variegata* (Day), *Ilisha leschenaulti* (V.), *I. motius* (Ham.), *I. sladeni* (Day), *Gonialosa manmina* (Ham.), *G. modestus* (Day), *Setipinna phasa* (Ham.), *Coilia cantoris* Blkr., *C. ramcarati* (Ham.), *C. quadragesimalis* V., *Thrissocles annandalei* (Chaudhuri), *T. kempfi* (Chaudhuri), *T. rambhae* (Chaudhuri) and *Galaxias indicus* Day. The remaining 18 of the endemic species are bathypelagic or abyssal, having been recorded from depths ranging between 272—2395 metres with bottom temperatures varying from 11.1°C. to 12.3°C. They are *Alepocephalus edentulus* Alc., *A. longiceps* Lloyd, *A. macrops* Lloyd, *Narcetes erimelas* Alc., *Xenodermichthys squamilateralis* Alc., *Leptoderma affinis* Alc., *Platytrichogen mirus* Lloyd, *Aulostomatomorpha phosphorops* Alc., *Triplophos hemingi* (McArdle), *Bathyclupea hoskynii* Alc., *Harpodon squamosus* Alc., *Scope-*

larchus guentheri Alc., *Bathypterois* (*Bathypterois*) *atricolor* Alc., *B. (Hemipterois) guentheri* Alc., *Myctophum indicus* (Day), *Lampanyctus* (*Lepidophanes*) *pyrsobolus* (Alc.), *Stemonosudis elongatus* (Ege).

Out of the 133 species distributed beyond the Indian region, 64 are bathypelagic or abyssal and 69 are littoral or semipelagic. In the 69 littoral species, 9 species viz., *Macrura ilisha* (Ham.), *Gudusia chapra* (Ham.), *Corica soborna* (Ham.), *Ilisha filigera* (V.) *Raconda russelliana* Gray, *Setipinna breviceps* (Cantor), *Coilia reynaldi* V., *Thrissocles purava* (Ham.), and *Xenengraulis spinidens* J. & S. are restricted to the north of Equator, their range of distribution being 0°—35°N., 48°—142°E., while the remaining 60 species extend their range both to north and south of Equator. Out of the remaining 60 species, 14 species viz., *Megalops cyprinoides* (Brouss.), *Harengula vittata* (V.), *Sardinella jussieu* Lac., *S. melanpura* (C.), *S. perforata* (Cantor), *S. sirm* (Walbaum), *Kowala coval* (C.), *Clupanodon punctatus* (Schl.), *Anchoviella indica* (v.Hass.), *Thrissocles baelama* (Forsk.), *Chanos chanos* (Forsk.), *Saurida gracilis* (Q. & G.), *Synodus japonicus* (Houttuyn), *Stolephorus japonica* (Houttuyn) are remarkably cosmopolitan extending from the east coast of Africa eastwards through the Indo-Pacific to the islands of Polynesia beyond 180°E., with a distributional range 35°N.—35°S., 18°E.—149°W. Out of the remaining 46 species, 3 species viz., *Elops saurus* L., *Albula vulpes* (L.) and *Trachinocephalus myops* (Schn.) are cosmopolitan extending their range from the east coast of Africa eastwards through the Indo-Pacific to beyond 180°E. with the distributional range 35°N.—35°S., 18°E.—149°W. and in the Atlantic with the range 5°—87°W., 14°—30°N. Of these 3 species, *Albula vulpes* (L.) has been recorded also from the Mediterranean with the range 36°—38°N., 15°E.—5°W.

Of the remaining 43 littoral species, 12 species, viz., *Sardinella dayi* Regan, *Harengula ovalis* (Bennett), *Macrura kelee* (C.), *Pellona ditchela* V., *Nematalosa nasus* (Bl.), *Anchoviella commersoni* Lac., *Thrissocles malabaricus* (Bl.), *T. setirostris* (Brouss.), *Chirocentrus arab* (Forsk.), *C. nudus* Swns., *Saurida tumbil* (Bl.) and *Synodus indicus* (Day) occur 20°S. or below 20°S. but do not extend eastwards beyond 180°E., thus showing a distributional range 35°N.—

33°S., 28°—180°E. Of the remaining 31 littoral species 4 species viz., *Dussumieria hasselii* Blkr., *Anchoviella heterolobus* (Rupp.), *Thrissocles hamiltonii* Gray, and *T. myx-tax* (Schn.) restrict their range between 13°S. and 18°S. of the Equator with the distributional range 35°N.—18°S., 39°—180°E.

The remaining 27 littoral species viz., *Dussumieria acuta* V., *Sardinella albella* (V.), *S. clupeioides* (Blkr.), *S. fimbriata* (V.), *S. longiceps* V., *S. sindensis* (Day), *Macrura sinensis* (L.), *Ilisha brachysoma* (Blkr.), *I. elongata* (Benn.), *I. indica* (Swns.), *I. kampani* (Web. & de Bft.), *I. melastoma* (C.), *I. novacula* (V.), *Opisthopterus tardoore* (C.), *Clupanodon thrissa* (L.), *Anodontostoma chacunda* (Ham.), *Setipinna taty* (V.), *Coilia dussumieri* V., *C. borneensis* (Blkr.), *Anchoviella tri* (Blkr.), *Pellona hoevenii* Blkr., *Thrissocles dussumieri* (V.), *T. kammalensis* (Blkr.), *T. valenciennesi* (Blkr.), *Notopterus chitala* (Ham.), *N. notopterus* (Pallas) and *Harpodon nehereus* (Ham.) extend their distribution between 2°S. and 10°S. of the Equator, not occurring beyond 150°E., within the range 35°N.—7°S., 38°—140°E.

Out of the 60 species and 4 subspecies which are non-endemic, bathypelagic or abyssal 19 species viz., *Alepocephalus bicolor* Alc., *A. blandfordi* Alc., *A. microlepis* Lloyd, *Bathytroctes macrolepis* Gthr., *B. squamosus* Alc., *Diogenichthys panurgus* Bolin, *Xenodermichthys guentheri* Alc., *Yarrella corythaeolum* (Alc.), *Stomias nebulosus* Alc., *Chauliodus pammelas* Alc., *Saurida undosquamis* (Rich.), *Evermannella atratus* (Alc.), *Bathypterois* (*Bathypterois*) *insulanum* Alc., *Benthosema fibulatum* (G. & C.), *B. pterotus* Alc., *Lampanyctus* (*Lampanyctus*) *macropterus* (Br.), *Diaphus* (*Lamprossa*) *coeruleus* (Klunz.), *Scopelengys tristis* Alc. and *Ateleopus indicus* (Wood-Mason & Alc.) have been recorded only from the Indo-Pacific region from the Cape of Good Hope to the western coasts of Central America within the distributional range 35°N.—35°S. 18°E.—80°W., at depths varying from 343—3931 m., in bottom temperatures 13.3°C. to 2.1°C. Out of these 19 species, 5 species viz., *Alepocephalus microlepis* Lloyd, *Xenodermichthys guentheri* Alc., *Diogenichthys panurgus* Bolin, *Benthosema fibulatum* (G. & C.) and *Scopelengys tristis* Alc., are restricted to the north of the Equator, their range of distribution being 0°—23°N., 53°E.—80°W., at depths

varying from 343—3289 m., in bottom temperatures 17.2°C — 2.1°C ., while 5 species viz., *Yarrella corythaeolum* (Alc.), *Saurida undosquamis* Rich., *Bathypterois* (*Bathypterois*) *insularum* Alc., *Benthosema pterotus* (Alc.) and *Diaphus* (*Lamprossa*) *coeruleus* (Klunz.) extend their range beyond 20° south of the Equator, in depths varying from 457—2084 m. and temperatures 13.3°C .— 3.18°C .; 9 species, viz., *Alepocephalus blandfordi* Alc., *A. bicolor* Alc., *Bathytroctes macrolepis* Gthr., *B. squamosus* Alc., *Stomias nebulosus* Alc., *Chauliodus pammelas* Alc., *Lampanyctus* (*Lampanyctus*) *macropterus* Br., *Ateleopus indicus* (Wood-Mason & Alcock) and *Evermannella atratus* (Alc.), restrict their range between 2° — 10° south of the Equator in depths varying from 430—1650 m. and bottom temperatures 12.12°C .— 2.2°C .

Eight species viz., *Bathytroctes microlepis* Gthr., *Platytroctes apus* Gthr., *Photostomias guerni* Collet, *Astronesthes martensii* Klunz., *Bathylchnus cyaneus* Br., *Melanostomias melanops* Br., *Diaphus* (*Lamprossa*) *garmani* Gilbert and *Vinciguerria nimbarius* (J. & W.) occur north of the Equator both in the Indo-Pacific and Atlantic Oceans, their range in the Indian Ocean being 4° — 24°N ., 39° — 94°E ., and in the Atlantic 0° — 39°N ., 7° — 83°W .

Four species viz., *Gonostoma elongatum* Gthr., *Polyipnus spinosus* Gthr., *Lampanyctus* (*Lepidophanes*) *longipes* Br., and *Neoscopelus macrolepidotus* Johnson, have been recorded north and south of the Equator in the Indo-Pacific region and north of the Equator in the Atlantic Ocean within the ranges 33°N .— 35°S ., 18°E .— 178°W ., and 0° — 41°N ., 7°E .— 80°W . respectively; one species viz., *Chlorophthalmus agassizi* Bonap. has been recorded north and south of the Equator in the Indo-Pacific and the Mediterranean with the distributional range 20°N .— 35°S ., 18°E .— 155°W . and $38^{\circ}13' \text{N}$., $15^{\circ}13' \text{E}$. respectively.

One species *Diaphus* (*Lamprossa*) *splendidum* (Br.) shows a distributional range 35°N .— 20°S ., 42° — 135°E ., north and south of Equator in the Indo-Pacific and 3° — 9°S ., 7° — 9°E . south of the Equator in the Atlantic.

One species *Stomias affinis* Gthr. has been found north of the equator in the Indo-Pacific and north and south of the Equator in the Atlantic within the range 0° — 15°N ., 41° — 98°E . and 30°N .— 5°S ., 11°E .— 87°W respectively.

Of the remaining 26 species and 4 subspecies, 12 species and 2 subspecies, viz., *Bathytroctes rostratus* Gthr., *Cyclothone microdon pallida* Br., *C. signata alba* Br., *C. obscura* Br., *Valenciennellus stellatus* Garman, *Argyropelecus affinis* Garman, *Astronesthes indicus* Br., *Diogenichthys laternatum* (Garman), *Vinciguerria lucetius* (Garman), *Hygophum reinhardti* (Lutken), *Myctophum spinosum* (Steind.), *Notolychnus valdiviae* (Br.), *Diaphus (Pantophos) dumerili* (Blkr.) and *Diaphus (Diaphus) lulkeni* Br. occur both to the south and north of the Equator in the Indo-Pacific as well as in the Atlantic, their range of distribution being 34°N.—40°S., 18°E.—74°W., 44°N.—37°S., 16°E.—87°W. respectively. Two species viz., *Chauliodus sloani* Schn., and *Diaphus (Diaphus) rafinesquii* (Cocco) occur both to the south and north of the Equator in the Indo-Pacific and in the Atlantic and also have been recorded from the Mediterranean, their range of distribution being 35°N.—29°S., 30°E.—140°W in the Indo-Pacific, 37°N.—40°S., 16°E.—87°W in the Atlantic and 36°—38°N., 14°—15°E. in the Mediterranean. One species, *Paralepis elongatus* (Br.) shows a restricted range occurring north and south of the equator in the Indian and Atlantic Oceans, its range of distribution being 7°1'2"N.—29°S., 30°30'—85°56'5" E. in the Indian Ocean and 2°36'5" N.—3°55'S., 3°27'5"—7°48'5" E. in the Atlantic Ocean.

One species viz. *Lampanyctus (Lampanyctus) crocodilus* (Risso) has been recorded north of the Equator in the Arabian Sea and the Atlantic and also from the Mediterranean in the ranges 22°14'25" N., 67° 8'55" E., 39° 39'45" N., 71° 35'15" W., and 38° 13' N., 15° 13' E. respectively.

Out of the remaining 10 species and 2 subspecies, *Nansenia graenlandicus* (Reinhardt) has been recorded from north and south of the Equator in the Indian Ocean and in the Atlantic sector of the Arctic Ocean within the ranges 4° N.—29° S., 30°—73° E., and 72°N., 40° W respectively; *Cyclothone acclinidens* Garman has been recorded from north and south of the Equator in the Indian Ocean and Atlantic and also from the Atlantic sector of the Antarctic within the ranges 24°N.—26°S., 41°—97°E., 37°N.—28°S., 9°E.—21°W. and 56°31' S., 14°29' E., respectively; *Cyclothone microdon microdon* Günther has been recorded from north and south of the Equator both in the Indo-Pacific and the Atlantic, from the Atlantic sector of the Arctic and also from the Atlantic sector of the Antarctic in the ranges

11°N.—50°S., 18°E.—90°W., 40°N.—50°S., 18°E.—88°W.,
 65°—67°N., 30°—58°W., 53°—62°S., 95°E.—57°W
 respectively; *Cyclothone signata signata* Garman has been
 recorded from north and south of the Equator both in the
 Indian and Atlantic Oceans and also from the Atlantic
 sector of the Arctic Ocean in the ranges 13° N.—30° S.,
 48°—97°E., 31°N.—37°S., 18°E.—21°W., and 61°21' N.,
 80° 41' W respectively. *Sternoptyx diaphana* Herm. has
 been recorded from north and south of the Equator both in
 the Indo-Pacific and Atlantic and also from the subarctic
 sector of the Atlantic in the ranges 35°N.—47°S., 18° E.—
 115°W., 46°N.—35°S., 16°E.—87°W and 46°N., 56°W.
 respectively; *Argyropelecus aculeatus* V has been recorded
 north and south of the Equator both in the Indian and
 Atlantic Oceans and also from the coast of Norway in the
 subarctic sector of the Atlantic in the ranges 20°N.—32°S.,
 39°—99°E., 32°N.—35°S., 16°E.—87° W and 10°E., 70°N.
 respectively; *Argyropelecus hemigymnus* Cocco has been
 recorded north and south of the Equator both in the
 Indian and Atlantic Oceans and also from the Mediterranean
 and subarctic sector of the Atlantic in the ranges 12°N.—
 30°S., 51°—97°E., 39°N.—35°N., 27°—87°W., 38°N.,
 15°E. and 60°—64°N., 1°—7°W., respectively; *Argyro-*
pelecus olfersii (C.) has been recorded north and south
 of the Equator both in the Indian and Atlantic Oceans,
 from the subarctic sector of the Atlantic and also from
 the Arctic ocean in the ranges 9°N.—35°S., 18°E.—
 79°W., 63°N.—3°S., 7°E.—74° W., and 71°N., 25°E. respec-
 tively; *Argyropelecus sladeni* Regan has been recorded
 from north and south of the Equator both in
 the Indian and Atlantic Oceans and also from the
 Atlantic sector of the Antarctic in the ranges 12°N.—
 5°S., 41°—65°E., 12°N.—15°S., 11°E.—20°W. and
 61°25' 30" S., 53°46' W respectively; *Malacosteus niger*
 Ayres has been recorded north and south of the Equator
 both in the Indian and Atlantic Oceans and also from
 the subarctic sector of the Atlantic in the ranges
 13°N.—10°S., 46°—97°E., 42°N.—33°S., 15°E.—70°W.
 respectively; *Idiacanthus fasciola* Peters has been record-
 ed from north and south of the Equator in the Indian and
 Atlantic oceans and also in the subantarctic sector of the
 Atlantic in the ranges 7°1'2"N—36°23' 4"S., 17°38'1"—130°
 E., 6°40'—40°7'N., 7°26'—87°30'W., and 56°31'S., 14°29'
 2"E., respectively; and *Gonichthys coccoi* (Cocco) has been
 recorded from north and south of the Equator in

the Indo-Pacific and the Atlantic, from the subarctic sector of the Atlantic and also from the Mediterranean in the ranges 34°N.—31°S., 18°E.—71°W., 46°N.—38°S., 2°E.—70°W., and 37°35' N., 14°10' E. respectively.

Littoral or semipelagic species occur in waters within the continental shelf in depths less than 200 metres. Bathypelagic species inhabit waters beyond the continental shelf in depths below 200 metres. Abyssal species occur in waters beyond the continental slope in depths below 2000 metres. Out of the total 81 bathypelagic species 36 have been recorded both from the bathypelagic and abyssal zones, 3 from the abyssal zone and 42 from the bathypelagic zone (200—2000 m.). The bathypelagic species are, thus, found to have a wide vertical range being capable of migrating upwards and downwards.

In the total 169 species of fishes of the Orders Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes and Ateleopiformes of the Indian region, 85 are littoral or semipelagic, 3 land-locked and exotic and 81 are bathypelagic or abyssal. The Order Clupeiformes consists of 78 littoral, 3 exotic and land-locked and 48 bathypelagic species. The Orders Bathyclupeiformes and Galaxiiformes are represented by a single species in each, of which the former is bathypelagic and the latter littoral. In the Order Scopeliformes 6 species are littoral and 31 bathypelagic or abyssal. The Order Ateleopiformes is represented by a single bathypelagic species. In other words, out of the total 169 species dealt with here, 129 belong to the Order Clupeiformes, 37 to the Order Scopeliformes and one each to the Orders Bathyclupeiformes, Galaxiiformes and Ateleopiformes. Thus the orders Clupeiformes and Scopeliformes together consists of 166 species, out of which 78 are bathypelagic and 85 littoral and 3 land-locked freshwater. Of the 81 bathypelagic species 17 are endemic to the Indian region while 64 are non-endemic to the Indian region. All the 85 littoral species have a restricted range in the Indo-Pacific and tropical Atlantic. *Bathyclupea haskynii* Alc., the single species representing the Order Bathyclupeiformes and *Galaxias indicus* Day, the single

representative of the Order Galaxiiformes are restricted in their range to the Bay of Bengal and the littoral districts of Madras, W Bengal and Bangladesh respectively, while the sole species *Ateleopus indicus* Wood-Mason & Alcock of the Order Ateleopiformes has been recorded only from the Arabian Sea, Bay of Bengal and the Philippine seas.

While the bathypelagic species are not affected by such physical barriers as the isotherms, and extend their distribution in all the five oceans, the littoral species evince a distributional pattern quite characteristic of them, by not penetrating into the cold waters of the Atlantic west of the Cape of Good Hope. The littoral and semipelagic species of the Indian region extend their range from the Red Sea and the east coast of Africa, through the Indo-Pacific eastwards even as far as to the east coast of tropical North and South America, but their range towards the west is restricted beyond the west of the Cape of Good Hope. This is due to the fact that the 12°C. isotherm (Plate I) bordering the south-west coast of Africa beyond west of the Cape of Good Hope and extending up to 22°S. latitude, serves as physical barrier for the free intermingling of the fishes of the Atlantic with those of the Indian region. However, it is possible that some of the species occurring exclusively in 20°C. isotherm may often extend their range to 12°C. isotherm in the Mediterranean and temperate Atlantic as and when surface temperature conditions there become favourable during summer months of the year.

Among the 17 littoral, semipelagic species extending their range eastwards beyond 180°E., *Albula vulpes* (L.), with its type-locality in the Bahama Is., Atlantic, is singular in its occurrence in the Indo-Pacific region. The occurrence of some Mediterranean and tropical Atlantic species in the Indo-Pacific and some Indo-Pacific species in the tropical Atlantic and the Mediterranean may be explained (Günther, 1880; Alcock, 1899, Norman, 1931) by the configuration of the land masses during the Eocene period when the Mediterranean Sea extended eastwards and opened into the Indian Ocean, and the isthmus of Panama

was submerged under sea and the Atlantic and Pacific Oceans were continuous, thus making it possible for an intermingling of the species. Smith (1953) has suggested that species common to the Indo-Pacific and the tropical Atlantic and the Mediterranean may be "relics of intermingling, for not very long ago in geological time conditions were different, and there was almost certainly a warm water connection between the Indian and Atlantic Oceans." Besides, the recent and artificially constructed Panama and Suez canals may have to some extent served as connecting passage for a free dispersal of species in certain cases.

In the preparation of this volume considerable use has been made of the vast literature on the orders Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliiformes and Ateleopiformes, reference to which may be made from the generic and specific synonymies and from the "References" given towards the end.

A few explanations for certain terms used are given below :—

(a) *For measurements.*—

1. *Trunk* is measured from tip of snout to the vent.
2. *Total length* is measured from the anteriormost tip of head (upper or lower jaw as the case may be) to end of tail fin (extremity of upper or lower lobe as the case may be).
3. *Standard length* is measured from the snout tip to the posterior edge of hypural.
4. *Head length* is taken from the tip of snout to the posterior edge of opercle including opercular spine wherever present.
5. *Snout length* is measured from the tip of snout to the anterior margin of eye.
6. *Eye diameter* is measured from margin to margin of the bony orbit.
7. *Depth of body* is taken as the vertical distance through the body at its deepest part.

8. *Least height of caudal peduncle* is the measurement taken at its narrowest part.
9. *Length of caudal peduncle* is measured from behind the last anal ray to the posterior edge of hypural.
10. *Width of head* is taken at its widest part.
11. *Interorbital width* is the distance between the eyes superiorly.

(b) *For taxonomic terms.*—

1. *Orthotype* is the type of a genus as indicated or distinctly implied by the original author.
2. *Logotype* is the type of a genus selected by the first “reviser”.
3. *Haplotype* or *monotype* is the sole species mentioned under a genus and so is an orthotype as well.
4. *Tautotype* is a name of a genus identical with the specific name of the species.
5. *Genotype* is the single species upon which a genus is based.
6. *Lectotype* is a specimen chosen as a holotype from the cotypes of a species.

The limits of the area on which the marine species are described in this volume, are as that defined in the Introduction of the first volume. For the freshwater species the limits of the areas are the political boundaries of India, Pakistan, Nepal, Burma and Ceylon.

K. S. MISRA, D. Sc.

ZOOLOGICAL SURVEY OF INDIA

CALCUTTA, JUNE 27TH, 1963.

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III. Class TELEOSTOMI

Endoskeleton bony, sometimes cartilaginous. Membrane bones of head well developed. Skull hyostylic, sometimes amphistylic. Skull with sutures. Endocranium ossified. Optic nerves forming solid chiasma or not forming solid chiasma. Plato-quadrate not fused with endocranium. Fin rays with pterygials. 4 pairs of gill arches ; 5th pair modified into tooth-bearing lower pharyngeal. Gills with outer edges free ; their bases attached to bony arches. A single lateral gill opening on either side of pharynx covered by operculum or a single ventral gill opening in pharynx. Heart divided into auricle, ventricle and arterial bulb. Arterial bulb either muscular with numerous valves or thin with a pair of opposite valves. Branchial septa reduced. Branchial lamellæ with double row of branchial rays. No spiracle. No intestinal valve. No nictitating membrane. Air bladder or lung. No cloaca except in *Nerophis aequoreus* (L.). No pterygopodia but some with gonopodium. Ova small. Mostly oviparous ; a few viviparous.

Lower Devonian to recent.

The class TELEOSTOMI is divided into two subclasses.

CROSSOPTERYGII and *ACTINOPTERYGII*

Key to subclasses of class TELEOSTOMI

1. Radials of paired fins arranged biserially (fossils except order COELACANTHIFORMES, not yet found in the Indian region) *CROSSOPTERYGII*
2. Radials of paired fins not arranged biserially (mostly living, found in the Indian region) *ACTINOPTERYGII*

iii. Subclass *CROSSOPTERYGII*

Endocranium usually divided. Parasphenoid without ascendent processes. Pineal foramen present or absent. Claviæ. Squamosal with jugal sensory canal. Internal

nares. Radial of paired fins biserial. A pair of large gular plates. No branchiostegal rays. Caudal fin heterocercal, diphyrcercal, hetero-diphyrcercal or gephyrocercal. Scales rhombic or cycloid, inverted by a layer of enamel-like ganoin.

Lower Devonian to recent; not recorded in the Indian region.

iv. Sub-class *ACTINOPTERYGII*

Skull with many or a few endochondral bones. No squamosal. Supraoccipital present or absent. No jugal sensory canal. No internal nares. Maxillary united or free with ectopterygoid and preopercular. Interoperculum present or absent. Each radial bearing many or single dermal fin ray; 1 or 2 rows of radial ossified. Pectoral radials directly attached to scapulo-coracoid cartilage or to scapular and coracoid, or indirectly attached through cartilaginous plate and ossified rods to scapula and coracoid. Clavicle present or absent. Pelvics well developed, vestigial or absent. Branchiostegal rays present. A single gular plate rarely present or absent. Caudal fin heterocercal or homocercal. Scales ganoid or non-ganoid; if ganoid without middle cosmine layer. Lepidosteid tubules either in scales or skeleton or totally absent.

Middle Devonian to recent.

The subclass *ACTINOPTERYGII* is divided into 34 orders.

Key to orders of subclass ACTINOPTERYGII

1. Air bladder totally absent 3
2. Air bladder present (except in superfamily ALEPOCEPHALOIDAE of order CLUPEIFORMES; in some species of ANGUILLIFORMES where air bladder may be absent; in some species of suborder STROMATOIDEI of order PERCIFORMES; in suborder AMMODYTOIDEI of order PERCIFORMES; and in some species of order TETRODONTIFORMES), 11
3. Skull mainly cartilaginous . ATELEOPIIFORMES
4. Skull mainly bony . 5

5. Gill openings confluent as a single transverse slit .. SYMBRANCHIFORMES
6. Gill openings separate as two lateral slits. 7
7. Pelvic fins modified into a true sucking disc GOBIESOCIFORMES
8. Pelvic fins not modified into a true sucking disc 9
9. A sucking disc (modified spinous dorsal) on top of head ; body not covered with bony plates ECHENEIFORMES
10. No sucking disc on top of head ; body covered with bony plates PEGASIFORMES
11. Physostomous 13
12. Physoclistic 23
13. Body cylindrical, greatly elongate. 15
14. Body neither cylindrical nor greatly elongate 17
15. A distinct caudal; pelvics present; body not eel-like; air bladder always present GALAXIIFORMES
16. No distinct caudal; pelvics absent or rudimentary; body eel-like; air bladder absent or present ANGUILLIFORMES
17. Weberian ossicles present CYPRINIFORMES
18. Weberian ossicles absent 19
19. Photophores always present (except in genus *Scopelogadus* and family SYNODIDAE) air bladder present or absent .. SCOPELIFORMES
20. Photophores always absent (except in suborder STOMATOIDEI of order CLUPEIFORMES) 21
21. Pelvics thoracic; always physostomous .. BATHYCLUPEIFORMES
22. Pelvics abdominal (except in genus *Raconia* where they are absent); rarely physoclistic (as in genera *Argentina* and *Opisthoproctus*) CLUPEIFORMES
23. Head asymmetrical ; both eyes on one side; no air bladder in adult .. PLEURONECTIFORMES

24. Head symmetrical; eyes normal; air bladder present or absent in adult	25	
25. A non-labyrinthic suprabranchial organ		OPHIOCEPHALIFORMES
26. No non-labyrinthic suprabranchial organ	27	
27. Pectoral fins divided into distinct upper and lower portions	29	
28. Pectoral fins not divided into upper and lower portions (except in genus <i>Dicrolene</i> of Family OPHIDIIDAE, genus <i>Lepidotrigla</i> of Family TRIGLIDAE and Family CIRRHITIDAE of order PERCIFORMES)	31	
29. Upper portion of pectoral elongate and wing-like and lower portion devoid of free filamentous rays		DACTYLOPTERIFORMES
30. Upper portion of pectoral neither elongate nor wing-like; lower portion of free filamentous rays		POLYNEMIFORMES
31. Anterior vertebrae 1-4 immovably united		SYNGNATHIFORMES
32. Anterior vertebrae normal	33	
33. Lateral muscles highly vascular and dark red; warm blooded; scales on the anterior part of body forming corselets		THUNNIFORMES
34. Lateral muscles not highly vascular and dark red; cold blooded; no corselets	.. 35	
35. No post-temporal	.. 37	
36. Post-temporal present (either large, small or replaced by ligament)	39	
37. No spines before dorsal fin		CHAUDHURIFORMES
38. Free spines before dorsal fin		MASTACEMBELIFORMES
39. Orbitosphenoid present	. 41	
40. Orbitosphenoid absent	.. 43	
41. Vertical fins with true spines	. BERYCIFORMES	
42. Vertical fins without true spines	LAMPRIDIFORMES	

43. Dorsal fin with spines (except in families CEPOLIDAE and CORYPHAENIDAE and suborders *OPHIDIOIDEI*, *AMMODYTOIDEI* and *TRICHIUROIDEI* of order PERCIFORMES and families TRIODONTIDAE, OSTRACIIDAE, TETRODONTIDAE, DIODONTIDAE and MOLIDAE of order TETRODONTIFORMES) 45
44. Dorsal fin without spines 61
45. An exoskeleton of bony rings GASTEROSTEIFORMES
46. No exoskeleton of bony rings 47
47. Gill openings restricted 49
48. Gill openings wide (except in suborder *CALLIONYMOIDEI* of order PERCIFORMES) 53
49. Mesethmoid present .. 51
50. Mesethmoid absent BATRACHOIDIFORMES
51. Upper ribs present TETRODONTIFORMES
52. No ribs .. LOPHIIFORMES
53. Anal very long, $\frac{2}{3}$ of the total length of fish and equal to second dorsal (when present) 55
54. Anal short, or if long not equal to second dorsal 57
55. 14 anal spines; single dorsal reduced to 10 spines NOTACANTHIFORMES
56. No anal spines; two dorsals without spines MACRURIFORMES
57. Three anal spines, remote from soft anal; body covered with spiny scales .. ZEIFORMES
58. Anal spines continuous with soft anal or if remote only 2 spines; body not covered with spiny scales 59
59. Pelvic fins always abdominal MUGILIFORMES
60. Pelvic fins ventral, jugular or thoracic and sometimes abdominal PERCIFORMES
61. Pelvic fins abdominal 63
62. Pelvic fins jugular GADIIFORMES
63. Anal very long; caudal tapering; pelvic fins with 8—10 rays; bathypelagic HALOSAURIFORMES

64. Anal short; caudal not tapering; pelvic fins with 6—7 rays; pelagic or littoral	65
65. Lateral line present	BELONIFORMES
66. Lateral line absent	CYPRINODONTIFORMES

VII. Order CLUPEIFORMES

Phyotomous (except in genera *Argentina* and *Opisthopterus*). Supraoccipital separated or not from frontals. Upper jaw with maxillaries and premaxillaries; premaxillaries single or paired. A single gular plate present or absent. Ectosteal and endosteal parts of the articular present or absent. Mesethmoid single or paired. Vomer (except in family Osmeridae) single. Mesocoracoid present or absent. Anterior vertebrae distinct; vertebral centra ossified or rarely unossified. No Weberian ossicles. Fins without fulcra. Dorsal and ventral ribs. Lepidosteoid tubules absent in scales and bones. Scales cycloid. Lateral line present or absent. Fins without true spines. Adipose fin present or absent. Pelvics when present abdominal. Luminous organs (photophores) present or absent. Caudal fin homocercal.

Middle Triassic to recent.

The order CLUPEIFORMES is divided into 6 suborders.

Key to suborders of order CLUPEIFORMES

1. Photophores present (in double rows)	<i>STOMIATOIDEI</i>
2. Photophores absent or when present, as in superfamily ALEPOCEPHALOIDAE of suborder CLUPEOIDAE not in double rows	3
3. Adipose fin present	<i>SALMONOIDEI</i>
4. Adipose fin absent	5
5. Dorsal fin situated in caudal region of body	7
6. Dorsal fin situated in trunk region of body	9
7. Body elongate, narrow; anal fin short (less than 40 rays); caudal bifurcate; dorsal fin always present	<i>CHIROCENTROIDEI</i>

8. Body neither elongate nor narrow; anal fin very long (more than 100 rays); caudal not bifurcate; dorsal fin present or absent *NOTOPTEROIDEI*
9. Mouth small, terminal; gill-membranes entirely united below; accessory branchial organ present *CHANOIDEI*
10. Mouth large, not terminal; gill-membranes entirely separate below; accessory branchial organ absent *CLUPEOIDEI*

iv. Suborder *CLUPEOIDEI*

Gular plate present or absent. Photophores absent, or when present not arranged in constant series. Air bladder present or absent, connected or not with the ear. No adipose fin. Pectoral radials in one or two rows. No suprabranchial organ. Upper jaw bordered by both maxillaries and premaxillaries or by only premaxillaries. Largest otolith in sacculus. Mucous canals on head. No pre-dentary bone. Oviducts.

Lower Cretaceous to recent.

The suborder *CLUPEOIDEI* is divided into 4 superfamilies.

Key to superfamilies of suborder CLUPEOIDEI

1. Abdomen smooth, non-keeled 3
2. Abdomen serrated or keeled or both *CLUPEOIDAE*
3. Gular plate present *ELOPOIDAE*
4. Gular plate absent 5
5. Eye moderate with well-developed adipose lids (non-deep sea forms) *ALBULOIDAE*
6. Eye large without adipose lids (deep sea forms) *ALEPOCEPHALOIDAE*

I. Superfamily *ELOPOIDAE*

Gular plate. No photophores. Air bladder not connected with ear. No adipose fin. Pectoral radials in one or two rows. No suprabranchial organ. Upper jaw bordered by maxillaries and premaxillaries. Branchiostegals 23-35. Young passing through a metamorphosis. Complete lateral line.

Fossil genera from Lower Cretaceous.

The superfamily ELOPOIDAE is divided into 2 families.

Key to families of superfamily ELOPOIDAE

1. Scales small (L. 1. above 90);
anal short (less than 20 rays) ELOPIDAE
2. Scales large (L. 1. below 50);
anal moderate (more than 20 rays) MEGALOPIDAE

XIX. Family ELOPIDAE

Body elongate, compressed. Head scaleless. Cleft of mouth oblique, maxilla extending beyond post-orbital margin. Margin of upper jaw formed by premaxillaries and maxillaries. Two supramaxillaries. Gular plate. Villiform teeth in jaws, vomer, palatines, pterygoids and tongue. Pseudobranchia. Branchiostegals 27-35. Gill membranes free, separated. Pectoral radials in one row. A single dorsal fin; origin opposite or beyond pelvics. Anal behind ends of inner margin of dorsal. No adipose fin. Pelvics with 10-16 rays. Small cycloid scales. Lateral line complete.

Fossil genera from Lower Cretaceous.

The family ELOPIDAE is represented by a single genus.

49. Genus *Elops* Linnaeus

1766. *Elops* Linnaeus, *Syst. Nat.*, 1 ed. 12 p. 518 (type, *E. saurus* L., monotypic).
1803. *Mugilomorus* Lacépède, *Hist. nat., Poiss*, 5, pp. 397, 398 (type, *M. anna-carolina* Lac.-*Elops saurus* L., monotypic).
1815. *Trichonotus* (nec Schneider, 1801) Rafinesque, *Analyse de la nature*, p. 88 (type, *Mugilomorus anna-carolina* Lac.).

Body elongate, compressed, scales thin, small. Cleft of mouth oblique; maxilla extending beyond postorbital margin. Gular plate present. Eye with well developed adipose lid. Abdomen neither keeled nor serrated. Pelvic origin opposite to dorsal origin. Anal short. Adipose fin absent. Caudal deeply forked. Pseudobranchiae present. Branchiostegals 27-34. Young passing through metamorphosis.

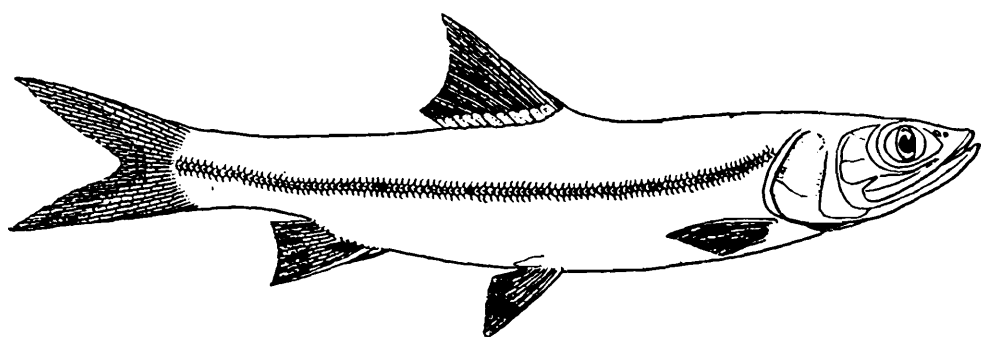
Distribution.—Red Sea, Arabia, East and South coasts of Africa, Mauritius, Madagascar, India, Pakistan, Sri Lanka, the Andamans, Malay Peninsula, Indonesia, Philippines, China, Japan, Queensland and Hawaii.

115. *Elops saurus* Linnaeus

(Pl. I, fig. 2; Text-fig. 1)

- 1766. *Elops saurus* Linnaeus, *Syst. Nat.*, 1, ed. 12, p. 518 (type locality: Carolina).
- 1775. *Argentina machnata* Forskäl, *Descript. Animal.*, pp. xiii, 68 (type locality: Djedda, Red Sea).
- 1839. *Elops indicus* Swainson, *Nat. Hist. Animal.*, 2, p. 292 [on Jinagow Russell, *Fish Coromandel*, 2, p. 63, pl. 179, 1803 (type locality: Vizagapatam)].
- 1846. *Elops saurus* Valenciennes, *Hist. nat. Poiss.*, 19, p. 365 (Massauah, Red Sea, Mauritius, Pondicherry, Coromandel).
- 1846. *Elops purpurascens* Richardson, *Ichth. China Japan*, p. 311 (type locality: Chinese seas).
- 1849. *Elops capensis* Smith, *Ill. Zool. S. Africa Fish.*, pl. 7 (type locality : Cape of Good Hope).
- 1850. *Elops machnata* Schlegel, in *Siebold's Fauna Japonica Pisces*, pts. 10-15, p. 241, pl. 109, fig. 2 (Southwest coast Japan; Korea).
- 1865. *Elops saurus* Kner, *Reise Novara Fische*, p. 338 (Madras).
- 1868. *Elops saurus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 470 (Zanzibar, Djedda, Penang, China, Cape of Good Hope).
- 1878. *Elops saurus* Day, *Fish. India*, p. 649, pl. 166, fig. 1 (tropical and subtropical seas).
- 1889. *Elops saurus* Day, *Fauna Brit. India, Fish.*, 1, p. 401 fig. 125 (tropical and subtropical seas).
- 1905. *Elops saurus* Jordan & Evermann, *Bull. U. S. Fish Comm.*, 23 (1903), p. 53 (Honolulu).
- 1909. *Elops machnata* Regan, *Ann. Mag. nat. Hist.*, (8) 3, p. 39 (Madras).
- 1909. *Elops hawaiiensis* Regan, *Ann. Mag. nat. Hist.*, (8) 3, p. 39 (type locality : Hawaii).
- 1909. *Elops australis* Regan, *Ann. Mag. nat. Hist.*, (8) 3, p. 39 (type locality : N. S. Wales).
- 1913. *Elops machnata* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 4.
- 1915. *Elops indicus* Chaudhuri, *Mem. Indian Mus.*, 5, p. 413 (Chilka Lake).
- 1917. *Elops saurus* Hornell, *Madras Fish. Bull.*, 11, p. 93. (Tuticorin).

1926. *Elops saurus* Oshima, *Annot. Zool. Japan.*, **11**, p. 2. (Hainan).
1927. *Elops hawaiiensis* Whitby, *J. Pan-Pacific Res. Inst.*, **2** (1), p. 3 (Fiji).
1929. *Elops saurus* Pillay, *J. Bombay nat. Hist. Soc.*, **33**, p. 354 (Travancore).
1931. *Elops saurus* Chu, *Biol. Bull. St. John's Univ.*, (1) p. 12 (China).
1933. *Elops indicus* Deraniyagala, *Ceylon J. Sci.*, (C) **5**, p. 82 (Ceylon).
1938. *Elops machnata* Fowler, *List Fish. Malaya*, p. 21 (Malacca, Penang, Singapore).
1941. *Elops saurus* Fowler, *Bull. U. S. nat. Mus.*, (100) **13**, p. 524.
1941. *Elops machnata* Herre, *Mem. Indian Mus.*, **13**, p. 333 (Andamans).
1949. *Elops saurus* Misra, *Rec. Indian Mus.*, **45**, p. 382.
1952. *Elops saurus* Mori, *Mem. Hyogo Univ. Agric.*, **1**, (3), p. 29 (Fusan).
1953. *Elops saurus* Misra, *Rec. Indian Mus.*, **50**, p. 370.
1953. *Elops saurus* Smith, *Sea Fish. South Africa*, p. 86, fig. 100 (The Cape, Mossel Bay, penetrating most tidal rivers).
1955. *Elops saurus* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 13.
1955. *Elops machnata* Munro, *Mar. Freshwater Fish. Ceylon*, p. 21.
- Vernacular names.*—INDIA: *Shonas*, *Chirya*, *Ghonos*, Marathi; *Ullahti*, Tamil; *Jallugu*, *Jinnagow*, Telugu. PAKISTAN: *Kinarhal*. SRI LANKA: *Mannava*, *Ranava*, Sinhalese: *Manna*, Tamil.



TEXT-FIG. 1.—Lateral view of *Elops saurus* L.

B. 27-35; D. 20-25(4/16-21); P. 17-19; V.6 : A.3/15-17; C. 19; L.1.94-102; L.tr.12/14.

Body elongate, subfusiform. Abdomen wide, smooth. Dorsal and ventral profiles nearly horizontal, of almost equal curve. Head 4.5-5.0, depth 5.0-6.5 in total length. Eyes with adipose lid, 4.5-5.0 in head, equal to snout and

interorbital. Cleft of mouth oblique, maxilla extending beyond postorbit. Length of gular plate $\frac{2}{3}$ of the length of lower jaw. Teeth numerous, villiform in both jaws, continued along the anterior edge of maxilla; on vomer in a triangular patch and on palatine about 10 rows. Single dorsal fin, origin nearer to caudal base than to snout end. Pectorals low, moderate, a little more than half head. Pelvics moderate; origin opposite or slightly before dorsal origin. Anal shorter than dorsal, origin midway between pelvic and caudal origins. Caudal deeply lobed in its posterior three-fourths. Scales small, a few rows forming a sort of sheath to dorsal, anal and caudal; 11-12 rows of scales between lateral line and pelvic base. Lateral line distinct, complete. Lower gill rakers 13-14. Vertebrae $65\frac{1}{2}$ - $69\frac{1}{2}$.

Silvery, fins yellowish with greenish tinge.

It attains 812 mm in length and weighs 13.6 kgms. It is a good sporting fish, ascending tidal rivers; flesh good.

Distribution.—India, Pakistan, Sri Lanka.—Red Sea, Arabia, Cape of Good Hope, East and South coasts of Africa, Madagascar, Mauritius, Malay Peninsula, Indonesia, the Philippines, China, Korea, Japan, Brisbane, New South Wales, Hawaii; in the mean annual isotherm of 20°C with the latitudinal and longitudinal range of 35° N.—35° S., 18° E.—155° W in the Indo-Pacific=(25° N., 35° S., 18°-102° E. in the Indian Ocean+35° N.—27° S., 103° E.—155° W in the Pacific Ocean).

XX. Family MEGALOPIDAE

Body oblong, elongate, compressed. Head scaleless. Cleft of mouth oblique; maxilla extending to the postorbital margin. Two supramaxillaries. Gular plates. Villiform teeth in jaws, vomer, palatines, pterygoids and tongue. No pseudobranchiae. Branchiostegals 23-27. Gill membranes free, separated. Single dorsal fin. Pectoral radials in 2 rows. Anal not behind ends of inner margin of dorsal. Scales large, cycloid. Complete lateral line.

Paleocene to recent.

The family MEGALOPIDAE is represented by a single genus.

50. Genus *Megalops* Lacépède

1802. *Megalops* Lacépède, *Hist. nat. Poiss.*, 5, p. 289 (type, *M. filamentosus* Lac.-*Clupea cyprinoides* Broussonet, monotypic).
 1878. *Brisbania* Castelnau, *Proc. Linn. Soc. N.S. Wales*, 2, p. 241 (type, *B. staigeri* Castelnau, monotypic).
 1896. *Tarpon* Jordan & Evermann, *Bull. U. S. nat. Mus.*, 47(1) pt. 1, p. 409 (type, *Megalops atlanticus* V. monotypic).

Body elongate, compressed, scales large. Cleft of mouth moderately oblique; maxilla extending to the postorbital margin. Gular plate present. Eyes with narrow adipose lids. Abdomen neither keeled nor serrated. Pelvic origin opposite to dorsal origin. Anal moderate. Adipose fin absent. Branched tubes in lateral line. Caudal deeply forked. No pseudobranchiae. Branchiostegals 23-27. Young passing through metamorphosis.

Distribution.—East and South coasts of Africa, Zanzibar, Natal, Madagascar, India, Pakistan, Sri Lanka, Burma, Malay Peninsula, Indonesia, Thailand, the Philippines, China, Formosa, Japan, Australia, Melanesia, Micronesia and Polynesia.

116. *Megalops cyprinoides* (Broussonet)

(Pl. I, fig. 4)

1782. *Clupea cyprinoides* Broussonet, *Ichth.*, pl. 9, (type locality: Oceans between the Tropics).
 1803. *Megalops filamentosus* Lacépède, *Hist. nat. Poiss.*, 5, p. 424, 458, pl. 13, fig. 3 (type locality: Port Dauphin, Madagascar).
 1822. *Cyprinodon cundinga* Hamilton, *Fish. Ganges*, pp. 254, 283 (type locality: salt water estuaries of the Ganges).
 1843. *Megalops setipinnis* Richardson, *Ann. Mag. nat. Hist.*, 11, p. 493 (type locality: Port Essington & Coburg Peninsula).
 1846. *Megalops indicus* Valenciennes, *Hist. nat. Poiss.*, 19, p. 388, pl. 42 (type locality: Port Dauphin, Madagascar; Mauritius; Bouru; Coromandel; Pondicherry; Malabar; Alipey; Cannanor; Panimbang; Java; Tahiti; Tanna).
 1850. *Megalops macrophthalmus* Bleeker, *Nat. Tijds. Ned. Ind.*, 1, p. 421 (type locality: Batavia, Java).
 1851. *Megalops kundinga* Jerdon, *Mad. J. Lit. Sci.*, 18, p. 146.
 1865. *Elops apalike* (nec Lac.) Day, *Fish. Malabar*, p. 228 (Malabar).

1866. *Megalops macropterus* Bleeker, *Ned. Tijdschr. Dierk.*, 3, p. 284 (type locality : Java, Sumatra, Singapore, Bintang, Celebes, Amboina).
1868. *Megalops cyprinoides* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 471 (Zanzibar; Shire River; Madras; Bengal; Penang; Java; Sumatra ; Amboina; Formosa; Aneitum; Cape York; Port Essington).
1878. *Megalops cyprinoides* Day, *Fish. India*, p. 650, pl. 159, fig. 3 (East coast of Africa, freshwater and estuaries of India, Ceylon, Malay Archipelago, China, Polynesia).
1878. *Brisbania staigeri* Castelnau, *Proc. Linn. Soc. N. S. Wales*, 2, p. 241, pl. 3 (type locality: Brisbane river, Queensland).
1880. *Megalops cyprinoides* Macleay, *Proc. Linn. Soc. N. S. Wales*, 4, p. 383 (Port Darwin).
1889. *Megalops cyprinoides* Day, *Fauna Brit. India, Fish.*, 1, p. 402, fig. 126 (Indian and Pacific Oceans, waters and estuaries of India, Ceylon, etc., occasionally captured in rivers, but much more commonly found in tanks).
1907. *Megalops cyprinoides* Lloyd, *Rec. Indian Mus.*, 1, p. 221 (Ak-yab).
1913. *Megalops cyprinoides* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 5, fig. 4.
1915. *Megalops cyprinoides* Ogilby, *Commercial Fish. Fisher. Queensland*, p. 46, (Brisbane).
1915. *Megalops cyprinoides* Chaudhuri, *Mem. Indian Mus.*, 5, p. 417 (Chilka lake).
1916. *Megalops cyprinoides* Raj, *Rec. Indian Mus.*, 12, p. 252 (Madras).
1929. *Megalops cyprinoides* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Megalops cyprinoides* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 34.
1931. *Megalops cyprinoides* Chu, *Biol. St. John's Univ.*, p. 12 (China).
1933. *Megalops cyprinoides* Deraniyagala, *Ceylon. J. Sci.*, (C), 5, p. 83.
1936. *Megalops cyprinoides* Suvatti, *Index Fish. Siam*, p. 8 (Siam).
1938. *Megalops cyprinoides* Fowler, *List Fish. Malaya*, p. 21 (Penang, Singapore).
1941. *Megalops cyprinoides* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 519.
1941. *Megalops cyprinoides* Herre, *Mem. Indian Mus.*, 13, p. 334 (Andamans).
1949. *Megalops cyprinoides* Misra, *Rec. Indian Mus.*, 45, p. 383

1952. *Megalops cyprinoides* Mori, *Mem. Hyogo Univ. Agric.*, **1**, (3), p. 29. (Fusan).
 1953. *Megalops cyprinoides* Misra, *Rec. Indian Mus.*, **50**, p. 371.
 1953. *Megalops cyprinoides* Herre, *Check List. Philippine Fish.*, p. 55 (Philippines).
 1953. *Megalops cyprinoides* Smith, *Sea Fish. South. Africa*, p. 86, fig. 101 (Natal, Algoa Bay).
 1955. *Megalops cyprinoides* Munro, *Mar. Freshwater Fish. Ceylon*, p. 23 (estuaries).

Vernacular names.—INDIA: *Cunnay*, *Nanchil*, *Velathan*, Malayalam; *Naharm*, *Punnikowa*, *Pania kai*, *Vorsa*, Orissa; *Moran kendai*, *Marua*, Tamil; *Kundinga*, Telugu; Standardised name: *Kannangi*. BURMA: *Nya-tan-youet*, *Nya koonya*. SRI LANKA: *Illeya*, *Mareva*, Singhalese.

B.23-27; D.2/14-19; P.14-16; V.10-11; A.2/21-26; C. 19; L1. 37-42; L.tr. 5-6/6.

Body oblong, slightly compressed. Ventral profile slightly more arched than dorsal. Head 4.3-5.0, depth 4.5—5.0 in total length. Eye with adipose lid, 3.3—3.5 in head, about half a diameter from end of snout and also apart. Cleft of mouth oblique; with gular plate. Teeth villiform in jaws, vomer, palatines, pterygoids and tongue. A single dorsal fin; origin nearer to caudal base than to snout end; last dorsal ray elongated, reaching caudal base. Pectorals 3/4 in head. Pelvics moderate; origin opposite or slightly before dorsal origin. Anal larger than dorsal; origin nearer to pelvic origin than to caudal. Caudal deeply forked. Scales large, 6 rows between lateral line and pelvic base. Lateral line complete with branched tubes. Lower gill rakers 30-31.

Dark blue above, silvery below; dorsal, caudal and upper parts of pectorals black, the rest of fins hyaline.

It attains 600 mm in length; occasionally captured in rivers and tanks; the flesh is poor and bony.

Distribution.—India, Pakistan, Burma, Sri Lanka.—East and South coasts of Africa, Natal, Zanzibar, Madagascar, Mauritius, Malay Peninsula, Penang, Singapore, Indonesia, Siam, Philippines, China, Formosa, Fusan, Port Darwin, Brisbane, Queensland, Melanesia, Micronesia, Polynesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35° N.—34°

S. 26° E.—170° W in the Indo-Pacific = (25° N.—34° S., 26°—142° E. in the Indian Ocean + 35° N.—27° S., 101° E.—170° W. in the Pacific Ocean).

II. Superfamily ALBULOIDAE

No gular plate. No photophores. Air bladder not connected with ear. No adipose fin. Pectoral radials in one row. No suprabranchial organ. Upper jaw bordered by premaxillaries. One supramaxillary. Scales cycloid. Young passing through metamorphosis. Upper cretaceous to recent. Lateral line complete.

The superfamily ALBULOIDAE is represented by a single family ALBULIDAE.

XXI. Family ALBULIDAE

Body elongate, abdomen flattened. Head scaleless. Cleft of mouth horizontal. Upper jaw formed by premaxillaries. Maxillaries edentulous. Two supramaxillaries. No gular plate. Villiform teeth on jaws, vomer and palatines; coarse blunt teeth on pterygoids, sphenoid and tongue. Gill membranes separated, free. Pseudobranchiae. Branchiostegals 12-16. Vertebrae 42+28. Single dorsal fin; origin before pelvics. Pectoral radials in one row. Anal small. Caudal deeply forked. Scales cycloid, moderate. Lateral line complete.

Paleocene to recent.

The family ALBULIDAE is represented by a single genus.

51. Genus *Albula* Scopoli

- 1763. *Albula* Gronow, *Zoophyl. Gronoviana. Animal.*, p. 102 (type, *Clupea macrocephala*-*Esox vulpes* L., designated by Desmarest, *Encyclop. Hist. nat. Chenu*, 19, p. 309., 1874; inadmissible).
- 1777. *Albula* Scopoli, *Introd. nat. Hist.*, p. 453 (type, *Esox vulpes* L.).
- 1801. *Albula* Schneider, *Syst. Ichth. Bloch*, p. 432 (type, *A. conorhynchus* Bl. Schn.-*Esox vulpes* L., monotypic).
- 1803. *Butyrinus* Lacépède, *Hist. nat. Poiss.*, 5, p. 45 (type, *B. bananus* Lac., monotypic).
- 1815. *Glossodus* Cuvier, *Mem. Mus. Hist. nat.*, 1, p. 48 (type, *Argentina glossodonta* Forsk.).

1829. *Butirinus* Cuvier, *Regne Animal.*, ed. 2, p. 329 (type, *Butyrinus bananus* Lac.).
1847. *Buturinus* Valenciennes, *Hist. nat. Poiss.*, 19, p. 316 (type, *Butyrinus bananus* Lac.).
1861. *Conorhynchos* (nec Bleeker, 1858, Motschoulsky, 1860) Gill, *Cat. Fish. E. Coast N. America*, p. 55 (type, *Butyrinus vulpes* Storer).
1899. *Atopichthys* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 326 (type, *A. esunculus* Garman).

Body elongate, slightly compressed, scales small. Head moderately compressed. Mouth small, horizontal; maxilla extends only to anterior margin of orbit. Snout pig-like. One supplemental bone. Gular plate absent. Eye moderate, with well developed adipose lid. Abdomen neither keeled nor serrated. Pelvic origin behind dorsal origin. Pectorals low. Anal short. Adipose fin absent. Caudal deeply forked. Simple tubes in lateral line. Gill-rakers very short. Young passing through metamorphosis.

Distribution. —S. Africa, Goree, W. Africa, Red Sea, Zanzibar, Natal, Mauritius, India, Pakistan, Mediterranean, Indonesia, Cochin-China, the Philippines, Sri Lanka, Malay Peninsula, Japan, Korea, Queensland, New South Wales, Melanesia, Micronesia, Polynesia, Hawaii, and Brazil.

117. *Albula vulpes* (Linnaeus)

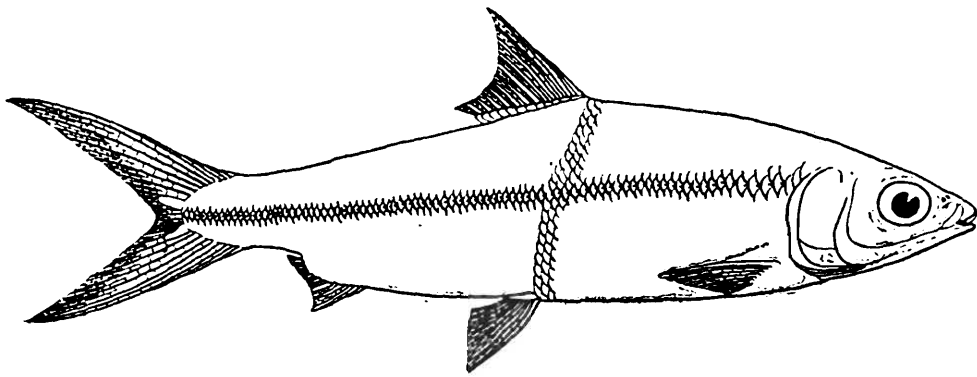
(Text-fig. 2)

1758. *Esox vulpes* Linnaeus, *Syst. Nat.*, 1, ed 10, p. 313 (type locality : Bahama Islands).
1775. *Argentina glossodonta* Forskål, *Descript. Animal.*, p. 68 (type locality: Djedda, Lohaja, Red Sea).
1801. *Esox argenteus* Schneider, *Syst. Ichth. Bloch*, p. 395 (type locality: Australia, New Zealand).
1801. *Clupea brasiliensis* Schneider, *Syst. Ichth. Bloch*, p. 427 (type locality: Brazil).
1801. *Albula conorynchus* Schneider, *Syst. Ichth. Bloch.*, p. 432 (type locality: Antilles).
1803. *Argentina bonuk* Lacépède, *Hist. nat. Poiss.*, 5, pp. 365, 366 (type locality: Arabian Sea).
1803. *Clupea macrocephala* Lacépède, *Hist. nat. Poiss.*, 5, pp. 426, 460 (type locality: Martinique).
1829. *Glossodus forskalii* Agassiz, *Spix. Pisc. Brasil*, p. 49 (type locality: Bahia, Brazil).

1846. *Albula parrae* Valenciennes, *Hist. nat. Poiss.*, 19, p. 245 (type locality: Martinique, Bahia, Rio Janeiro).
1846. *Albula neoguinaica* Valenciennes, *Hist. nat. Poiss.*, 19, p. 254 (type locality: New Guinea).
1846. *Albula seminuda* Valenciennes, *Hist. nat. Poiss.*, 19, p. 253 (type locality: New Guinea).
1846. *Albula erythrocheilos* Valenciennes, *Hist. nat. Poiss.*, 19, p. 254, pl. 574 (type locality: Friendly Is.).
1846. *Albula forsteri* Valenciennes, *Hist. nat. Poiss.*, 19, p. 256 (type locality: Tahiti).
1854. *Albula rostrata* Gray, *Cat. Fish. Gronow*, p. 189 (type locality: American Ocean, Indian & Mediterranean Seas).
1868. *Albula conorhynchus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 468.
1878. *Albula conorhynchus* Day, *Fish. India*, p. 648 (Red Sea, Seas of Africa, India, Malay Archipelago and America, also the Pacific).
1889. *Albula conorhynchus* Day, *Fauna Brit. India, Fish.*, 1, p. 401 (Coasts of India and all the tropical and subtropical seas).
1893. *Albula conorhynchus* Kent, *Great Barrier Reef*, p. 302 (North Queensland).
1913. *Albula vulpes* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 7, fig. 5.
1916. *Albula vulpes* Raj, *Rec. Indian Mus.*, 12, p. 253 (Madras).
1922. *Albula virgata* Jordan & Jordan, *Mem. Carnegie Mus.*, 10, p. 6, pl. 1, fig. 1' (type locality: Honolulu).
1928. *Albula vulpes* Fowler, *Mem. Bishop Mus.*, 10, p. 27. (Tahiti, Honolulu).
1929. *Albula vulpes* McCulloch, *Mem. Austral. Mus.*, 5, p. 35.
1931. *Albula vulpes* Chu, *Biol. Bull. St. John's Univ.*, p. 13 (Shores of all tropical seas).
1933. *Albula vulpes* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 81 (Ceylon).
1938. *Albula vulpes* Fowler, *List Fish. Malaya*, p. 22 (Penang, Singapore).
1941. *Albula vulpes* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 529.
1949. *Albula vulpes* Misra, *Rec. Indian Mus.*, 45, p. 384.
1952. *Albula vulpes* Mori, *Mem. Hyogo Univ. Agric.*, 1, No. 3, p. 29 (Koje Is., Korea).
1953. *Albula vulpes* Misra, *Rec. Indian Mus.*, 50, p. 371.
1953. *Albula vulpes* Herre, *Check List Philippine Fish.*, p. 57.
1953. *Albula vulpes* Smith, *Sea Fish. South. Africa*, p. 85 (South of Natal, Alagoa Bay).

1955. *Albula vulpes* Munro, *Mar. Freshwater Fish. Ceylon*, p. 23 (coastal waters and estuaries).

Vernacular nam^s.—SRI LANKA : *Vauva*, *Miya*, Sinhalese.



TEXT-FIG. 2.—Lateral view of *Albula vulpes* (L.)

B. 14-16; D.3-4/14-15; P.16-18; V 9-11; A. 3/6; C.17; L.l. 70-80; L.tr. 8-9/9-11.

Body elongate, subfusiform, slightly compressed, with abdomen smooth and flattened; both profiles equally convex. Head 4.2—5.0, depth 4.8—6.5 in total length. Eyes 4.0—6.0 in head, 1.8—2.3 in snout, 1.0—1.5 in interorbital, with well developed adipose lid. Mouth inferior, cleft horizontal inferior; maxilla almost reaching to below front edge of eye. Villiform teeth on jaws, vomer, palatines; granular on pterygoids, sphenoid and tongue. Single dorsal fin, origin nearer to snout end than to caudal. Pectorals low, nearly half of head. Pelvics small, below last half of dorsal; origin nearer to anal origin than to pectoral base. Anal shorter and much smaller than dorsal; origin much nearer to caudal than to pelvic origin. Caudal deeply lobed. Scales cycloid, small; 9-11 between lateral line and pelvics; 23-28 predorsal scales. Lateral line complete with simple tubes. Gill rakers 8+8—12.

Silvery : olivaceous above with faint, dark streaks along rows of scales; black spot on tip of snout.

It attains 900 mm in length and is a game fish; flesh palatable.

Distribution.—India, Pakistan, Sri Lanka.—Mediterranean, Red Sea, Zanzibar, Natal, South Africa, Mauritius, Malay Peninsula, Singapore, Indonesia, Cochin-China, the Philippines, Korea, Japan, North Queensland, New South

Wales, Melanesia, Micronesia, Polynesia, Hawaii, Tahiti, Brazil and Antilles; in the mean annual isotherms of 20°C. with the latitudinal and longitudinal range of 35°N.—29°S., 30 E.—149° W. in the Indo-Pacific=(25° N.—29° S., 26°—140° E. in the Indian Ocean +35°N.—27°S., 103°E.—149° W. in the Pacific Ocean); 18°—23° N., 74°W in the Atlantic.

III. Superfamily CLUPEOIDEAE

No gular plate. No photophores. Air bladder connected with ear. No adipose fin. Pectoral radials in one row. No suprabranchial organ. One or two supramaxillaries. Lateral line absent, or when present traversing only the anterior 2-5 scales. Scales cycloid, sometimes with pectinated edge.

Cretaceous to recent.

The superfamily CLUPEOIDEAE is represented by 2 families.

Key to families of superfamily CLUPEOIDEAE

1. Upper jaw prominent, projecting over lower jaw; maxillaries much elongated ENGRAULIDAE
2. Upper jaw not prominent and not projecting over lower jaw; maxillaries not much elongated CLUPEIDAE

XXII. Family CLUPEIDAE

Body elongate, compressed. Head scaleless. Cleft of mouth small. Upper jaw formed by premaxillaries and maxillaries. No gular plate. Teeth present or absent. Pseudobranchiae. Gill membranes separated, free from isthmus. Branchiostegals 6-20. Single dorsal fin present or absent. Pelvics present or absent. Anal moderate or long. Lateral line ceasing after 2-5 scales.

Lower Cretaceous to recent.

The family CLUPEIDAE is divided into 3 subfamilies.

Key to subfamilies of family CLUPEIDAE

1. Abdomen serrated 3
2. Abdomen not serrated DUSSUMIERIINI
3. Toothless DOROSOMATINI
4. Toothed CLUPEINI

vi. Subfamily *DUSSUMIERIINI*

Abdomen non-serrated, round. Dorsal origin nearer to caudal base than to snout end or nearer to snout end than to caudal. Without enlarged scales at caudal base.

Key to genera of subfamily DUSSUMIERIINI

Dorsal origin nearer caudal base than snout tip	3	
2. Dorsal origin nearer snout tip than caudal base		Stolephorus
3. Lateral line scales less than 40 (35-38); enlarged scales at base of caudal		Ehirava
4. Lateral line scales more than 39 (40-56); no enlarged scales at base of caudal		Dussumeria

52. Genus *Dussumeria* Valenciennes

1847. *Dussumeria* Valenciennes, *Hist. nat. Poiss.*, 20, p. 467
(type *D. acuta* V., monotypic).

Body elongate, compressed, scales thin large, deciduous, no enlarged scales at base of caudal. Cleft of mouth moderate; maxilla extends to anterior margin of eye. Two supplemental bones present. Pseudobranchiae large. Branchiostegals 14-20. Gular plate absent. Gill membranes free from isthmus and free from each other. Eyes with well developed adipose lid. Abdomen rounded, non-serrated. Pelvic origin opposite to dorsal origin. Anal short. Adipose fin absent. Caudal deeply forked; lateral line absent.

Distribution.—South Arabia, Gulf of Suez, India, Sri Lanka, Burma, Malay Peninsula, Indonesia, China, Formosa and Queensland.

Key to species of genus Dussumeria Valenciennes

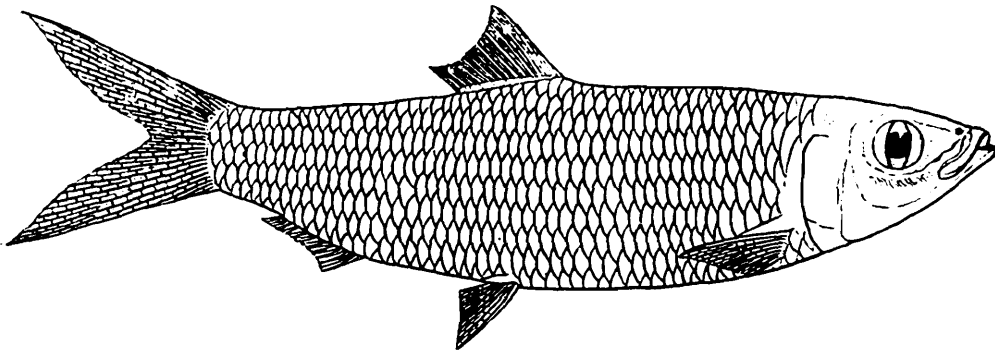
Lateral line scales 40-42; depth of body $5-5\frac{1}{2}$ times in total length	<i>D. acuta</i>
Lateral line scales 52-56; depth of body $5\frac{2}{3}-6\frac{1}{2}$ times in total length	<i>D. hasseltii</i>

118. *Dussumieria acuta* Valenciennes

(Text-fig. 3)

1847. *Dussumieria acuta* Valenciennes, *Hist. nat. Poiss.*,¹ 20, p. 467 pl. 606 (type locality: Bombay; Coromandel).
1849. *Dussumieria elopsoides* Bleeker, *Verh. Bat. Gen. (Madura)*, 22, p. 12 (type locality: Madura Straits near Kammal and Surabaya).
1851. *Dussumieria acuta* Jerdon, *Madras J. Lit. Sci.*, 18, p. 145.
1865. *Dussumieria acuta* Day, *Fish. Malabar*, p. 226 (Malabar).
1868. *Dussumieria elopsoides* Bleeker, *Versl. Meded. Akad. Wet. Amsterdam*, (2) 2, p. 300 (Waigi).
1870. *Dussumieria acuta* Day, *Proc. zool. Soc. Lond.*, p. 701 (Andamans).
1878. *Dussumieria acuta* Day, *Fish. India*, p. 647, pl. 166, fig. 4. (from Sind through the seas of India to the Malay Archipelago).
1889. *Dussumieria acuta* Day, *Fauna Brit. India, Fish.*, 1, p. 369, fig. 123 (from Sind through the seas of India to the Malay Archipelago).
1912. *Dussumieria acuta* Jenkins, *Rec. Indian Mus.*, 7, p. 60 (Chilka Lake).
1913. *Dussumieria acuta* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 21 (Java).
1917. *Dussumieria acuta* Hornell, *Madras Fish. Bull.*, 11, p. 93 (Tuticorin).
1929. *Dussumieria acuta* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Dussumieria acuta* Deraniyagala, *Spolia Zeylan.*, 15, p. 33 (Ceylon).
1930. *Dussumieria acuta* Fowler, *Proc. Acad. nat. Sci. Philadelphia*, (1929), p. 598 (Hong Kong).
1931. *Dussumieria acuta* Chu, *Biol. Bull. St. John's Univ.*, p. 14.
1931. *Dussumieria elopsoides* Chu, *Biol. Bull. St. John's Univ.*, p. 15.
1933. *Dussumieria acuta* Deraniyagala, *Ceylon J. Sci. (C)*, 5, p. 82 (Ceylon).
1933. *Dussumieria acuta* Sorley, *Marine Fish. Bombay Presidency*, p. 160 (Bombay).
1935. *Dussumieria acuta* Fowler, *Proc. Acad. nat. Sci. Philadelphia*, 87, p. 90 (Bangkok).
1936. *Dussumieria acuta* Suvatti, *Index Fish. Siam*, p. 12 (Singra).
1938. *Dussumieria acuta* Fowler, *List Fish. Malaya*, p. 24 (Singapore, Penang.).

1941. *Dussumieria acuta* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 570.
1941. *Dussumieria acuta* Herre, *Mem. Indian Mus.*, 13, p. 334 (Andamans).
1949. *Dussumieria acuta* Misra, *Rec. Indian Mus.*, 45, p. 384.
1953. *Dussumieria acuta* Misra, *Rec. Indian Mus.*, 50, p. 372.
1953. *Dussumieria acuta* Herre, *Check List Philippine Fish.*, p. 60 (Philippines).
1955. *Dussumieria acuta* Anonymous, *Mar. Fish. Karachi, Sind and Makran*, p. 18 (Coasts of Sind and Makran).
1955. *Dussumieria acuta* Munro, *Mar. Freshwater Fish. Ceylon*, p. 28 (coastal waters Ceylon).



TEXT-FIG. 3.—Lateral view of *Dussumieria acuta* V. (After F. Day)

Vernacular names.—INDIA: *Opul-dah*, Andamanese; *Charlay*, Malayalam; *Kanat*, Marathi; *Poondouuringa*, Tamil; *Marrawa*, Telegu; Standardised name: *Pana-Thondon*. SRI LANKA: *Thondaya*, *Tondaya*, Singhalese.

B. 14-15; D. 3/12-17; P.14-15; V.8; A. 3/13-14/1
C. 21; L.1. 40-42; L. tr. 11/12; Predorsal scales 27.

Body elongate, compressed, abdomen smooth. Ventral profile more convex than dorsal profile. Head 5.0-5.5, depth 5.0-5.2 in total length. Eyes 4.0 in head, 1.0 to 1.5 in snout and greater than interorbital; adipose lid narrow, marginal. Cleft of mouth moderate, maxilla not reaching to below anterior margin of eye. Jaws subequal. Small fixed teeth in jaws, villiform patches on palatines. pterygoids and tongue, but none on vomer. A single dorsal fin; origin more than an eye diameter, nearer to caudal origin than to snout end and before pelvic origin. Pectorals low, 1.8 in head. Pelvics small; origin much nearer to anal origin than to pectoral base. Anal small, far behind the end of the inner margin of dorsal; origin

equidistant between pelvic and caudal origins. Caudal deeply forked. Scales moderate, deciduous. Lateral line absent. Gill rakers 11-22, lanceolate, 1.5 times longer than eye.

Steel bluish grey above becoming silvery shot with purple on sides and below ; lower fins whitish.

It attains 177 mm. in length and is good eating.

Distribution.—India, Pakistan, Sri Lanka.—South Arabia, Malay Peninsula, Penang, Singapore, Indonesia, Siam, Hong Kong, China, Philippines, Melanesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 45°—140°E. in the Indo-Pacific=(4°—25°N., 45°—100°E. in the Indian Ocean +22°N. —7°S., 100° —140°E. in the Pacific Ocean).

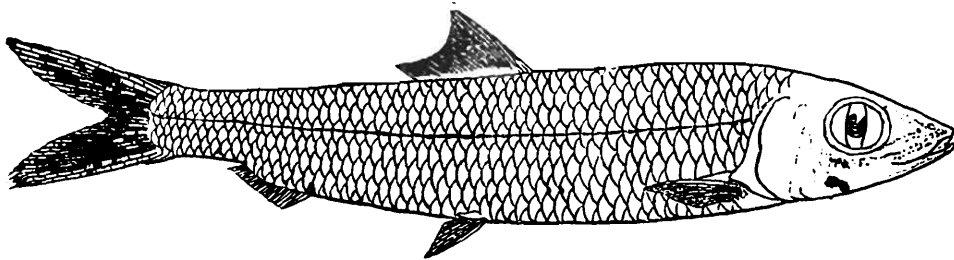
119. *Dussumieria hasseltii* Bleeker*

(Text-fig. 4)

1851. *Dussumieria hasseltii* Bleeker, *Nat. Tijds. Ned. India*, 1, p. 422 (type locality: Batavia, Cheribon, Samarang, Surabaya).
1870. *Dussumieria elopsoides* (nec Bleeker) Day, *Proc. zool. Soc. Lond.*, p. 701.
1878. *Dussumieria hasseltii* Day, *Fish. India*, p. 647, pl. 166, fig 5 (from Canara and the Coromandel coast of India to the Malay Archipelago and China).
1889. *Dussumieria hasseltii* Day, *Fauna Brit. India, Fish.*, 1, p. 399 (from Canara and the Coromandel Coast of India to the Malay Archipelago and China).
1913. *Dussumieria hasseltii* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 23.
1915. *Dussumieria hasseltii* Ogilby, *Mem. Queensland Mus.*, 3, p. 134 (Cape York).
1917. *Dussumieria hasseltii* Hornell, *Madras Fish. Bull.*, 11, p. 92 (Tuticorin).
1924. *Dussumieria hasseltii* Fowler, *J. Bombay nat. Hist. Soc.*, 30, p. 39 (Calicut).
1929. *Dussumieria hasseltii* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 37 (Queensland).
1931. *Dussumieria hasseltii* Chu, *Biol. Bull. St. John's Univ.*, p. 1
1936. *Dussumieria hasseltii* Suvatti, *Index Fish. Siam.*, p. 13 (Gulf of Siam).

*Now considered conspecific with *Dussumieria acuta* Valenciennes, 1847 (vide Whitehead *et. al.*, 1966, *Zool. Verhandl. Leiden*. 84, p. 31) *ed.*

1936. *Dussumieria hasseltii* Hora & Mukerji, *Rec. Indian Mus.*, **38**, p. 18 (Maungmagan, Burma)
1937. *Dussumieria hasseltii* Herre & Myers, *Raffles Mus. Bull.*, **13**, p. 12 (Malacca).
1941. *Dussumieria hasseltii* Fowler, *Bull. U.S. nat. Mus.*, (100)13, p. 572.
1941. *Dussumieria hasseltii* Herre, *Mem. Indian Mus.*, **13**, p. 334 (Andamans).
1949. *Dussumieria hasseltii* Misra, *Rec. Indian Mus.*, **45**, p. 384.
1953. *Dussumieria hasseltii* Misra, *Rec. Indian Mus.*, **50**, p. 372.
1953. *Dussumieria hasseltii* Herre, *Check List Philippine Fish.*, p. 60. (Philippines).
1955. *Dussumieria hasseltii* Munro, *Mar. Freshwater Fish. Ceylon*, p. 29 (coastal waters of Ceylon)



TEXT-FIG. 4.—Lateral view of *Dussumieria hasseltii* Blkr. (After F. Day)

Vernacular names.—INDIA: *Mannethi*, Kanarese; *Kola koyan*, Malayalam; *Mada kandai*, *Thondon*, Tamil; *Murava*, Telegu; Standardised name: *Thondon*.

B. 15-20; D. 4/13-16; P. 14-16; V. 8; A. 3/12-13/1; C. 19; L. 1.52-56; L. tr. 12/13; Predorsal scales 24.

Body elongate, slightly compressed; abdomen smooth. Ventral and dorsal profiles evenly convex. Head 4.5—5.0, depth 5.6—6.3 in total length. Eyes 4.0—4.2 in head, 1.1 in snout, greater than interorbital; adipose lid moderate. Cleft of mouth moderate, almost horizontal; maxilla almost reaching below front margin of eye. Jaws subequal. Small fixed teeth in jaws, villiform patches on palatines, pterygoids and tongue, but none on vomer. Single dorsal fin; origin nearer to caudal base by an eye diameter than to snout end. Pectorals low, 1.8—2.0 in head. Pelvics small; origin much nearer to anal origin than to pectoral base. Anal small,

behind end of inner margin of dorsal; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Scales moderate, deciduous. Lateral line absent. Gill rakers $12+19-26$, lanceolate, half of eye diameter.

Dark greenish blue above, silvery below; a golden lateral band from opercle to caudal; pectorals, pelvics and anal white, except first ray of pectoral; dorsal yellowish green; caudal shot with blue, green and gold.

It attains 203 mm. in length and is good eating.

Distribution.—India, Burma, Sri Lanka.—Malay Peninsula, Singapore, Indonesia, Thailand, Indo-China, Philippines, Formosa, China, Cape York, Queensland; in the mean annual isotherm of 20°C . with the latitudinal and longitudinal range of $22^{\circ}\text{N}-13^{\circ}\text{S}$., $75^{\circ}-140^{\circ}\text{E}$. in the Indo-Pacific= $(13^{\circ}\text{N}-13^{\circ}\text{S}$., $75^{\circ}-140^{\circ}\text{E}$. in the Indian Ocean+ $22^{\circ}\text{N}-7^{\circ}\text{S}$., $101^{\circ}-123^{\circ}\text{E}$. in the Pacific Ocean).

53. Genus *Ehirava* Deraniyagala

1929. *Ehirava* Deraniyagala, *Spolia Zeylan.*, 15, p. 34 (type, *E. fluviatilis* Deraniyagala, orthotypic).

This genus resembles *Dussumieria* in almost every respect, except that there are two enlarged scales at base of the caudal fin and there are 6 branchiostegals only which distinguish it from *Dussumieria*.

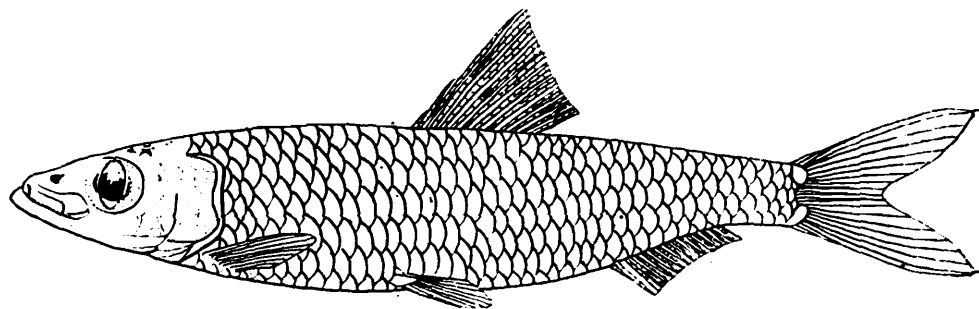
Distribution.—Sri Lanka.

120. *Ehirava fluviatilis* Deraniyagala

(Text-fig. 5)

1920. *Ehirava fluviatilis* Deraniyagala, *Spolia Zeylan.*, 15, p. 34, pl. 14 (type locality: Piliandera, Kalutara S., Panadura, Digela, Kehelvatta, Kelaniya; type in British Museum).
1933. *Ehirava fluviatilis* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
1949. *Ehirava fluviatilis* Misra, *Rec. Indian Mus.*, 45, p. 385.
1953. *Ehirava fluviatilis* Misra, *Rec. Indian Mus.*, 50, p. 372.
1955. *Ehirava fluviatilis* Munro, *Mar. Freshwater Fish. Ceylon*, p. 28 (rivers and estuaries of Ceylon).

Vernacular names.—SRI LANKA: *Ehirava*, *Gan ehirava*, *Ahirava*, *Gan Ahirava*, Singhalese.



TEXT-FIG. 5.—Lateral view of *Ehirava fluviatilis* Deraniyagala
(After P.E.P. Deraniyagala)

B.6; D.13; P.12—14; V.8; A.15; C.19; L.l. 35—38;
L. tr. 6—7; Predorsal scales 15.

Body elongate, slightly compressed; abdomen rounded, smooth. Ventral profile a little more convex than dorsal profile. Head 4.5, depth 5.8 in total length (3.6—4.2, 4.8—5.0 in standard length). Eye 3.5 in head, 1.4 in snout; adipose lid thin but well developed in adult. Cleft of mouth rather oblique, moderate; maxilla extending to the anterior margin of eye, serrated in lower edge. Lower jaw prominent. Single dorsal fin; origin nearer to caudal base than to snout end. Pectoral base 1.7 in head. Pelvics moderate, nearly equal to pectorals; origin before dorsal origin, nearer to anal origin than to pectoral base. Anal base almost equal to dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Scales moderate, deciduous. Lateral line absent. Gill rakers 25—27, slender, tuberculate slightly longer than branchial filaments.

Vertex green with about six large melanophores arranged in a ring in the interorbital space followed by a V-shaped pattern on parietals with apex directed posteriorly. Body iridescent, nearly pink.

It attains 50 mm in length. It is found in rivers and estuaries upto 15 miles from sea and is good eating.

Distribution : Sri Lanka; in the mean annual isotherm of 20° C. in Lat. 6° —7° N., Long. 79° 59' E. in the Indian Ocean.

54. Genus *Stolephorus* Lacépède

1803. *Stolephorus* Lacépède, *Hist. nat. Poiss.*, 5, p. 381 (type, *Atherina japonica* Houttuyn, designated by Jordan & Gilbert, *Bull. U.S. nat. Mus.*, 16, p. 272, 1883).
 1851. *Spratelloides* Bleeker, *Nat. Tijds. Ned. Ind.*, 2, p. 214 (type, *Clupea argyrotaeniata* Blkr., orthotypic).
 1935. *Gilchristella* Fowler, *Proc. Acad. nat. Sci. Philad.*, 87, p. 365 (type, *Spratelloides aestuarius* Gilchrist, orthotypic).

Body elongate, moderately subcylindrical. Scales moderate, thin, deciduous. Cleft of mouth oblique, maxilla extending only to anterior margin of orbit. Two supplemental bones present. Pseudobranchiae. 6 branchiostegals. Eyes without adipose lid. Abdomen non-serrated. Pelvic origin a little behind dorsal origin. Anal short. Adipose fin absent. Caudal deeply forked. Gill membranes free from each other and from isthmus. Gill rakers long.

Distribution.—Red Sea, S. Africa, Madagascar, Mauritius. India, Singapore, the Indonesia, Philippines, China, Korea, Japan, Queensland, Melanesia, Polynesia and Hawaii.

Key to species of genus Stolephorus Lacépède

1. Lateral line scales 40-50; eye 4.0—4.5 in head; pelvic origin behind dorsal origin . . . *S. japonica*
2. Lateral line scales 38; eye 3.3 in head; pelvic origin slightly before dorsal origin . . . *S. malabaricus*

121. *Stolephorus japonica* (Houttuyn)*

1782. *Atherina japonica* Houttuyn, *Verh. Holland. Maatsch. Haaslem*, 20, p. 340 (type locality: Japan).
 1846. *Clupea gracilis* Schlegel, in *Siebold's Fauna Japonica, Pisces*, p. 238, pl. 108, fig. 2 (type locality: South-east coast of Nagasaki).
 1909. *Spratelloides gracilis* Günther, *J. Mus. Godeffroy*, pt. 16, p. 384 (Fiji).
 1913. *Spratelloides gracilis* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 20, fig. 12 (Celebes, Macassar; Banda; Batjan; Ternate).
 1928. *Spratelloides japonicus* Mori, *J. Pan Pacific Res. Inst.*, 3, p. 3 (Fusan).

**Atherina japonica* Houttuyn is a *nomen dubium* (vide Whitehead, 1963, *Bull. zool. Nomencl.*, 20(4), pp. 281—284) and hence the species bears the name *Spratelloides gracilis* (Temminck & Schl.)—ed.

1933. *Spratelloides gracilis* Hardenberg, *Treubia*, 14 (2), p. 215 (Temiang S., Lingga Archipelago, Sumatra).
1936. *Stolephorus japonicus* Herre, *Field Mus. nat. Hist. Publ.*, 353, *Zool. Ser.*, 21, p. 33 (Tahiti).
1937. *Spratelloides gracilis* Gruvel & Chabanaud, *Mem. Inst. Egypte*, 35, p. 4 (Gulf of Suez).
1938. *Stolephorus gracilis* Fowler, *List Fish. Malaya*, p. 24 (Malaya).
1941. *Stolephorus japonicus* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 567 (Philippines; Susak; Japan; Tahiti, Society Is., Kagoshima, Japan).
1955. *Spratelloides japonicus* Munro, *Mar. Freshwater Fish. Ceylon*, p. 28 (coastal waters of Ceylon).

B.6; D.13—14; P.11-12; V.8; A.13—14; L.1. 40—45; L. tr.8; Predorsal scales 13.

Body elongate, moderately compressed; abdomen rounded, smooth. Dorsal and ventral profiles more or less equal. Head 4.8, depth 7.0 in total length (4.0 and 6.0 in standard length). Eyes 4.0—4.5 in head, 1.0 in snout. No adipose lid. Cleft of mouth oblique, small, maxilla reaching front border of eye or a little behind. Teeth absent or very minute, deciduous, on jaws, vomer, pterygoids and tongue. Single dorsal fin, origin nearer to snout end than to caudal end. Pectorals low, 1.5 in head. Pelvics small; origin below 10th dorsal ray, nearer to anal origin than to pectoral base. Anal equal to dorsal; origin nearer to caudal base than to pelvic origin. Caudal deeply forked, equal to head. Scales moderate, deciduous. No lateral line. Gill rakers 18+26—28, twice gill filaments, smaller than eye.

Dark brownish above, silvery below, with a silvery lateral band.

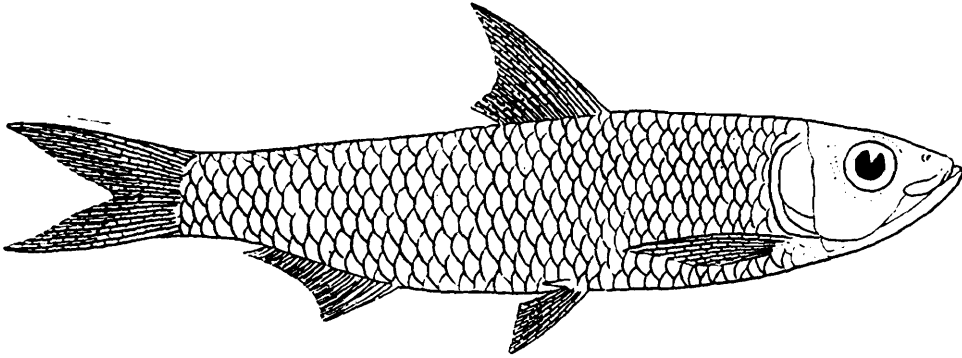
It attains 94 mm. length.

Distribution.—Sri Lanka.—Red Sea, Malaya, Indonesia the Philippines, Japan, Korea, Lord Howe, Polynesia,; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 35° N.—18° S., 32° E.—155° W. in the Indo-Pacific=(4° —30° N., 32° —100° E. in the Indian Ocean+ 35° N.—18° S., 103° E.—155° W. in the Pacific Ocean).

122. *Stolephorus malabaricus* (Day)*[†]

(Text-fig. 6)

1873. *Spratelloides malabaricus* Day, *Proc. zool. Soc. Lond.*, p. 240 (type locality: Malabar).
 1878. *Spratelloides malabaricus* Day, *Fish. India*, p. 648, pl. 161 fig. 5 (Western coast of India, in rivers and estuaries).
 1889. *Spratelloides malabaricus* Day, *Fauna Brit. India, Fish.*, 1, p. 400, fig. 124.
 1949. *Stolephorus malabaricus* Misra, *Rec. Indian Mus.*, 45, p. 385.
 1953. *Stolephorus malabaricus* Misra, *Rec. Indian Mus.*, 50, p. 372.



TEXT-FIG. 6.—Lateral view of *Stolephorus malabaricus* (Day). (After F. Day)

B.6; D. 13—14; P.13; V.8, A.18—19; L.l. 38; L.tr. 9.

Body elongate, moderately compressed; abdomen rounded, smooth. Dorsal and ventral profiles more or less equal. Head 4.5—5.5, depth 5.2, in total length. Eyes 3.3 in head, 1.1 in snout. No adipose eye lid. Cleft of mouth oblique, small; maxilla almost reaching front edge of eye. Teeth small, deciduous; sometimes on jaws, vomer, pterygoids and tongue. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, a little less than head. Pelvics small; origin slightly before dorsal, equidistant between anal origin and pectoral base. Anal longer than dorsal; origin nearer to pelvic origin than to caudal base. Caudal deeply forked. Scales moderate, deciduous. Lateral line absent. Gill rakers 18+28, finely lanceolate.

Light yellowish, green above; a silvery stripe along the side; abdomen silvery; upper caudal lobe with a bluish posterior edge; some fine black points along the back; upper edge of eye dark green.

It attains 76 mm. in length and is found in rivers and estuaries.

*Now placed under the monotypic genus, *Dayella* Talwar & Whitehead (*vide* Talwar & Whitehead, 1971, *Bull. Br. Mus. nat. Hist. (Zool.)*, 22 (2), p. 63). *ed.*

Distribution.—India; in the mean annual isotherm of 20° C. in Lat. 11° N., Long. 76° E. in the Arabian Sea.

vii. Subfamily *CLUPEINI*

Abdomen keeled, serrated. Dorsal fin present or absent. Pelvics present or absent; fin rays reduced to seven or six. No enlarged scales at caudal base.

Key to genera of subfamily CLUPEINI

1. Anal one, continuous	3	
2. Anal two, divided (second detached as two enlarged connected rays).		Corica
3. Anal moderate (rays 14—22); jaws equal or subequal; pelvics well developed	5	
4. Anal long (rays 35—95); lower jaw prominent; pelvics small or absent	13	
5. Lateral line scales less than 50 (39—49)	7	
6. Lateral line scales more than 79 (80—110)		Gudusia
7. Dorsal origin before pelvic origin	9	
8. Dorsal origin opposite pelvic origin		Kowala
9. Upper jaw without median notch	11	
10. Upper jaw with distinct median notch		Macrura
11. Last 2 anal rays enlarged		Sardinella
12. Last 2 anal rays not enlarged		Harengula
13. Pelvics absent	15	
14. Pelvics present	17	
15. Dorsal fin present		Opisthopterus
16. Dorsal fin absent		Raconda
17. Occipital ridges converging behind or parallel; oral edge of upper jaw with a toothed bone between maxillary and premaxillary		Pellona
18. Occipital ridges subparallel behind; oral edge of upper jaw with a ligament between maxillary and premaxillary		Ilisha

55. Genus *Harengula* Valenciennes

1847. *Harengula* Valenciennes, *Hist. nat. Poiss.*, **20**, p. 277 (type, *H. latulus* V.=*Clupea macrophthalmus* Ranzani, designated by Gill, *Proc. Acad. nat. Sci. Philad.*, p. 36 (1861)).
1849. *Clupalosa* Bleeker, *Verh. Bat. Gen.* **22**, p. 12 (type, *C. bulan* Blkr., monotypic).
- 1866-72. *Paralosa* Bleeker, *Atl. Ichth. Ind. Neel.*, **6**, p. 111 (type, *Alausa melanura* V., nec *Clupea melanura* C., monotypic).
1896. *Lile* Jordan and Evermann, *Bull U. S. nat. Mus.*, (47), pt. 1, 428 (type, *Clupea stolifera* Jord. & Gilb., monotypic).
1923. *Wilkesina* Fowler & Bean, *Proc. U. S. nat. Mus.*, **63**, p. 63 (type, *Harengula fijiensis* Fowler & Bean, orthotypic).
1933. *Herklotsella* Fowler, *Proc. Acad. nat. Sci. Philad.*, **85**, p. 246 (type, *Harengula dispilonotus* Blkr., orthotypic).

Body more or less oblong, compressed. Scales moderate. Cleft of mouth more or less oblique; maxilla extends only to a little beyond anterior margin of orbit. Supplemental bone present. Lower jaw prominent. Fine teeth in jaws. Upper jaw without median notch. Pseudobranchiae. Branchiostegels 6. Opercle with radiating striae. Eyes without adipose lid. Abdomen keeled and serrated. Pelvic origin opposite to dorsal origin. Anal single, short, last two anal rays not enlarged. Adipose fin absent. Caudal forked.

Distribution.—Red Sea, Arabia, Reunion Is., S. Africa, Zanzibar, Madagascar, Seychelles, India, Pakistan, Sri Lanka, the Andamans, Nicobars, Singapore, Indonesia, China, the Philippines, Thailand, Japan, Korea, Queensland, Melanesia and Micronesia.

Key to species of genus Harengula Valenciennes

1. Lateral line scales 38—41; postventral scutes 12—13; anal as long as dorsal	<i>H. vittata</i>
2. Lateral line scales 42—45; post- ventral scutes 13—14; anal shorter than dorsal	<i>H. ovalis</i>

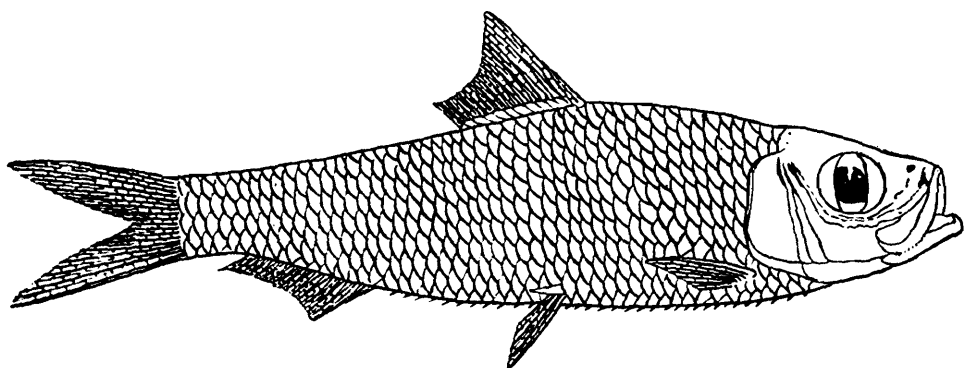
123. *Harengula ovalis* (Bennett)*

(Text-fig.7)

1830. *Clupea ovalis* Bennett, *Mem. Life of Raffles*, p. 690 (type, locality: Sumatra).
1835. *Clupea punctata* Rüppell, *Neue Wirbelth., Fische*, p. 78, pl. 21, fig. 2 (type locality: Red Sea).
1835. *Clupea quadrimaculata* Rüppell, *Neue Wirbelth., Fische*, p. 78, pl. 21, fig. 3 (type locality: Mossaua).
1847. *Sardinella lineolata* Valenciennes, *Hist. nat. Poiss.*, 20, p. 272 (type locality: Trincomale, Ceylon).
1847. *Harengula bipunctata* Valenciennes, *Hist. nat. Poiss.*, 20, pp. (216) 298 (type locality: Massaua).
1847. *Harengula arabica* Valenciennes, *Hist. nat. Poiss.*, 20, p. 298 (type locality: Mohila).
1847. *Meletta obtusirostris* Valenciennes, *Hist. nat. Poiss.*, 20, pp. (276) 375 (type locality: Seychelles).
1847. *Meletta venenosa* Valenciennes, *Hist. nat. Poiss.*, 20, pp. (277) 377 (type locality: Seychelles).
1853. *Harengula moluccensis* Bleeker, *Nat. Tijds, Ned. Ind.*, 4, p. 609 (type locality: Ternate, Amboina, Ceram).
1853. *Harengula punctata* Bleeker, *Verh. Bat. Gen.* 25, p. (18) 49 (Nagasaki).
1863. *Harengula spilura* Guichenot, *Notes le Reunion*, 2, p. 16 (type locality: Bourbon).
1868. *Clupea moluccensis* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 427 (Molucca Sea; Ceylon).
1878. *Clupea kunzei* Day (*nec.* Bleeker), *Fish. India*, p. 636, pl. 163, fig. 1 (Ceylon, Andamans and Nicobars to the Malay Archipelago; the example figured was from the Andamans).
1889. *Clupea kunzei* Day, *Fauna Brit. India, Fish.*, 1, p. 372 (Ceylon, Andamans and Nicobars to the Malay Archipelago).
1911. *Harengula kunzei* Kendall & Goldsborough, *Mem. Harv. Mus. Comp. Zool.*, 26, p. 243 (Fiji, Suva).
1912. *Clupea kunzei* Jenkins, *Rec. Indian Mus.*, 7, p. 59 (Puri, Orissa).
1913. *Clupea (Harengula) moluccensis* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 81, fig. 28.
1929. *Clupea (Harengula) moluccensis* Deraniyagala, *Spolia Zeylan.*, 15, p. 43 (Ceylon).
1931. *Harengula moluccensis* Chu, *Biol. Bull. St. John's Univ.*, 1, p. 13, (Hong Kong).
1937. *Harengula punctata* Gruvel & Chabanaud, *Mem. Inst. Egypte*, 35, p. 3 (Suez Canal).

**Clupea ovalis* Bennett, 1830 is a *nomen dubium* (*vide* Whitehead, 1969, *J. mar. biol. Ass. India*, 9(2), p. 230); this species is now identified as *Herklotsichthys punctatus* (Rüppell, 1837). *ed.*

1938. *Harengula ovalis* Fowler, *List Fish. Malaya*, p. 26. (Singapore).
1939. *Harengula punctata* Herre, *Rec. Indian Mus.*, 41, p. 329 (Andamans).
1941. *Harengula ovalis* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 589.
1941. *Harengula punctata* Herre, *Mem. Indian Mus.*, 13, p. 334.
1949. *Harengula punctata* Misra, *Rec. Indian Mus.*, 45, p. 385.
1953. *Harengula punctata* Misra, *Rec. Indian Mus.*, 50, p. 374.
1953. *Harengula punctata* Herre, *Check List Philippine Fish.*, p. 72 (Philippines).
1953. *Harengula ovalis* Smith, *Sea Fish. South. Africa*, p. 91 (Durban).
1955. *Harengula ovalis* Munro, *Mar. Freshwater Fish. Ceylon*, p. 25 (coastal waters of Ceylon).



TEXT-FIG. 7.—Lateral view of *Harengula ovalis* (Benn.) (After F. Day)

Vernacular names.—INDIA: *Kanat*, Marathi. SRI LANKA : *Silinda*, *Kolamura Salaya*, *Korrumburua*, *Ehalamura*, Singhalese.

B.6; D.17—19; P. 15—16; V.8; A. 17—19; C.20; L.l. 42—45; L.tr.10—12; Predorsal scales 14.

Body oblong, compressed; abdomen keeled, serrated. Dorsal and ventral profiles more or less equally convex. Head 4.5—4.6, depth 4.5—4.7 in total length. Eyes 3.0—3.2 in head, about a diameter in snout, 0.6 in interorbital. Lower jaw prominent. Cleft of mouth oblique, moderate; maxilla reaching a little beyond anterior margin of orbit. Teeth on jaws, palatines, pterygoids and tongue, but none on vomer. Single dorsal fin; origin nearer to snout end than to caudal base. Pectoral base nearly 2.0 in head. Pelvics a little smaller than pectorals; origin behind

dorsal origin and equidistant between anal origin and pectoral base. Anal equal to dorsal; origin a little nearer to pelvic origin than to caudal base. Caudal deeply forked. Lateral line absent. Scales in regular rows. Abdominal scutes, preventral 18, postventral 13—14. Gill rakers 14+31—38, finely lanceolate, one third as long as eye.

Bluish along back becoming silvery white, shot with purple on sides and below.

It attains 160 mm in length.

Distribution.—India, Pakistan, Sri Lanka.—Suez Canal, Red Sea, Arabia, S. Africa, Seychelles, Indonesia, the Philippines, China, Japan, Melanesia, Micronesia, Suva, Polynesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 32° N—29° S. 30°—180°E. in the Indo-Pacific=(25°N.—29°S., 30°—102°E. in the Indian Ocean+35°N.—16°S., 103°-180°E. in the Pacific Ocean).

124. *Harengula vittata* (Valenciennes)*

- 1847. *Clupeonia vittata* Valenciennes, *Hist. nat. Poiss.*, 20, p. 352 (type locality: Vanikoro).
- 1847. *Alausa melanura* Valenciennes, *Hist. nat. Poiss.*, 20, p. 441. (type locality: New Guinea, Amboina, Vanikoro, Bourbon).
- 1876. *Clupea (Alausa) melanura* Martens, *Preuss. Exped. Ost. Asien*, 1, p. 405 (Bangkok).
- 1878. *Clupea melanura* Day, *Fish. India*, p. 641 (seas of India and the Malay Archipelago).
- 1889. *Clupea melanura* Day, *Fauna Brit. India, Fish.*, 1, p. 378 (seas of India and the Malay Archipelago).
- 1891. *Harengula melanura* Sauvage, *Hist. nat. Madagascar, Poiss.*, p. 492, pl. 48, fig. 4 (Reunion, Zanzibar).
- 1913. *Clupea (Harengula) melanura* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 72.
- 1928. *Harengula vittata* Fowler, *Mem. Bishop Mus.*, 10, p. 31 (Samoa).
- 1941. *Harengula vittata* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 596.
- 1949. *Harengula vittata* Misra, *Rec. Indian Mus.*, 45, p., 386.
- 1953. *Harengula vittata* Misra, *Rec. Indian Mus.*, 50, p. 374.
- 1953. *Harengula vittata* Smith, *Sea Fish. South Africa*, p. 91 (as far south as Durban).

*Now considered a synonym of *Sardinella melanura* (Cuvier, 1829) (vide Whitehead, 1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, p.66). ed.

B.6; D.15—17; <P.13—15; <V.8; A.18—19; <C.19; L.1. 38—41; L. tr. 10—13.

Body oblong, compressed; abdomen keeled serrated. Ventral profile more convex than dorsal profile. Head 5, depth 5 in total length. Eyes with very narrow adipose lid, 3.0—3.5 in head, 1.0 in snout, 0.7 in interorbital. Lower jaw prominent, longer than upper. Cleft of mouth oblique, moderate; maxilla reaching beyond anterior margin of orbit. Teeth very fine, on jaws, palatines, pterygoids and tongue, but none on vomer. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, moderate, $\frac{2}{3}$ in head. Pelvics small, less than $\frac{3}{4}$ of pectoral; origin equidistant between pectoral base and anal origin, opposite or slightly before dorsal origin. Anal base a little longer than dorsal base; origin equidistant between caudal base and pelvic origin. Caudal deeply forked. Lateral line absent. Scales in regular rows. Abdominal scutes, preventral 17, postventral 12—13. Lower gill-rakers 45—60.

Back blue shot with purple; a fine yellow line dividing it from the silvery sides and abdomen; a blue spot on opercle; outer third of caudal lobes black.

It attains 140 mm in length.

Distribution.—India, Pakistan, Burma.—S. Africa, Zanzibar, Indonesia, Thailand, Melanesia, Micronesia, Samoa, Polynesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—29°S., 30°E.—170°W. in the Indo-Pacific=(15°N.—29°S., 32°—98°E in the Indian Ocean+13°N.—12°S., 100°E—170°W. in the Pacific Ocean).

56. Genus *Sardinella* Valenciennes

1847. *Sardinella* Valenciennes, *Hist. nat. Poiss.*, 20, p. 28 (type, *S. aurita* C.V., designated by Gill, *Proc. Acad. nat. Sci. Philad.*, p. 35, 1861).
1847. *Clupeonia* Valenciennes, *Hist. nat. Poiss.*, 20, p. 345 (type, *Clupanodon jussieu* Lac., logotypic).
1849. *Amblygaster* Bleeker, *J. Ind. Archipel.*, 3, p. 73, (type, *A. clupeoides* Blkr., monotypic).
- 1858-61. *Sardinia* Poey, *Mem. Hist. nat. Cuba*, 2, p. 310 (type, *S. pseudohispanica* Poey, monotypic).

Body more or less oblong, well compressed. Scales large. Cleft of mouth more or less oblique; maxilla extends to postorbital margin. Supplemental bone present. No distinct median notch in upper jaw. Jaws subequal. Pseudobranchia. Branchiostegals 6. No teeth in jaws. Eyes with small adipose lid. Opercle without radiating striae. Abdomen keeled and serrated. Dorsal origin before pelvic origin. Anal single, moderate, last 2 rays enlarged. Adipose fin absent. Caudal forked. Gill rakers fine, numerous, small.

Distribution.—Mediterranean, Red Sea, East and South Africa, Mauritius, Madagascar, Zanzibar, Seychelles, Arabia, Persian Gulf, India, Pakistan, Sri Lanka, the Andamans, Burma, Malaya, Singapore, Indonesia, Thailand, Indo-China, China, the Philippines, Formosa, Australia, Micronesia and Polynesia.

Key of species of genus Sardinella Valenciennes

1. Ventral scutes sharp, keeled and exposed	5	
2. Ventral scutes little evident, less exposed	3	
3. Maxillary reaching eye; 18 preventral and 16 postventral scutes; lateral line scales 47		<i>S. clupeioides</i>
4. Maxillary not reaching eye; 17-18 preventral and 14-16 postventral scutes; lateral line scales 42-43		<i>S. sirm</i>
5. Lower gill-rakers 130-250	7	
6. Lower gill-rakers 31-80	9	
7. Depth of body 3·8 in total length; eye 3·7-4·0 in head; lower gill-rakers 130		<i>S. dayi</i>
8. Depth of body 5·0 in total length; eye 4·5 in head; lower gill-rakers 180-250		<i>S. longiceps</i>
9. Lower gill-rakers 35—38; abdominal scutes 26		<i>S. melanura</i>
10. Lower gill-rakers 58—80; abdominal scutes 27—33	11	
11. Depth of body 4·5—5·0		<i>S. sindensis</i>
12. Depth of body 3·3—4·1.	.. 13	

13. Anal base longer than dorsal base; depth of body 4.1 in total length. *S. jussieu*
14. Anal base equal to or smaller than dorsal base; depth of body 3.3—3.9 in total length 15
15. Pelvic origin nearer to anal origin than to pectoral base; lower gill-rakers 80 *S. fimbriata*
16. Pelvic origin nearer to pectoral base than to anal origin; lower gill-rakers 58—65 17
17. Depth of body 3.3—3.5 in total length; anal base equal to dorsal base *S. albella*
18. Depth of body 3.9 in total length; anal base slightly smaller than dorsal base *S. perforata*

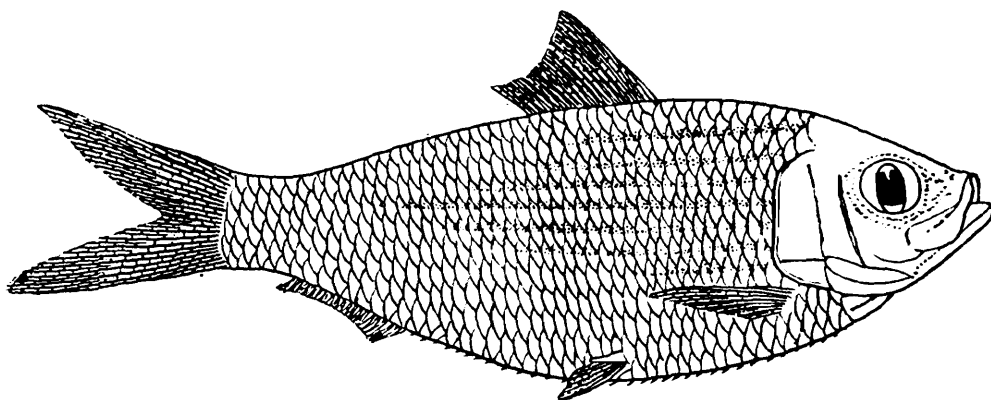
125. *Sardinella albella* (Valenciennes)

(Pl. I, fig. 3; Text-fig. 8)

1847. *Kowala albella* Valenciennes, *Hist. nat. Poiss.*, 20, p. 362, pl. 602 (type locality: Pondicherry).
1852. *Sardinella brachysoma* Bleeker,* *Verh. Bat. Gen.* 24, p. 19 (type locality: Batavia).
1855. *Harengula hypselosoma* Bleeker, *Nat. Tijds. Ned. Ind.*, 8, p. 427 (type locality: Amboina).
1868. *Clupea albella* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 424 (Pondicherry).
1878. *Clupea brachysoma* Day, *Fish. India*, p. 635, pl. 163, fig. 3 (East coast of Africa, Seas of India to the Malay Archipelago).
1889. *Clupea brachysoma* Day, *Fauna Brit. India*, Fish., 1, p. 371 (East coast of Africa, Seas of India to the Malay Archipelago).
1910. *Clupea brachysoma* Jenkins, *Rec. Indian Mus.*, 5, p. 131 (Karachi).
1913. *Clupea (Harengula) brachysoma* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 70, fig. 25 (Java, Sumatra, Borneo, Amboina, Banka).
1917. *Sardinella brachysoma* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 381 (Madras).
1935. *Clupea brachysoma* Fowler, *Proc. Acad. nat. Sci. Philadelphia*, 87, p. 90 (Bangkok).

**Sardinella brachysoma* Bleeker, 1852 is considered distinct from *S. albella* (Val.) and is recorded from India (vide Whitehead, 1969, *J. mar. biol. Ass. India*, 9 (2), p. 232); there is no definite record of *S. albella* from India. Ed.

1941. *Sardinella albella* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 605.
 1949. *Sardinella albella* Misra, *Rec. Indian Mus.*, 45, p. 386.
 1953. *Sardinella albella* Misra, *Rec. Indian Mus.*, 50, p. 375.
 1953. *Sardinella brachysoma* Herre, *Check List Philippine Fish.*, p. 66. (Philippines).
 1955. *Sardinella albella* Munro, *Mar. Freshwater Fish. Ceylon*, p. 25 (coastal waters of Ceylon).



TEXT-FIG. 8.—Lateral view of *Sardinella albella* (V.) (After F. Day)

Vernacular names.—INDIA : *Pedi*, Kanarese; *Currudden toaddy*, Malayalam; *Patulda*, Marathi. SRI LANKA : *Karlau*, *Hadalla*, *Sudaya*, Singhalese.

B.6; D.17—20; P. 14—17; V.8; A. 18—22; C. 20; L.1. 44—48; L.tr. 11—13; Predorsal scales 15—18.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more arched than dorsal profile. Head 4.8—5.2, depth 3.3—3.5 in total length. Eyes with broad adipose lid, 3.0 in head, 1.0 in snout, 0.8—1 in interorbital. Lower jaw prominent. Cleft of mouth oblique, moderate; maxilla reaching midorbit. No teeth on jaws. Single dorsal fin; origin much nearer to snout end than to caudal base. Pectorals low, $\frac{2}{3}$ of head. Pelvics small, little more than half of pectorals; origin behind dorsal origin and nearer to pectoral base than to anal origin. Anal base equal to dorsal base; origin nearer to caudal origin than to pelvic origin; last 2 anal rays rather prolonged. Caudal deeply forked. Lateral line absent. Scales regularly arranged, edges crenulated. Abdominal scutes, preventral 17—18, postventral 12—13. Gills rakers 30+60—65, slender, longest equals gill filaments and eye.

Dark greenish above, becoming silvery on sides and below; bases of scales a little darker; caudal fin dark tipped.

It attains 188 mm length.

Distribution.—India, Pakistan, Burma.—East coast of Africa, Indonesia, Thailand, Hongkong, the Philippines; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N. —7°S., 38°—123°E. in the Indo-Pacific=(10°—25°N., 38°—98°E., in the Indian Ocean +22°N.—7°S., 100°—123°E. in the Pacific Ocean).

126. *Sardinella clupeoides* (Bleeker)

- 1849. *Amblygaster clupeoides* Bleeker, *J. Ind. Archipel.*, 3, p. 73 (type locality: Macassar) (error in spelling).
- 1907. *Clupea okinawensis* Kishinouye, *J. Imp. Fish. Bur.*, 14, p. 96, pl. 19, fig. 2 (type locality: Okinawa, Riu Kiu).
- 1913. *Clupea (Amblygaster) clupeoides* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 63, fig. 23 (Java, Sumatra, Bintang, Celebes.)
- 1933. *Sardinella clupeoides* Deraniyagala, *Ceylon J. Sci. (C)* 5, p. 83.
- 1938. *Sardinella clupeoides* Fowler, *List. Fish. Malaya*, p. 31 (Penang, Singapore).
- 1941. *Sardinella clupeoides* Fowler, *Bull. U.S. nat Mus.*, (100) 13, p. 619.
- 1949. *Sardinella clupeoides* Misra, *Rec. Indian Mus.*, 45, p. 387.
- 1953. *Sardinella clupeoides* Herre, *Check List. Philippine Fish.*, p. 66.
- 1953. *Sardinella clupeoides* Misra, *Rec. Indian Mus.*, 50, p. 375.
- 1955. *Amblygaster clupeoides* Munro, *Mar. Freshwater Fish. Ceylon*, p. 26 (Coastal waters of Ceylon).

Vernacular name.—SRI LANKA : *Galhurulla*, Singhalese.

B.6; D. 17—19; P. 16—17; V.8; A. 16—18; C.20; L.1.40—43; L.tr.11—12; Predorsal scales 14—18.

Body elongate, compressed; abdomen keeled; post ventral edge not strongly serrated. Dorsal and ventral profiles nearly equally convex. Head 5.0, depth 5.1 in total length. Eyes with broad adipose lid, 3.5—4.0 in head, 1.1 in snout, 1.0 in interorbital. Lower jaw prominent. Cleft of mouth oblique, small; maxilla

not reaching to front margin of eye. Teeth on palatines, pterygoids and tongue, none on vomer and jaws. Single dorsal fin; origin nearer to snout and than to caudal base. Pectoral low, nearly half in head. Pelvics small, $\frac{2}{3}$ of pectoral; origin rather equidistant between anal origin and pectoral base, behind dorsal origin. Anal base equal to dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Lateral line absent. Scales in regular rows. Abdominal scutes in groove, preanal 15—16, postventral 12—14, poorly developed. Gill rakers 17—22+32—33.

Dark blue green above, silvery below.

It attains 270 mm in length.

*Distribution**.—Sri Lanka.—Malaya, Indonesia, the Philippines, Hongkong, Japan, in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 26°N.—7°S., 80°—127°E. in the Indo-Pacific=(5°N. 80°—100°E. in the Indian Ocean+26°N.—7°S., 103°—127°E. in the Pacific Ocean).

127. *Sardinella dayi* Regan

1917. *Sardinella dayi* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 381 (type locality: Karwar, India).
 1924. *Sardinella dayi* Fowler, *J. Bombay nat. Hist. Soc.*, 30, p. 36 (Calicut).
 1941. *Sardinella dayi* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 604, fig. 16. (specimen figured was from Mauritius.)
 1949. *Sardinella dayi* Misra, *Rec. Indian Mus.*, 45, p. 387.
 1953. *Sardinella dayi* Misra, *Rec. Indian Mus.*, 50, p. 375.
 B.6; D. 16—18; V.8; A. 19—20; L.1. 38—44; L.tr.12—13; Predorsal scales 12—17.

Body oblong, compressed; abdomen keeled, serrated. Ventral and dorsal profiles more or less equal. Head 5.5, depth 3.8 in total length. Eyes with broad adipose lid, 3.7—4.0 in head, 1.0 in snout, greater than interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching nearly midorbit. Single dorsal fin; origin much nearer to snout end than to caudal base. Pectoral low, $\frac{2}{3}$ in head. Pelvics small, $\frac{2}{3}$ in pectorals; origin behind dorsal origin, slightly nearer to pectoral base than

*Recently reported from India (*vide* Bennett, 1965, *J. mar. biol. Ass. India*, 7 (1), p. 208). *ed.*

to anal origin. Anal base slightly longer than dorsal base; origin nearer to pelvic origin than to caudal base. Caudal deeply forked. Lateral line absent. Scales not deciduous, in regular rows. Abdominal scutes, pre ventral 16—17, postventral 12—14. Gill rakers 68+130, finely lanceolate, equal to eye.

Slaty brown above becoming pale to whitish on sides and below.

It attains 156 mm in length.

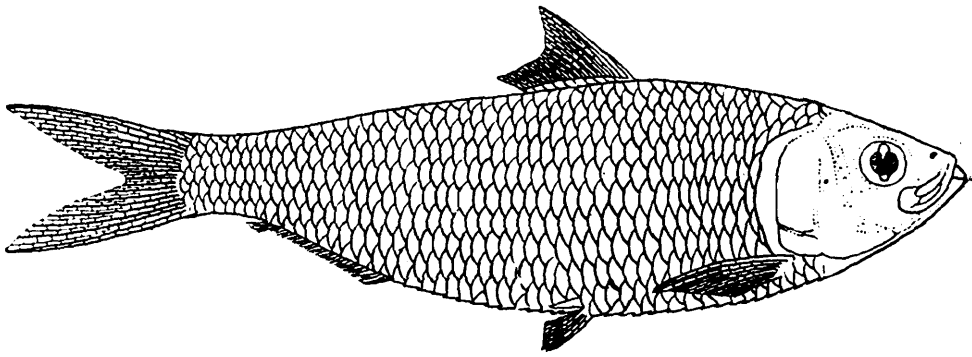
Distribution.—India.—Mauritius; in the mean annual isotherm of 20°C. in Lat. 14°N.—20°S., Long. 57°—74°E. in the Indian Ocean.

128. *Sardinella fimbriata* (Valenciennes)

(Text-fig. 9)

1847. *Spratella fimbriata* Valenciennes, *Hist. nat. Poiss*, 20, p. 359 pl. 600 (type locality: Malabar).
1850. *Kowala lauta* Cantor, *J. As. Soc. Bengal*, 8, p. 1279. (type locality: Penang).
1865. *Spratella fimbriata* Day, *Fish. Malabar*, p. 233 (Malabar).
1878. *Clupea fimbriata* Day (*partim*), *Fish. India*, p. 637, pl. 161, fig. 3 (Red Sea, seas of India to the Malay Archipelago; the example figured, life-size, was from Vizagapatnam).
1889. *Clupea fimbriata* Day (*partim*), *Fauna Brit. India*, Fish., 1, p. 373 (Red Sea, seas of India to the Malay Archipelago).
1913. *Clupea (Harengula) fimbriata* Weber & de Beaufort (*partim*), *Fish. Indo-Austral. Arch.*, 2, p. 75, nec. fig. 26 (Java, Sumatra, Banka, Borneo, Bali, Celebes, Ambon).
1916. *Clupea fimbriata* Govindan, *Madras Fish. Bull.*, 9, p. 114.
1917. *Sardinella fimbriata* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 382. (Akyab, Orissa, Malabar).
1929. *Clupea fimbriata* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1931. *Sardinella fimbriata* Chu, *Biol. Bull. St. John's Univ.*, 1, p. 14 (Hainan; China).
1933. *Clupea fimbriata* Sorley, *Marine Fish. Bombay Presidency*, p. 160 (Bombay; Sind).
1936. *Sardine lla fimbriata* Suvatti, *Index Fish. Siam*, p. 9 (Siam).
1941. *Sardinella fimbriata* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, P 609.

1949. *Sardinella fimbriata* Misra, *Rec. Indian Mus.*, **45**, p. 387.
 1953. *Sardinella fimbriata* Misra, *Rec. Indian Mus.*, **50**, p. 375.
 1953. *Sardinella fimbriata* Herre, *Check List Philippine Fish.*, p. 66 (Philippines).
 1955. *Sardinella fimbriata* Munro, *Mar. Freshwater Fish. Ceylon*, p. 26 (Coastal waters).



TEXT-FIG. 9.—Lateral view of *Sardinella fimbriata* (V.) (After F. Day)

Vernacular names.—INDIA: *Charee-addee*, Hindustani; *Pedi*, Kanarese; *Cuttary Charlay*, Malabar; *Pedwa*, *Washi*, Marathi; *Poonduringa*, *Chalai*, Tamil; *Kowal Telegu*; Standardised name: *Chala mathi*. PAKISTAN: *Kich-uklouar*. SRI LANKA: *Gol salaya*. Singhalese.

B. 6; D. 18—19; P. 15—16; V. 8.; A. 16—21; C. 20; L. l. 45; L. tr. 11—12; Predorsal scales 12—15.

Body rather elongate, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 4.5—5.2, depth 3.7 in total length. Eyes with broad adipose lid, 3.3—4.0 in head, 1.1 in snout and 0.9 in interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching beyond anterior margin of eye. Teeth on palatines and tongue, none on vomer and pterygoids. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, $\frac{3}{4}$ of head. Pelvics small, nearly half of pectorals; origin below middle of dorsal, nearer anal origin than to pectoral base. Anal base equal to dorsal base; origin equidistant between pelvic origin and caudal base. Caudal deeply forked. Lateral line absent. Scales regularly arranged in rows. Abdominal scutes, preventral 16—17, postventral 12—13, Gill rakers 43+ 80.

Bluish green, sides silvery; dorsal fin with numerous fine black dots, and a black mark at base of its anterior rays; caudal with bluish reflections and tipped with dark.

It attains 140 mm in length.

Distribution:—India, Pakistan, Burma, Sri Lanka, Singapore, Indonesia, Thailand, Tonkin, China, the Philippines; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 62°—123°E. in the Indo-Pacific=(4°—25°N., 62°—98°E. in the Indian Ocean+19°N.—7°S., 103°—123°E. in the Pacific Ocean).

129. *Sardinella jussieu* Lacépède*

1803. *Clupanodon jussieu* Lacépède, *Hist. nat. Poiss.*, 5, pp. 469, 474, pl. 11, fig. 2 (type locality: Mauritius).
1847. *Clupeonia fasciata* Valenciennes, *Hist. nat. Poiss.*, 20, p. 349 (type locality: Bourbon).
1849. *Clupea gibbosa* Bleeker, *Ind. Archipel.*, 3, p. 72 (type locality: Macassar).
1852. *Spratella tembang* Bleeker, *Nat. Tijds. Ned. Ind.*, 3, p. 774. (type locality: Macassar; Batavia).
1878. *Clupea fimbriata* (part.) Day (nec. Val.), *Fish. India*, p. 637.
1878. *Clupea tembang* Macleay, *Proc. Linn. Soc. New South Wales*, 2, p. 264 (Port Darwin).
1889. *Clupea fimbriata* (part.) Day (nec. Val.), *Fauna Brit. India*, Fish., 1, p. 373.
1909. *Clupea gibbosa* Günther, *J. Mus. Godeffroy*, pt. 16, p. 381 (Ponape, Samoa, Tonga, Society Is., Fiji).
1913. *Clupea (Harengula) fimbriata* (part) Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 75, fig. 26.
1917. *Sardinella gibbosa* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 383 (Ganjam, Madras).
1929. *Sardinella fasciata* Mc Culloch, *Austral. Mus. Mem.*, 5, p. 38.
1929. *Sardinella jussieu* Fowler, *Proc. Acad. nat. Sci. Philadelphia*, p. 592 (Shanghai).
1930. *Sardinella jussieu* Fowler, *Proc. Acad. nat. Sci. Philadelphia*, p. 598 (Hong Kong).
1934. *Sardinella jussieu* Fowler, *Proc. Acad. nat. Sci. Philad.*, 86, p. 411 (Natal, Philippines).

**Jussieu* Lacépède is a *nomen dubium* (vide Whitehead, 1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2 p. 54); and is replaced by *S. gibbosa* Bleeker, 1849. *ed.*

1935. *Clupea (Harengula) gibbosa* Deraniyagala, *Ceylon J. Sci.* (C) **5**, p. 82 (Ceylon).
 1941. *Sardinella jussieu* Fowler, *Bull. U.S. nat. Mus.*, (100) **13**, p. 611.
 1949. *Sardinella gibbosa* Misra, *Rec. Indian Mus.*, **45**, p. 387.
 1953. *Sardinella gibbosa* Misra, *Rec. Indian Mus.*, **50**, p. 375.
 1953. *Sardinella gibbosa* Herre, *Check List Philippine Fish.*, p. 67, (Philippines).
 1953. *Sardinella jussieu* Smith, *Sea Fish. South. Africa*, p. 92 (Natal).
 1955. *Sardinella jussieu* Munro, *Mar. Freshwater Fish. Ceylon*, p. 26 (coastal waters).

Vernacular name.—Standardised name : *Choodai*.

B.6; D. 18—19; P.15—16; V.8; A.16—19; C.20; L.1. 45; L. tr. 12; Predorsal scales 14—16.

Body elongate, compressed; abdomen keeled, serrated. Ventral and dorsal profiles equally convex. Head 5·8, depth 4·1 in total length. Eyes with broad adipose lid, 3·3 in head, 1·0 in snout and a little longer than interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching midorbit. No teeth. Single dorsal fin; origin much nearer to snout than to caudal base. Pectorals low, nearly equal to head. Pelvics small, nearly half of pectorals; origin equidistant between anal origin and pectoral base, and behind dorsal origin. Anal base longer than dorsal base; origin nearer to pelvic origin than to caudal base. Caudal deeply forked. Lateral line absent. Scales regularly arranged. Abdominal scutes, preventral 17—19, postventral 12—14. Gill rakers 28+63, lanceolate, 1·4 in eye.

Brown above, silvery white below; muzzle dusky; dark spot at base of dorsal fin anteriorly; other fins whitish.

It attains 178 mm. in length.

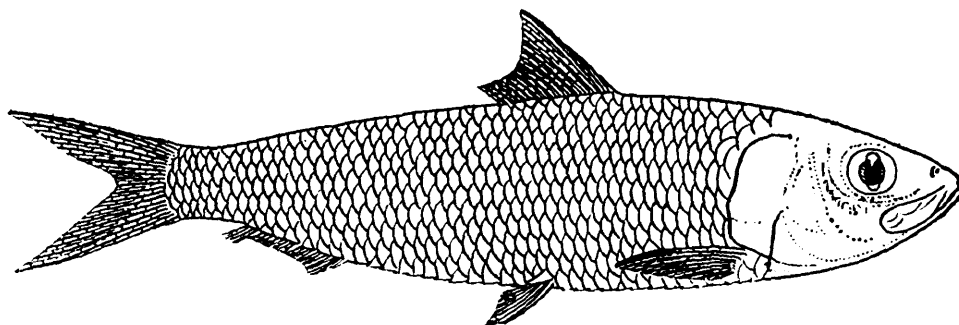
Distribution.—India, Sri Lanka.—Durban, Mauritius, Bourbon, Madagascar, Malaya, Indonesia, Hongkong, the Philippines, Queensland, Micronesia, Polynesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 34° N.—29° S., 30° E.—170° W. in the Indo-Pacific=(13° N.—29° S., 32°—131° E. in the Indian Ocean+34° N.—16° S., 103° E.—170° W. in the Pacific Ocean).

130. *Sardinella longiceps* Valenciennes

(Text-fig. 10)

1847. *Sardinella longiceps* Valenciennes, *Hist. nat. Poiss.*, **20**, p. 273 (type locality : Pondicherry).
1847. *Sardinella neohowii* Valenciennes, *Hist. nat. Poiss.*, **20**, p. 274 (type locality : Cannanor, Malabar).
1847. *Alausa scombrina* Valenciennes, *Hist. nat. Poiss.*, **20**, p. 442 (type locality: Cannanor, Malabar).
1865. *Sardinella neohowii* Day, *Fish. Malabar*, p. 220 (Malabar).
1868. *Clupea longiceps* Günther, *Cat. Fish. Brit. Mus.*, **7**, p. 428 (Cochin).
1868. *Clupea scombrina* Gunther, *Cat. Fish. Brit. Mus.*, **7**, p. 448 (Cochin).
1878. *Clupea longiceps* Day, *Fish. India*, p. 637, pl. 161, fig. 2.
1889. *Clupea longiceps* Day, *Fauna Brit. India. Fish.*, **1**, p. 373 (Sind, down the Western coast of India, more rarely on the Eastern, Ceylon, the Andamans to the Malay Archipelago).
1910. *Clupea longiceps* Jenkins, *Rec. Indian Mus.*, **5**, p. 131 (Karachi).
1913. *Clupea (Harengula) longiceps* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 82 (Java, Bali).
1917. *Sardinella longiceps* Regan, *Ann. Mag. nat. Hist.*, (8) **19**, p. 379 (India, Muscat, Mombasa).
1917. *Clupea longiceps* Hornell, *Madras Fish. Bull.*, **11**, p. 92 (Tuticorin).
1924. *Sardinella longiceps* Fowler, *J. Bombay nat. Hist. Soc.*, **30**, p. 36 (Calicut).
1924. *Sardinella longiceps* Hornell & Nayadu, *Madras Fish. Bull.*, **18**, p. 129 (Madras).
1929. *Clupea longiceps* Pillay, *J. Bombay nat. Hist. Soc.*, **33**, p. 355 (Travancore).
1929. *Clupea (Harengus) longiceps* Deraniyagala, *Spolia Zeylan*, **15**, p. 44, pl. 18, fig. 11 (Ceylon).
1933. *Sardinella longiceps* Deraniyagala, *Ceylon J. Sci.*, (C) **5**, p. 83 (Ceylon).
1933. *Clupea longiceps* Sorley, *Marine Fish. Bombay Presidency*, **27**, p. 160 (Bombay).
1941. *Sardinella longiceps* Fowler, *Bull. U. S. nat. Mus.*, (100) **13**, p. 603.
1941. *Sardinella longiceps* Herre, *Mem. Indian Mus.*, **13**, p. 334 (Andamans).

1949. *Sardinella longiceps* Misra, *Rec. Indian Mus.*, **45**, p. 388.
 1953. *Sardinella longiceps* Misra, *Rec. Indian Mus.*, **50**, p. 375.
 1953. *Sardinella longiceps* Herre, *Check List Philippine Fish.*, p. 68 (Philippines).
 1955. *Clupea longiceps* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 14.
 1955. *Sardinella longiceps* Munro, *Mar. Freshwater Fish. Ceylon*, p. 25 (coastal waters).



TEXT-FIG. 10.—Lateral view of *Sardinella longiceps* Val. (After F. Day)

Vernacular names.—INDIA : *Tarli multhi*, Kanarese; *Charlay*, *Pay-charlay*, Malayalam; *Haid*, Marathi; Standardised name : *Nalla mathi*. PAKISTAN : *Lee-gur*, Baluchistan; *Lonar*, Sind. SRI LANKA : *Pesalaya*, Singhalese; *Pechalai*, *Pesalai*, Tamil.

B. 6; D. 16—18; P. 15—17; V. 8; A. 13—16; C. 17; L. l. 45—48; L. tr. 12—13; Predorsal scales 13—15.

Body elongate, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 3.7—4.2, depth 5.0—5.2 in total length. Eyes with adipose lid, 4.5—5.0 in head, about 1.0 in snout, 0.6 in interorbital. Lower jaw projecting beyond upper. Cleft of mouth oblique; maxillary reaching beyond front margin of eye, 2.5 in head. No teeth. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, more than half in head. Pelvics small, more than half of pectorals; origin a little nearer to pectoral base than to anal origin, and behind dorsal origin. Anal base equal to dorsal base; origin equidistant between pelvic and caudal base. Caudal deeply forked. Lateral line absent. Scales non-deciduous. Abdominal scutes, preventral 18, postventral 13-14. Gill rakers 158+200, setiform, little longer than gill filaments, 1.0—1.5 times eye.

Slaty above, pale to whitish below; a large greenish-gold spot on the upper margin of opercle and preopercle; fins pale.

It attains 204mm. in length and large quantities of oil are made from them in Malabar.

Distribution.—India, Pakistan, Sri Lanka.—Mombasa Arabia, Seychelles, Indonesia, Indo-china, Philippines; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 39°—123°E. in the Indo-Pacific=(25°N.—4°S., 39°—92°E. in the Indian Ocean+14°N.—7°S., 108°—123°E. in the Pacific Ocean).

131. *Sardinella melanura* (Cuvier)

1829. *Clupea melanura* Cuvier, *Regne Animal.*, 2, ed. 2, p. 318 (on Lacépède).
1847. *Clupeonia commersoni* Valenciennes, *Hist. nat. Poiss.*, 20, p. 350 (type locality : Bombay).
1868. *Clupea atricauda* Günther, *Cat. Fish. Brit. Mus.*, 2, p. 426 (type locality : Ceram, Ambion, Port Blair).
1870. *Clupea atricauda* Day, *Proc. zool. Soc. Lond.*, p. 701 (Andamans).
1872. *Clupea* (*Harengula*) *sundaica* Bleeker, *Atl. Ichth. Ind. Neerland.*, 6, p. 105, nec. figure (type locality : Java, Celebes).
1878. *Clupea atricauda* Day, *Fish. India*, p. 636, pl. 164, fig. 5 (Andamans to the Malay Archipelago; the example figured was from Port Blair).
1889. *Clupea atricauda* Day, *Fauna Brit. India*, Fish., 1, p. 372 (Andamans to the Malay Archipelago).
1911. *Clupea ogura* Kishinouye, *J. Coll. Agric. Tokyo*, 2, p. 384, pl. 30, fig. 2 (type locality: Futani, Chichijima, Bonin Is.).
1913. *Clupea* (*Harengula*) *atricauda* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 80 (Java, Nias, Bali, Celebes, Ambon, Ceram, Halmahera).
1917. *Sardinella melanura* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 384.
1917. *Clupea atricauda* Hornell, *Madras Fish. Bull.*, 11, p. 91.
1928. *Sardinella melanura* Fowler, *Mem. Bishop. Mus.*, 10, p. 30 (Tahiti, Papeete, Suva, Society Is., Nukahiva).
1929. *Clupea atricauda* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1933. *Clupea* (*Harrengula*) *melanura* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
1936. *Sardinella melanura* Suvatti, *Index Fish. Siam*, p. 10 (Siam).
1937. *Sardinella melanura* Fowler, *Proc. Acad. nat. Sci. Philadelphia*, 89, p. 130 (Bangkok).
1941. *Sardinella melanura* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 614.

1941. *Sardinella melanura* Herre, *Mem. Indian Mus.*, 13, p. 33 (Andamans).
1949. *Sardinella melanura* Misra, *Rec. Indian Mus.*, 45, p. 388.
1953. *Sardinella melanura* Misra, *Rec. Indian Mus.*, 50, p. 375.
1953. *Sardinella melanura* Herre, *Check List Philippine Fish.*, p. 68 (Philippines).
1953. *Sardinella melanura* Smith, *Sea Fish. South. Africa*, p. 92 (Delagoa Bay).
1955. *Sardinella atricauda* Anonymous, *Mar. Fish. Karachi. Sind & Makran*, p. 14 (Coasts of Sind & Makran).
1955. *Sardinella melanura* Munro, *Mar. Freshwater Fish. Ceylon*, p. 26. (coastal waters).

Vernacular names.—INDIA : *Keeri-charlay*, Malayalam; *Chalai, Salai*, Tamil. PAKISTAN: *Polli*, Karachi. SRI LANKA : *Salaya*, Singhalese.

B. 6; D. 15—18; P. 13—15; V 8; A. 18—21; C. 19; L. 1. 38—40; L. tr. 10—12; Predorsal scales 11—16.

Body oblong, compressed, abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 5.0, depth 4.0—5.0 in total length. Eyes with broad adipose lid, 3.0—3.5 in head, 1.0 in snout, 0.7 in interorbital. Lower jaw longer than upper. Cleft of mouth oblique; maxillary reaching one third of eye. No teeth. Single dorsal fin, origin nearer to snout end than to caudal base. Pectorals low, 1.4—1.5 in head. Pelvics small, 2.1—2.2 in head; origin nearly equidistant between pectoral base and anal origin. Anal base slightly longer than dorsal base; origin slightly nearer to caudal base than to pelvic origin. Caudal deeply forked. Lateral line absent. Scales rounded. Abdominal scutes, pre-ventral 16, postventral 10. Gill rakers 16—18+35—38.

Neutral slaty to bluish above; sides and abdomen silvery; a blue spot on opercle; outer third of caudal lobes blackish.

It attains 208 mm in length.

Distribution.—India, Pakistan, Sri Lanka.—East coast of Africa, Mauritius, Madagascar, Malaya, Singapore, Indonesia, Siam, Bangkok, the Philippines, Japan, Micronesia, Polynesia; in the mean annual isotherm of 20°C.

with the latitudinal and longitudinal range of 34°N.—25°S., 32°E.—149°W. in the Indo-Pacific=(25°N.—25°S., 32°S., 32°—100° E. in the Indian Ocean+34°N.—18°S., 101°E.—149° W., in the Pacific Ocean).

132. *Sardinella perforata* (Cantor)*

1849. *Clupeonia perforata* Cantor, *J. As. Soc. Bengal*, 18, p. 1278 (type locality : Penang Sea, Malay Penninsula, Singapore, Sumatra).
1868. *Harengula* (*Spratella*) *kowala* Bleeker, *Versl. Akad. Amsterdam*, (2) 2, p. 294 (type locality : Rio Bintang). ♀
1913. *Clupea* (*Harengula*) *perforata* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 74 (Java, Sumatra, Banka, Borneo, Celebes, Amboina).
1913. *Clupea perforata* Weber, "*Siboga*" *Exped., Fische*, 57, p. 8 (Lumbok; Macassar).
1917. *Sardinella perforata* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 382 (Persian Gulf, Malay Archipelago).
1928. *Sardinella perforata* Fowler, *Mem. Bishop Mus.*, 10, p. 30 (Samoa).
1936. *Sardinella perforata* Suvatti, *Index Fish. Siam*, p. 10 (Gulf of Siam).
1938. *Sardinella perforata* Fowler, *List. Fish. Malaya*, p. 31 (Penang, Singapore).
1941. *Sardinella perforata* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 607.
1953. *Sardinella perforata* Herre, *Check List Philippine Fish.*, p. 69 (Philippines).
1955. *Sardinella perforata* Munro, *Mar. Freshwater Fish. Ceylon*, p. 25 (coastal waters).

B. 6; D. 17—19; P. 14—15; V 8; A. 18—20; L. 1. 43—44; L. tr. 12—13; Predorsal scales 14.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal. Head 5.2, depth 3.9 in total length. Eyes with broad adipose lid, 3.7—3.8 in head, greater than snout or interorbital. Lower jaw not prominent. Cleft of mouth slightly oblique; maxilla reaching $\frac{1}{4}$ — $\frac{1}{3}$ in eye. No teeth. Single dorsal fin; origin nearer to snout end than to caudal origin. Pectorals low, 1.2—1.3 in head. Pelvics small, 2.0 in head; origin nearer to pectoral base than to anal origin and behind dorsal origin. Anal base slightly

*Now considered a junior synonym of *Sardinella albella* (Val., 1847) (*vide* Whitehead, 1960, *J. mar. biol. Ass. India*, 9(2) p. 233). *Ed.*

smaller than dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Lateral line absent. Scales adherent; axillary pelvic scales $4/5$ of fin. Abdominal scutes, preventral $17+8$, postventral 14. Gill rakers $30+58-60$, finely setiform, 1.8 in eye.

Black brown above, silvery white on sides and below; dark spot at bases of front dorsal rays.

It attains 150 mm. in length; littoral, euryhaline.

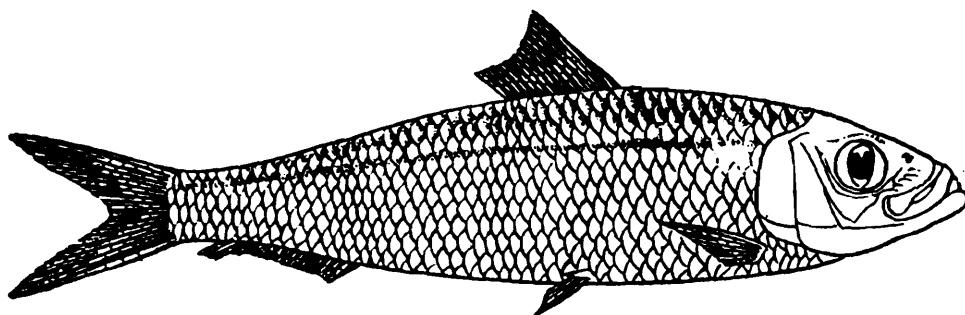
Distribution.—Sri Lanka.—Persian Gulf, Malaya, Singapore, Indonesia, Thailand, the Philippines, Amoy, China, Samoa, Polynesia; in the mean annual isotherm of 20°C . with the latitudinal and longitudinal range of $27^{\circ}\text{N}.$ — $12^{\circ}\text{S}.$, $51^{\circ}\text{E}.$ — $170^{\circ}\text{W}.$ in the Indo-Pacific—(5° — $27^{\circ}\text{N}.$, 51° — $100^{\circ}\text{E}.$ in the Indian Ocean+ $24^{\circ}\text{N}.$ — $7^{\circ}\text{S}.$, $101^{\circ}\text{E}.$ — $170^{\circ}\text{W}.$ in the Pacific Ocean).

133. *Sardinella sindensis* (Day)

(Pl. I, fig. 1; Text-fig. 11)

- 1878. *Clupea sindensis* Day, *Fish. India*, p. 638, pl. 163, fig. 2 (type locality : Karachi; type in the Zoological Survey of India; the example figured, life size, was from Karachi).
- 1889. *Clupea sindensis* Day, *Fauna Brit. India*, Fish., 1, p. 374 (seas of the Seychelles, Sind and Bombay).
- 1910. *Clupea sindensis* Jenkins, *Rec. Indian Mus.*, 5, p. 131 (Karachi).
- 1917. *Clupea sindensis* Hornell, *Madras Fish. Bull.*, 11, p. 91 (Tuticorin).
- 1917. *Sardinella sindensis* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 383 (Sind, Bombay, Amboina, Formosa).
- 1929. *Clupea sindensis* Pillay, *J. Bombay nat. Hist. Soc.*, 33, 355 (Travancore).
- 1933. *Clupea sindensis* Sorley, *Marine Fish. Bombay Presidency*, p. 160 (Bombay).
- 1941. *Sardinella sindensis* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 611.
- 1949. *Sardinella sindensis* Misra, *Rec. Indian Mus.*, 45, p. 389.
- 1953. *Sardinella sindensis* Misra, *Rec. Indian Mus.*, 50, p. 375.
- 1955. *Clupea sindensis* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 14 (coasts of Sind and Makran).

Vernacular names.—INDIA : *Jirai*, Kanarese; *Vattu Kanni*, Malayalam; *Kanat*, Marathi.



TEXT-FIG. 11.—Lateral view of *Sardinella sindensis* (Day) (After F. Day)

B. 6; D. 16—19; P. 15; V. 8; A. 18—21; C. 21; L. 1. 41—44; L. tr. 11; Predorsal scales 11—12.

Body elongate, compressed; abdomen keeled, serrated. Dorsal and ventral profiles more or less equally convex. Head 4.5—5.0 in total length. Eyes with broad adipose lid, 4.2 in head, 1.2 in snout, 1.0 in interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching little beyond anterior margin of eye. Single dorsal fin; origin nearer to snout end than to caudal origin. Pectorals low, 1.8 in head. Pelvics small, 3.6 in head; origin nearer to pectoral base than to anal origin and behind dorsal origin. Anal base longer than dorsal base; origin nearer to caudal base than to pelvic origin; last 2 rays prolonged. Caudal deeply forked. Lateral line absent. Abdominal scutes poorly developed, preventral 17—19, postventral 12—15. Lower gill rakers 58—66.

Deep bluish grey above becoming silvery spot with gold on sides and below; lines along rows of scales in upper third of body; small dark shoulder spot; dark spot at base of front dorsal rays; upper part of dorsal and ends of caudal lobes blackish.

It attains 203 mm in length; littoral, euryhaline.

Distribution.—India, Pakistan.—Indonesia, Formosa; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—4°S., 62°—128°E. in the Indo-Pacific=(8°—25°N., 62°—78°E. in the Indian Ocean+25°N.—4°S., 120°—128°E. in the Pacific Ocean).

134. *Sardinella sirm* (Walbaum)

1792. *Clupea sirm* Walbaum, *Artedi Pisc.*, 3, p. 38 (on Forskål, *Descript. Animal.*, p. 17, 1775 (type locality : Arabia)).
1835. *Clupea sirm* Rüppell, *Neue Wirbelth., Fische*, p. 77, pl. 21, fig. 1 (type locality : Red Sea, Massaua).
1847. *Sardinella leiogaster* Valenciennes, *Hist. nat. Poiss.*, 20, p. 270 (type locality : Trincomalee, Ceylon).
1854. *Sardinella leiogastroides* Bleeker, *Nat. Tijds. Ned. Indie*, 7, p. 255 (type locality : Manado, Celebes).
1872. *Clupea pinguis* Günther, *Ann. Mag. nat. Hist.*, (4) 10, p. 425 (type locality : Misol).
1878. *Clupea leiogaster* Day, *Fish. India*, p. 636 (Ceylon to the Malay Archipelago).
1889. *Clupea leiogaster* Day, *Fauna Brit. India*, Fish., 1, p. 372 (Ceylon to the Malay Archipelago).
1913. *Clupea (Amblygaster) leiogaster* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 61.
1917. *Clupea leiogaster* Hornell, *Madras Fish. Bull.*, 11, p. 91 (Tuticorin).
1931. *Sardinella leiogaster* Chu, *Biol. Bull. St. John's Univ.*, (1), p. 14 (Hongkong).
1933. *Sardinella leiogaster* Deraniyagala, *Ceylon J. Sci.*, (C), 5, p. 83 (Ceylon).
1938. *Sardinella sirm* Fowler, *List Fish. Malaya*, p. 32 (Serangoon, Singapore).
1941. *Sardinella sirm* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 616.
1949. *Sardinella sirm* Misra, *Rec. Indian Mus.*, 45, p. 389.
1953. *Sardinella sirm* Misra, *Rec. Indian Mus.*, 50, p. 375.
1953. *Sardinella sirm* Herre, *Check List Philippines Fish.*, p. 70 (Philippines).
1955. *Sardinella sirm* Munro, *Mar. Freshwater Fish. Ceylon*, p. 26 (coastal waters).

Vernacular names.—SRI LANKA : *Hurulla*, Singhalese; *Kirimeen chalai*, Tamil.

B. 6; D. 17—19; P. 16—18; V. 8; A. 17—20; C. 17; L. I. 42—43; L. tr. 10—12; Predorsal scales 15—16.

Body elongate, compressed; abdomen keeled, serrated, dorsal and ventral profiles equally convex. Head 4.6—5.2, depth 5.5—6.0 in total length. Eyes with adipose lid, 3.3—4.2 in head, 1.0—1.5 in snout, 0.7—0.8 in interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla almost reaching front margin of eye.

Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.5—1.6 in head. Pelvics small, 2.6—2.8 in head; origin nearer to pectoral base than to anal origin and behind dorsal origin. Anal base longer than dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Lateral line absent. Scales deciduous. Abdominal scutes poorly developed, preventral 17—18, postventral 14—16. Gill rakers 25+43, slender, one and a half in eye.

Dark bluish green above, silvery white on sides and below; a longitudinal band on the upper half of body with 13—20 deep blue spots.

It attains 294 mm in length.

Distribution.—India, Sri Lanka.—Red Sea, Arabia, Zanzibar, Malaya, Indonesia, Hong Kong, the Philippines, Micronesia, Polynesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 22°N.—12°S., 38°E.—170°W. in the Indo-Pacific=(22°N.—5°S., 38°—100°E. in the Indian Ocean+22°N.—12°S., 103°E.—170°W. in the Pacific Ocean).

57. Genus *Macrura* van Hasselt*

1823. *Macrura* (*Macroura* Meuschen, 1778 in mammals; *Macrourus* Bloch, 1786 in fishes; *Macrurus* Schneider, 1801 in fishes not involved) van Hasselt, *Alg. konst. Letterbode*, 21, p. 329; type, *Clupea kelee* C., monotypic; *fid.* Fowler, *Bull. U. S. nat. Mus.* (100) 13, p. 626, 1941; admissible according to Art. 36, Rec. of the International Commission of Zoological Nomenclature).
1916. *Paralosa* (*nec.* Bleeker) Regan, *Ann. Durban Mus.*, 1, p. 167 (type, *P. durbanensis* Reg., monotypic) (inadmissible).
1917. *Hilsa* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 303 (type, *Paralosa durbanensis* Reg.).
1934. *Tenualosa* Fowler, *Proc. Acad. nat. Sci. Philad.*, 85 p. 246 (type, *Alosa reevesii* Richardson, orthotypic).

Body oblong, well compressed; scales large. Maxilla extending to postorbital margin. Supplemental bone present. Jaws subequal. Upper jaw with distinct median notch. Eyes with adipose lid. Branchiostegals 5. Abdomen keeled and serrated. Dorsal origin before

*Whitehead (1965, *Bull. Br. Mus. nat. Hist. (Zool.)*, 12 (4), p. 128) considers these fishes under the genus *Hilsa* Regan, 1917 and does not consider *Macrura* van Hasselt as a senior synonym of *Hilsa*. *ed.*

pelvic origin. Anal single, moderate, last 2 anal rays not enlarged. Adipose fin absent. Caudal deeply forked. Pseudobranchiae. Close-set, numerous, fine gill rakers. Enlarged scale at caudal base absent.

Distribution.—Aden, Zanzibar, South and East Iraq. Persian Gulf, India, Pakistan, Sri Lanka, Burma, Malaya, Thailand, Indonesia, China and Formosa.

*Key to species of genus Macrura van Hasselt**

1. Lateral transverse scales less than 16; 17-18 preventral and 11-13 postventral scutes . . . 3
2. Lateral transverse scales more than 16 (17-19) ; 16-17 pre-ventral and 14-15 postventral acutes . . . *M. ilisha*
3. Parietal ridges expanded and striated; length of head $4\frac{1}{2}$ times in total length . . . *M. kelee*
4. Parietal ridges narrow and covered with smooth skin; length of head $5-5\frac{1}{2}$ times in total length . . . *M. sinensis*

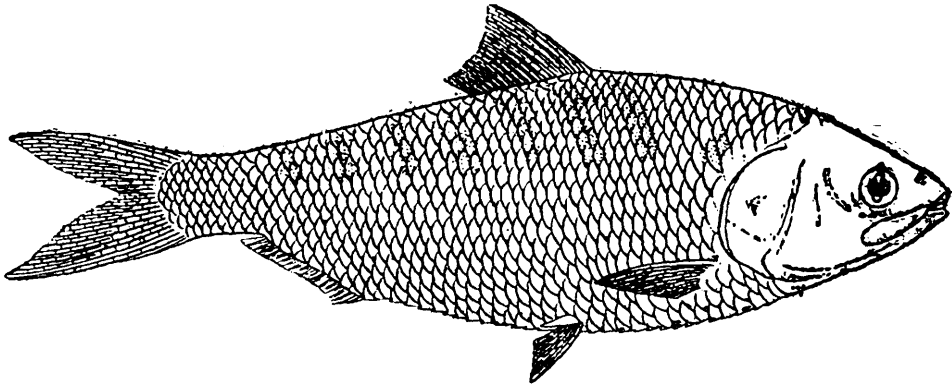
135. *Macrura ilisha* (Hamilton)

(Text-fig. 12)

1822. *Clupanodon ilisha* Hamilton, *Fish. Ganges*, p. 243, pl. 19, fig. 73 (type locality : Ganges estuaries, Patna, Goalpara, Calcutta, Dhaka-Dacca).
1829. *Clupea palasah* Cuvier, *Regne animal*, 2, ed. 2, p. 320 (on *Palasah* Russell, *Fish. Coromandel.*, p. 77, pl. 198, 1803), (type locality : Vizagapatam).
1847. *Alausa palasah* Valenciennes, *Hist. nat. Poiss.*, 20, p. 432 (Bombay).
1865. *Alausa palasah* Day, *Fish. Malabar*, p. 235 (Malabar).
1865. *Alausa palasah* Kner, *Reise Novara Fische*, p. 331 (Ceylon).
1868. *Clupea palasah* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 445 (Ganges, Cochin).
1873. *Clupea palasah* Day, *Rep. Freshwater Fish. India & Burma*, p. 22 (Indus, Cauveri, Hoogli, Irrawaddi).

*Whitehead (1965, *Bull. Br. Mus. nat. Hist. Zool.*, 12 (4), p. 127) recognises two subgenera of *Hilsa* viz., *Hilsa* Regan (*H. kelee*) and *Tenualosa* Fowler (*H. ilisha* and *H. toli*). *ed.*

1878. *Clupea ilisha* Day, *Fish. India*, p. 640, pl. 172, fig. 3 (Persian Gulf ascending the Tigris, the coasts of Sind, India and Burma, passing up the large rivers to breed, also in the Malay Archipelago; Day collected them as high as Delhi and Hamilton recorded them from Agra and Cawnpore).
1889. *Clupea ilisha* Day, *Fauna Brit. India*, Fish., 1, p. 376, fig. 115.
1896. *Clupea (Alosa) ilisha* Steindachner, *Ann. Hofmus Wien*, 11, p. 228 (Rangoon).
1907. *Clupea ilisha* Lloyd, *Rec. Indian Mus.*, 1, p. 221 (Akyab).
1910. *Clupea ilisha* De, *Rep. Fish. East Bengal & Assam*, p. 18 (Eastern Bengal and Assam).
1913. *Clupea ilisha* Southwell, *Rec. Indian Mus.*, 9, pp. 88, 296 (Monghyr, Buxar, Calcutta, Diamond Harbour).
1916. *Clupea ilisha* Raj, *Rec. Indian Mus.*, 12, p. 252 (Tanjore).
1916. *Clupea ilisha* Govindan, *Madras Fish. Bull.*, 9, p. 115.
1917. *Hilsa ilisha* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 306 (Persian Gulf to Burma).
1917. *Clupea ilisha* Hornell, *Madras Fish. Bull.*, 11, p. 92 (Tuticorin).
1937. *Hilsa ilisha* Shaw & Shebbeare, *J. roy. As. Soc. Bengal, (Sci.)*, 3, p. 13, fig. 4 (Sarahat).
1938. *Hilsa ilisha* Hora, *Rec. Indian Mus.*, 40, p. 147 (Putla, Nawabgunge).
1940. *Hilsa ilisha* Hora & Nair, *Rec. Indian Mus.*, 42, p. 35 (East Bengal).
1940. *Hilsa ilisha* Prashad, Hora & Nair, *Rec. Indian Mus.*, 42, p. 529 (Chandipore, Goalundo).
1941. *Macrura ilisha* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 633.
1943. *Hilsa ilisha* Hora & Misra, *J. roy. As. Soc. Bengal, (Sci.)*, 9, 1, p. 2 (Iraq).
1949. *Hilsa ilisha* Misra, *Rec. Indian Mus.*, 45, p. 389.
1953. *Hilsa ilisha* Misra, *Rec. Indian Mus.*, 50, p. 347.
1955. *Clupea ilisha* Anonymous, *Mar. Fish Karachi, Sind & Makran*, p. 15 (Sind and Makran).
1955. *Tenuulosa ilisha* Munro, *Mar. Freshwater Fish. Ceylon*, p. 25 (coastal waters).
1960. *Hilsa ilisha* Menon, *Rec. Indian Mus.*, 54, p. 141 (Habanian.)



TEXT-FIG. 12.—Lateral view of *Macrura ilisha* (Ham.) (After F. Day)

Vernacular names.—INDIA : *Hilsa*, Bengal; *Pala*, Marathi; *Ilisha*, Orissa; *Oolum*, Tamil; *Palasah*, Telegu; Standardised name: *Hilsa*, *Palla*. BANGLADESH : *Hilsa*. PAKISTAN : *Palo*, *Pulla*, Sindhi. BURMA : *Nya-tha-louk*.

B. 5; D. 18—19; P. 15; V. 9; A. 19—22; C. 19; L. 1. 46—49; L. tr. 17—19.

Body oblong, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 4.2—4.5, depth 3.5—3.7 in total length. Eyes with broad adipose lid, 4.5—7.0 in head, 1.0—1.5 in snout, 1.5 in interorbital. Lower jaw not projecting beyond the upper. Cleft of mouth oblique; maxilla reaching midorbit to postorbit. No teeth. Single dorsal fin, origin nearer to snout than to caudal base. Pectorals low, 1.7 in head. Pelvics small, 2.8 in head; origin nearer pectoral base than to caudal origin and below the anterior half of the dorsal. Anal base equal to dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Lateral line absent. Scales in regular rows. Abdominal scutes, preventral 16—17, postventral 14—15. Lower gill rakers 120—220.

Silvery shot with gold and purple; row of spots along upper third of body, most distinct behind the upper third of opercle in young but spots disappearing in adults.

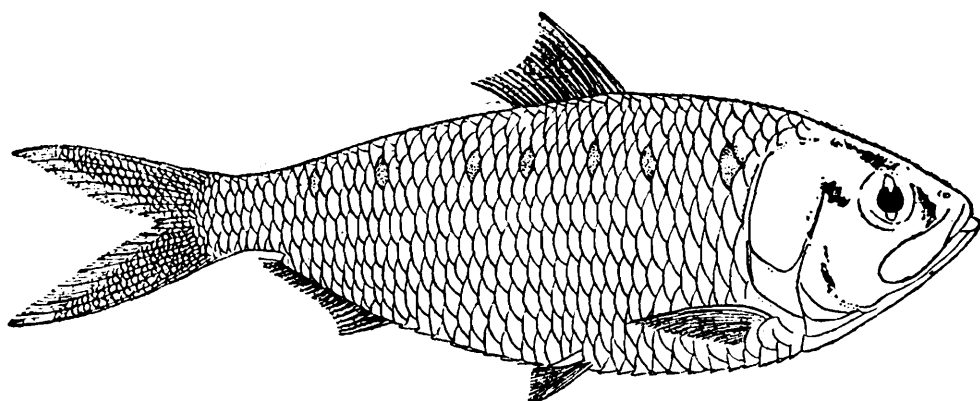
It attains 482 mm. in length and is good eating; littoral, euryhaline.

Distribution.—India, Pakistan, Bangladesh, Burma, Sri Lanka.—Iraq, Persian Gulf; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 6°—35° N., 48°—98° E. in the Indian Ocean.

136. *Macrura kelee* (Cuvier)

(Text-fig. 13)

1829. *Clupea kelee* Cuvier, *Régne animal.*, ed. 2, 2, p. 320 (on *Kelee* Russell, 1803, *Fish. Coromandel*, 2, p. 75, pl. 195 upper fig. (type locality : Vizagapatnam).
1847. *Clupeonia blochii* Valenciennes, *Hist. nat. Poiss.*, 20, p. 353 (type locality: Tranquebar).
1852. *Alosa kanagurta* Bleeker, *Verh. Bat. Gen.*, 24, pp. 13, 34 (type locality : Batavia, Muntok, East Indies).
1866. *Alosa malayana* Bleeker, *Ned. Tijds. Dierk.*, 3, p. 294 (type locality : Java, Sumatra).
1878. *Clupea kanagurta* Day, *Fish. India*, p. 640, pl. 162, fig. 4 (East coast of Africa, Sind, coasts of India to the Malay Archipelago).
1889. *Clupea kanagurta* Day, *Fauna Brit. India*, *Fish.*, 1, p. 377 (East coast of Africa, Sind, coasts of India to the Malay Archipelago).
1906. *Clupea durbanensis* Regan, *Ann. Natal Govt. Mus.*, 1, pl. 4 (type locality : Durban Bay).
1913. *Clupea (Alosa) kanagurta* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 67.
1924. *Hilsa blochii* Fowler, *J. Bombay nat. Hist. Soc.*, 30, p. 3 (Bombay).
1927. *Harengula kanagurta* Paradise & Whitley, *Mem. Queensland Mus.*, 9, p. 76, pl. 12, fig. 1 (Sir Edward Pellew Group).
1929. *Clupea kanagurta* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Clupea (Alosa) kanagurta* Deraniyagala, *Spolia Zeylan.*, 15, p. 39 (Ceylon).
1929. *Harengula kanagurta* Wu, *Contr. Biol. Lab. Sci. Soc. China*, 5, (4), p. 17, fig. 13 (Amoy).
1936. *Hilsa kanagurta* Suvatti, *Index Fish. Siam*, p. 12 (Siam, Singora, Bangkok).
1938. *Hilsa blochii* Fowler, *List. Fish. Malaya*, p. 27 (Penang, Seletar, Serangoon).
1941. *Macrura kelee* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 627.
1945. *Hilsa kanagurta* Smith, *Bull. U. S. nat. Mus.*, 188, p. 46 (Siam).
1949. *Hilsa kanagurta* Misra, *Rec. Indian Mus.*, 45, p. 390.
1953. *Macrura kelee* Smith, *Sea Fish. South. Africa*, p. 90, fig. 109 (Durban).
1955. *Clupea kanagurta* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 15 (Sind and Makran).
1955. *Macrura kelee* Munro, *Mar. Freshwater Fish. Ceylon*, p. 24 (coastal waters).



TEXT-FIG. 13.—Lateral view of *Macrura kelee* (C.) (After F. Day)

Vernacular names.—INDIA : *Koli meen*, Tamil; *Keelee*, *Koi meen*, Telegu; Standardised name : *Keelee*. SRI LANKA : *Seriya*, *Koiya*, *Kattu massa*, Singhalese.

B. 5; D. 3/15; P. 16; V 8; A. 3/17—18; C. 19; L. 1. 42—45; L. tr. 13—14; Predorsal scales 10—15.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 4.2, depth 3.2—3.5 in total length. Eyes with broad adipose lid, 4.0 in head, 1.0 in snout, 1.0 in interorbital. Lower jaw scarcely projects beyond the upper. Cleft of mouth oblique, maxilla extending to below hinder third of orbit. No teeth. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.5—1.7 in head. Pelvics small, 3.0 in head; origin nearer to pectoral base than to anal origin and behind the middle of dorsal. Anal base longer than dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked. Lateral line absent. Scales regularly arranged. Abdominal scutes, preventral 16—18, postventral 11—13. Gill rakers 50+95—130, setiform, equal to eye; gill filaments 2.2 in gill rakers.

Bluish green above, gold dotted with purple on sides and below; row of about six or eight oval spots in line from behind upper edge of opercle along side; upper edge of dorsal with dark mark.

It attains 178 mm. in length and is good eating, though bony; an excellent bait.

Distribution.—India, Pakistan, Sri Lanka.—Aden, Zanzibar, South Africa, Malaya, Amoy, Indonesia, Siam, Micronesia; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 25° N.—29° S.,

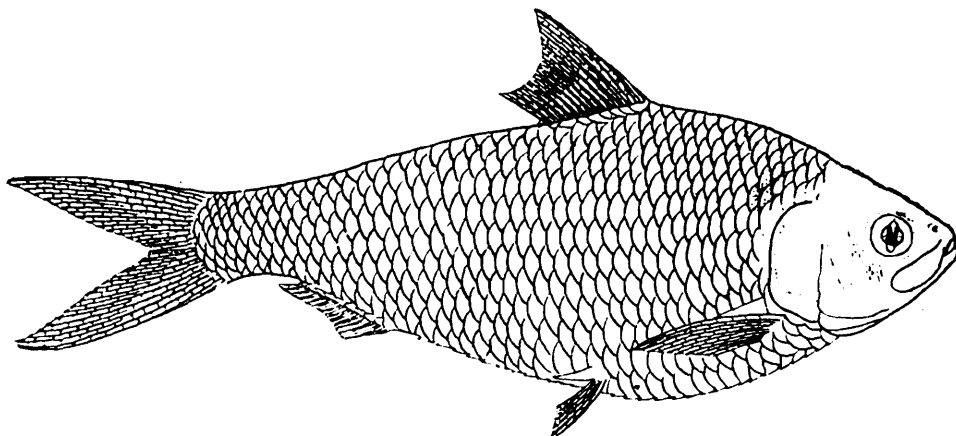
30°—135° E. in the Indo-Pacific=(25° N.—29° S., 30°—100° E. in the Indian Ocean+24° N.—7° S., 101°—135° E. in the Pacific Ocean).

137. *Macrura sinensis* (Linnaeus)*

(Text-fig. 14)

1758. *Clupea sinensis* Linnaeus, *Syst. Nat.*, ed. 10, 1, p. 319 (type locality : China).
1847. *Alausa toli* Valenciennes, *Hist. nat. Poiss.*, 20, p. 435 (type locality : Coromandel, Pondicherry).
1878. *Clupea toli* Day, *Fish. India*, p. 641, pl. 162, fig. 2 (from Bombay through the seas of India to the Malay Archipelago and China; the example figured life-size was from Bombay).
1889. *Clupea toli* Day, *Fauna Brit. India*, Fish., 1, p. 377 (from Bombay through the seas of India to the Malay Archipelago and China).
1910. *Clupea toli* De, *Rep. Fish. East. Bengal and Assam*, p. 18 (Chittagong).
1913. *Clupea (Alosa) toli* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 64 (Java, Sumatra, Formosa).
1917. *Hilsa toli* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 306 (India).
1929. *Clupea toli* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Clupea (Alosa) toli* Deraniyagala, *Spolia Zeylan.*, 15, p. 39 (Ceylon).
1931. *Hilsa toli* Chu, *Biol. Bull. St. John's Univ.* (1), p. 14 (China).
1932. *Clupea (Alosa) toli* Chevy, *Inst. Oceanogr. Indo-China* 19° note, p. 9 (Cochin China; Cambodia).
1936. *Hilsa toli* Suvatti, *Index Fish. Siam*, p. 12 (Nontaburi).
1938. *Hilsa sinensis* Fowler, *List Fish. Malaya*, p. 28 (Penang, Singapore).
1941. *Macrura sinensis* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 631.
1949. *Hilsa toli* Misra, *Rec. Indian Mus.*, 45, p. 390.
1953. *Hilsa toli* Anonymous, *Mar. Fish. Karachi, Sind and Makran*, p. 15 (Sind and Makran).
1955. *Tenualosa sinensis* Munro, *Mar. Freshwater Fish. Ceylon*, p. 24 (coastal waters).

*Whitehead (1965, *Bull. Br. Mus. nat. Hist. (Zool.)*, 12 (4), p. 143) identified this species as *Hilsa (Tenualosa) toli* (Valenciennes, 1847), since Linnaeus description of *Clupea sinensis* is too vague for a positive identification to be made. *ed.*



TEXT-FIG. 14.—Lateral view of *Macrura sinensis* (L.) (After F. Day)

Vernacular names.—INDIA : *Palpedi*, Kanarese; *Oolum*, Malayalam; *Bing*, Marathi; *Ullam*, Tamil; *Ullam*, Telegu; Standardised name: *Bhing*. PAKISTAN : *Palla*, Sind. BANGLADESH : *Nur hilisha*, Chittagong. BURMA : *Doung danna*, Arracan, SRI LANKA: *Ulla*, Singhalese.

B. 5; D. 16—19; P. 14; V 8; A. 18—21; C. 24; L. 1 39—40 : L. tr. 13—15; Predorsal scales 16.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 5.0—5.5, depth 3.5—4.0 in total length. Eyes with broad adipose lid, 4.2—7.5 in head, 1.0 in snout, 1.0 in interorbital. Lower jaw rather projecting beyond the upper. Cleft of mouth oblique, maxilla extending to hind part of eye. No teeth. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.3 in head. Pelvics small, 2.1 in head; origin nearer to pectoral base than to anal origin and below middle of dorsal fin. Anal base equal to dorsal base; origin nearer to caudal base than to pelvic origin. Caudal deeply forked, 1.2 times length of head. Lateral line absent. Scales in regular rows. Abdominal scutes, preventral 17—18, postventral 11—13. Lower gill rakers 70—95.

Silvery, spot with yellow and purple; dark shoulder spot in young.

It attains 912 mm. in length and is good eating; littoral, euryhaline.

Distribution.—India, Pakistan, Sri Lanka.—Malaya, Indonesia, Thailand, Cochin-China, Cambodia, Takao, Formosa, China; in the mean annual isotherm of 20° C.

with the latitudinal and longitudinal range of 25° N.—7°S., 62°—120°E. in the Indo-Pacific=(6°—25° N.—62°100E. in the Indian Ocean+24°N.—7°S., 103°—120°E. in the Pacific Ocean).

58. Genus **Gudusia** Fowler

1911. *Gudusia* Fowler, *Proc. Acad. nat. Sci. Philad.*, **63**, p. 207 (type, *Clupanodon chapra* Ham., orthotypic).

Body oblong, well compressed. Scales very small. Maxilla extending to middle of orbit. Supplemental bone present. Eyes with adipose lid. Abdomen serrated and keeled. Dorsal origin a little behind pelvic origin. Anal single, moderate; last anal rays not enlarged. Adipose fin absent. Caudal deeply forked. Lower gill-rakers 200 or more.

Distribution.—India, Pakistan, Burma and Malayasia

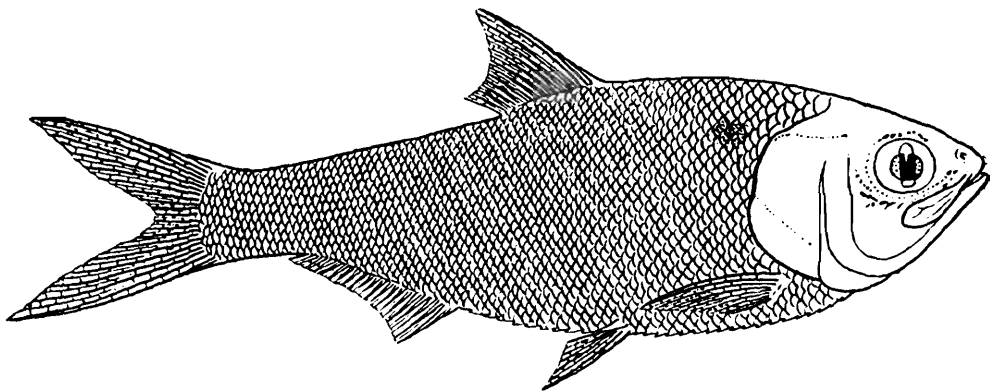
Key to species of genus Gudusia Fowler

1. Anal fin longer, 24-29 rays; caudal equal to head, lobes subequal; cross bars on sides *G. variegata*
2. Anal fin shorter, 21-24 rays; caudal longer than head, lower lobe longer; no cross bars on sides *G. chapra*

138. **Gudusia chapra** (Hamilton)
(Text-fig. 15)

1822. *Clupanodon chapra* Hamilton, *Fish. Ganges*, pp. 248, 383 (type locality: Upper parts of the Ganges).
- 1832-34. *Clupea indica* Gray, *Ill. Indian. Zool. Hardwicke*, **2**, pl. 92, fig. 1, 2 (type locality: India).
- 1832-34. *Clupea champil* Gray, *Ill. Ind. Zool. Hardwicke*, **2**, pl. 92, fig. 5, 6 (Indian Ocean).
1847. *Alausa microlepis* Valenciennes, *Hist. nat. Poiss*, **20**, p. 439. (type locality: Bengal).
1853. *Alausa microlepis* Bleeker, *Verh. Bat. Gen.*, **25**, pp. (74), 146 (Calcutta).
1868. *Clupea indica* Günther, *Cat. Fish. Brit. Mus.*, **7**, p. 444 (Ganges, Assam, Cachar).
1868. *Clupea chapra* Günther, *Cat. Fish. Brit. Mus.*, **7**, p. 447 (Bengal).
1869. *Clupea chapra* Day, *Proc. zool. Soc. Lond.*, p. 385 (Orissa).
1878. *Clupea chapra* Day, *Fish. India*, p. 639, pl. 161, fig. 1 (fresh-water of rivers and tanks of Sind and throughout India as far south as the Kistna River but absent from the Malabar coast and Madras).

1889. *Clupea chapra* Day, *Fauna Brit. India*, Fish., 1, p. 375.
1907. *Clupea chapra* Lloyd, *Rec. Indian Mus.*, 1, p. 221 (Akyab).
1910. *Clupea chapra* Jenkins, *Rec. Ind an Mus.*, 5, p. 140 (Monghyr).
1910. *Clupea chapra* De, *Rep. Fish. East. Bengal and Assam*, p. 17 (Eastern Bengal, Sylhet).
1912. *Clupea suhia* Chaudhuri, *Rec. Indian Mus.*, 7, p. 437, pl. 38, fig. 1 (type locality : River Gandak in Saran, Bihar; type in the Zoological Survey of India).
1917. *Gudusia chapra* Regan, *Ann. Mag. nat. Hist.*, (8) 29, p. 307 (Northern India, Sind to Assam).
1933. *Clupea chapra* Sorley, *Marine Fish. Bombay Presidency*, p. 170 (Bombay).
1937. *Gudusia chapra* Shaw & Shebbeare, *J. roy. As. Soc. Bengal, Sci.*, 3, p. 12 (Siliguri Bazar).
1938. *Gudusia chapra* Fowler, *List. Fish. Malaya*, p. 26 (Penang, Malaya).
1941. *Gudusia chapra* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 634 (Ganges river, India).
1949. *Gudusia chapra* Misra, *Rec. Indian Mus.*, 45, p. 391.
1953. *Gudusia chapra* Misra, *Rec. Indian Mus.*, 50, p. 377.



TEXT-FIG.15.—Lateral view of *Gudusia chapra* (Ham.) (After F. Day)

Vernacular names.—INDIA : Coori, Bengali; Gobri, Kanarese; Gudua, Oriya.

B. 5; D. 3/13; P. 13; V 8; A. 3/18—21; L. 1. 80—110; L. tr. 33—35; Predorsal scales 28.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal. Head 4.3—4.5, depth 3.5—4 in total length. Eyes with broad adipose lid, 3.5—4.0 in head, 0.6 in snout, 1.0—1.2 in interorbital. Lower jaw not projecting over the upper.

Cleft of mouth oblique; maxilla extending to midorbit. No teeth. Single dorsal fin, origin nearer to caudal base than to snout end. Pectorals low, 1.6 in head. Pelvics small; origin nearer to pectoral base than to anal origin and a little before dorsal origin. Anal base longer than dorsal base; origin nearer to pelvic origin than to caudal origin. Caudal deeply forked, lower lobe the longer; smaller than head. Lateral line absent. Scales smooth, small. Abdominal scutes, preventral 18—19, postventral 8—10. Lower gill rakers 200 or more.

Silvery spot with gold; back and caudal edge dark; a dark spot, sometimes absent, on the shoulder.

It attains 203 mm in length; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, Malaya; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 5°—25°N., 62°—100°E. in the Indian Ocean.

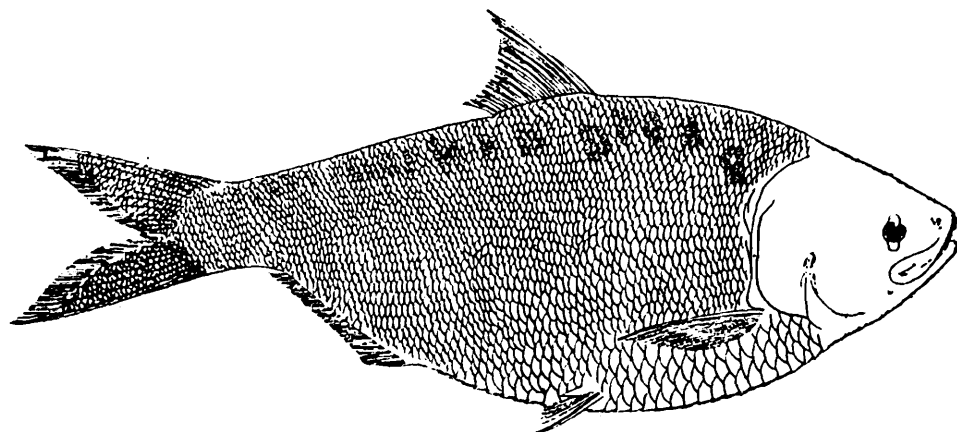
139. *Gudusia variegata* (Day)*

(Text-fig. 16)

- 1869. *Clupea variegata* Day, *Proc. zool. Soc. Lond.*, p. 623 (type locality: Irrawaddi river and its branches : type in the Zoological Survey of India).
- 1878. *Clupea variegata* Day, *Fish. India*, p. 639, pl. 161, fig. 4 (Irrawaddi and its branches).
- 1889. *Clupea variegata* Day, *Fauna Brit. India*, Fish., p. 375.
- 1890. *Clupea variegata* Vinciguerra, *Ann. Mus. Civ. Stor. nat. Genova*, (2) 9, p. 350 (Irrawaddi).
- 1910. *Clupea variegata* Jenkins, *Rec. Indian Mus.*, 5, p. 138 (Mandalay).
- 1917. *Gudusia variegata* Regan, *Ann. Mag. nat. Hist.*, 29, p. 308.
- 1924. *Gudusia variegata* Myers, *Amer. Mus. Nov.*, (150), p. 1 (Burma).
- 1929. *Gudusia variegata* Prashad & Mukerji, *Rec. Indian Mus.*, 31, p. 209 (Myitkyina).

*Srivastava (1968, *Fishes Eastern Uttar Pradesh*, p. 6) described a new species, *Gudusia godanahiai* from Gorakhpur, Uttar Pradesh, which Talwar & Whitehead (1971, *Bull. Br. Mus. nat. Hist. (Zool.)* 22 (2), p. 70) considered conspecific with *Gudusia variegata* (Day) thereby extending the distribution to India. *ed.*

1941. *Gudusia variegata* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 635.
 1949. *Gudusia variegata* Misra, *Rec. Indian Mus.*, 45, p. 391.
 1953. *Gudusia variegata* Misra, *Rec. Indian Mus.*, 50, p. 377



TEXT-FIG. 16.—Lateral view of *Gudusia variegata* (Day) (After F. Day)

B. 5; D. 3/12—15; P. 17; V 8; A. 3/21—26; C. 17;
 L. 1. 90; L. tr. 35;

Body oblong compressed; abdomen keeled, serrated. Ventral profile a little more convex than dorsal profile. Head 4.5—4.6, depth 3.0 in total length. Eyes with broad adipose lid, 4.0—4.5 in head 0.7 in snout, 1.0 in interorbital. Lower jaw not prominent. Cleft of mouth oblique; maxilla reaching to midorbit. No teeth. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.5 in head. Pelvics small, 2.4 in head; origin equidistant between pectoral base and anal origin and a little before dorsal origin. Anal base longer than dorsal base; origin nearer to pelvic base than to caudal base. Caudal deeply forked, equal to head. Lateral line absent. Scales smooth, small. Abdominal scutes, preventral 18, postventral 10. Lower gill rakers over 200.

Silvery glossed with gold and bronze; a dark humeral spot; a row of about 18 bars across back descending short way over sides; dorsal with a basal black band in its posterior half; caudal tipped black.

It attains 178 mm. in length; littoral, euryhaline.

Distribution.—Burma; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 16°—20°N., 96°—98°E.

59. Genus **Kowala** Valenciennes*

1847. *Kowala* Valenciennes, *Hist. nat. Poiss.*, 20, p. 362 (type, *Clupea kowal* Rüpp., tautotypic).
1850. *Clupeoides* Bleeker, *Nat. Tijds. Ned. Ind.*, 1, p. 272 (type, *C. borneensis* Blkr., monotypic).

Body oblong, well compressed, scales thin large. Maxilla extending to middle of orbit. Supplemental bone present. Eye with adipose lid. Abdomen keeled and serrated. Dorsal origin opposite pelvic origin. Anal single, moderate; last anal rays not enlarged. Adipose fin absent. Caudal deeply forked.

Distribution.—India, Pakistan, Sri Lanka, Burma, Malaya, Singapore, Indonesia, Thailand, the Philippines, China, New Guinea and Tahiti.

140. **Kowala coval** (Cuvier)**

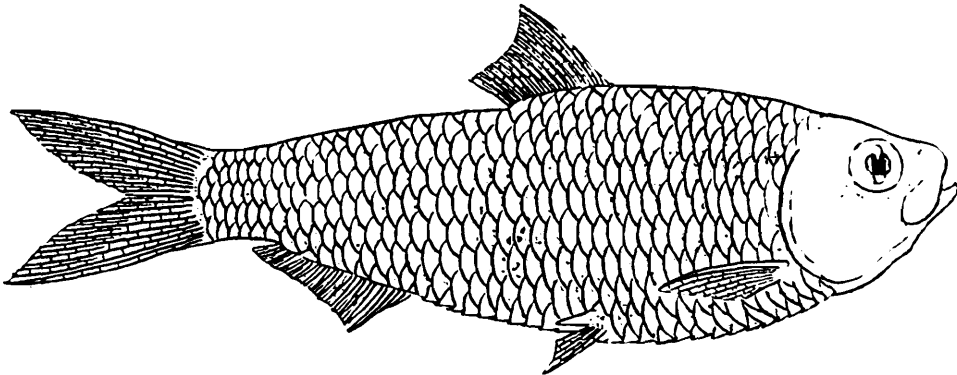
(Text-fig. 17)

1829. *Clupea coval* Cuvier, *Régne Animal*, 2, ed. 2, p. 318 (on *Kowal* Russell, 1803), *Fish. Coromandel*, 2, p. 70, pl. 186, upper fig. (type locality: Vizagapatam).
1847. *Kowala thoracata* Valenciennes, *Hist. nat. Poiss.*, 20, p. 363 (type locality: Pondicherry; according to Regan the type is in the Paris Museum).
1852. *Rogenia argyrotaenia* Bleeker, *Nat. Tijds. Ned. Ind.*, 3, p. 457 (type locality: Muntok; Batavia).
1866-72. *Clupea (Harengula) kowal* Bleeker, *Atlas Ichth. Ind. Neerland.*, 6, p. 109 (Canton).
1868. *Clupea lile* Günther (nec. Val.), *Cat. Fish. Brit. Mus.*, 7, p. 450.
1878. *Clupea lile* Day, *Fish. India*, p. 638, pl. 162, fig. 1 (seas of India and Burma to the Malay Archipelago; the example figured, life-size, was from Bombay).
1889. *Clupea lile* Day, *Fauna Brit. India, Fish.*, 1, p. 374.
1907. *Clupea lile* Lloyd, *Rec. Indian Mus.*, 1, p. 221 (Akyab).

*Whitehead (1967), *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, pp. 52—72, treated the genus *Kowala* Val., 1847, a junior synonym of the genus *Sardinella* Valenciennes, 1847, and treated the species, *Kowala thoracata* Val., 1847 under the monotypic genus [*Escualosa* Whitley, 1940. ed.

**Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool. Suppl. 2*, p. 70). considers *Clupea coval* a *nomen dubium* and replaced it by the name *Escualosa thoracata* (Val., 1847). ed.

1910. *Clupea lile* Jenkins, *Rec. Indian Mus.*, 5, p. 131 (Karachi).
 1913. *Clupeoides lile* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 57, fig. 22 (Java, Pinang, Singapore, Banka).
 1913. *Clupea (Harengula) thoracata* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 78 (Penang : Pondicherry).
 1922. *Kowala thoracata* Regan, *Ann. Mag. nat. Hist.*, (9) 10, p. 588 (Karachi to New Guinea).
 1928. *Clupeoides lile* Fowler, *Mem. Bishop Mus.*, 10, p. 31 (Western India to East Indies and Tahiti).
 1929. *Clupeoides lile* Deraniyagala, *Spolia Zeylon.*, 15, p. 36 (Ceylon).
 1933. *Kowala thoracata* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
 1933. *Clupeoides lile* Fowler, *List Fish. Malaya*, p. 25.
 1936. *Clupeoides lile* Hardenberg, *Treubia*, 15, livr. 3, p. 230.
 1936. *Clupeoides lile* Suvatti, *Index Fish. Siam*, p. 11 (Siam, Bangkok).
 1940. *Clupeoides lile* Herre, *Rec. Indian Mus.*, 42, p. 9 (Mergui).
 1941. *Kowala coval* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 638.
 1949. *Kowala coval* Misra, *Rec. Indian Mus.*, 45, p. 392.
 1953. *Clupeoides lile* Herre, *Check List Philippine Fish.*, p. 73.
 1955. *Clupea lile* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 14 (coasts of Sind and Makran).
 1955. *Kowala coval* Munro, *Mar. Freshwater Fish. Ceylon*, p. 24 (coastal waters).



TEXT-FIG. 17.—Lateral view of *Kowala coval* (C.) (After F. Day)

Vernacular names.—INDIA : *Berza*, Kanarese; *Bhitgi*, Marathi. PAKISTAN : *Mittoo*, SRI LANKA : *Silinda*, *Sudu*, *Sudaya*, Singhalese; *Vellai schudai*, Tamil.

B. 6; D. 12—15; P. 13; V 8; A. 17—20; L. 1. 38—41; L. tr. 9—10; Predorsal scales 16.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 5.0—5.5, depth 3.5—3.7 in total length. Eye with broad adipose lid, 3.0—3.2 in head, 0.6 in snout and interorbital. Lower jaw slightly longer. Cleft of mouth oblique, maxilla reaching to midorbit. Teeth on pterygoids, palatines, tongue and vomer. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.3 in head. Pelvics small, 1.8 in head; origin nearer to pectoral base than to anal origin, opposite dorsal origin. Anal base longer than dorsal base; origin nearer to pelvic origin than to caudal base. Caudal deeply forked, longer than head. Lateral line absent. Scales moderate, smooth, in regular rows. Abdominal scutes, preventral 16—19, postventral 10. Lower gill rakers 32, longer than gill-filaments, shorter than half eye.

Golden shot with purple; a brilliant silvery band along the side as deep as one scale; caudal bluish, tipped black a brilliant bronze coloured spot on occiput.

It attains 102 mm. in length; littoral.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Malaya, Indonesia, Thailand, Cochin-China, the Philippines, Melanesia, Tahiti; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—18°S., 62°E.—149°W. in the Indo-Pacific=(6°—25° N., 62°—100°E. in the Indian Ocean+23°N.—18°S., 101°E.—149°W. in the Pacific Ocean).

60. Genus *Corica* Hamilton

1822. *Corica*: Hamilton, *Fish. Ganges*, pp. 253, 383 (type, *C. soborna* Ham., monotypic).

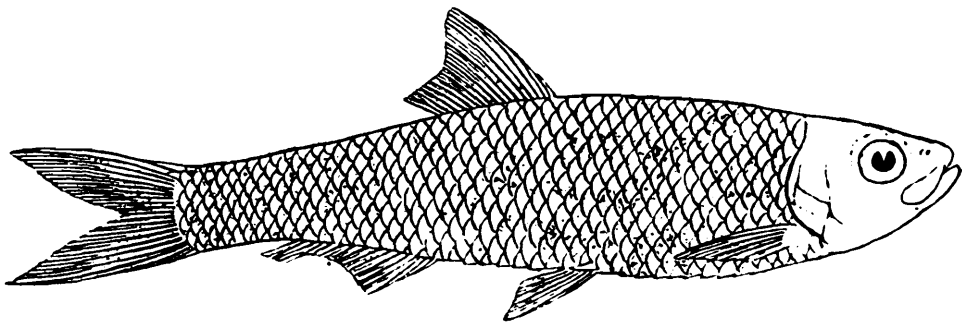
1855. *Clupeichthys* Bleeker, *Nat. Tijds. Ned. Ind.*, 9, p. 274 (type, *C. goniognathus* Blkr., monotypic)

Body moderately elongate, abdomen slightly compressed serrated, serrations commencing behind the pectorals. Scales moderate. Maxilla extending to anterior margin of orbit. Eyes without adipose lid. Branchiostegals 6. Gill rakers 19-22. Abdomen keeled and serrated. Dorsal origin opposite to pelvic origin. Anal moderate, as two fins, the second fin formed by thickened elongated rays. Adipose fin absent. Caudal forked.

Distribution.—India, Pakistan, Malaya, Indonesia, Thailand.

141. *Corica soborna* Hamilton
(Text-fig. 18)

1822. *Corica soborna* Hamilton, *Fish. Ganges*, pp. 253, 383 (type locality: Ganges river).
 1832-34. *Corica guborni* Gray, *Ill. Indian Zool Hardwicke*, 2, pl. 91, figs. 7, 8 (India).
 1852. *Spratella pseudopterus* Bleeker, *Nat. Tijds. Ned. Ind.*, 3, p. 432 (type locality : Pamangkat, S. W. Borneo).
 1878. *Corica soborna* Day, *Fish. India*, p. 642, pl. 162, fig. 5 (Orissa and Bengal; the example figured life-size, was from Orissa).
 1889. *Corica soborna* Day, *Fauna Brit. India, Fish.*, 1, p. 378 (Orissa and Bengal).
 1910. *Corica soborna* De, *Rep. Fish. East. Bengal & Assam*, p. 18 (Tripura, Assam, Eastern Bengal).
 1929. *Corica soborna* Hora, *Mem. Indian Mus.*, 9, p. 188.
 1941. *Corica soborna* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 644.
 1949. *Corica soborna* Misra, *Rec. Indian Mus.*, 45, p. 392.
 1953. *Corica soborna* Misra, *Rec. Indian Mus.*, 50, p. 377.



TEXT-FIG. 18.—Lateral view of *Corica soborna* Ham. (After F. Day)

Vernacular name.—INDIA : *Cutwaal alise*, *God-haee*, Oriya.

B. 6; D. 15—16; V 8; A $2/12-13+ii$; L. 1. 40—42; L. tr. 10.

Body moderately elongate, compressed; abdomen keeled, serrated; thorax non-serrated. Ventral and dorsal profiles more or less equally convex. Head 5.2—5.5, depth 5.0—5.5 in total length. Eyes 3.5 in

head, equal to snout. Lower jaw slightly prominent. Cleft of mouth oblique, maxilla reaching to midorbit. Teeth on jaws, palatines and tongue. Single dorsal fin, origin midway between snout end and caudal base. Pectorals low, 1.4 in head. Pelvics moderate, 1.8 in head; origin nearer to anal origin than to pectoral base and before dorsal origin. Anal base longer than dorsal base; divided as 2 fins, second formed by 2 thickened rays, much longer than the rays of the first anal; origin nearer to pelvic origin than to caudal base and opposite posterior end of dorsal base. Caudal deeply forked, a little longer than head. Lateral line absent. Scales moderate. Abdominal scutes, preventral 10—11, postventral 7—8. Gill rakers 22, longer than gill filaments.

Brownish shot with silver, with a light lateral band.

It attains 50 mm in length and is good eating; littoral, euryhaline.

Distribution.—India, Pakistan.—S.W. Borneo, Thailand, in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 1°—26°N., 85°—111° E. in the Indo-Pacific=(19°—26°N., 85°—93° E. in Bay of Bengal +1°—11°N., 100°—111°E. in the Pacific).

61. Genus *Ilisha* Richardson

- 1839. *Platygaster* (*nec.* Latereille, 1809, Schilling, 1829, Dumeril & Bibron, 1844) Swainson, *Nat. Hist. Animals*, 2, p. 294 (type, *P. africanus* Swns., logotypic; inadmissible.)
- 1846. *Ilisha* (Gray) Richardson, *Ichth. China Japan*, p. 306 (type, *I. abnormis* Rich., monotypic).
- 1913. *Zunasia* Jordon & Metz., *Mem. Carnegie Mus.*, 6 (1), p. 7 (type, *Pristigaster chinensis* Basilewsky, orthotypic).
- 1934. *Euplatygaster* Fowler, *Proc. Acad. nat. Sci. Philad.*, 85, p. 246 (type, *Pellona brachysoma* Blkr., orthotypic).

Body elongate, compressed. Scales large. Maxilla extending to middle of orbit. Two supplemental bones present. Edge of upper jaw with a ligament extending from lateral end of premaxillary to prominent middle of maxillary. Eyes with rudimentary or well developed adipose lid. Occipital ridges subparallel or diverging behind. Gill rakers not very numerous. Abdomen keeled and serrated. Dorsal origin opposite to pelvic

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origin. Anal single, long. Adipose fin absent. Caudal deeply forked.

Distribution.—East Africa, Zanzibar, India, Sri Lanka, Pakistan, Burma, Malay Peninsula, Indonesia, Cochin-China, the Philippines, Formosa, China, Japan, and Korea.

Key to speceis of genus Ilisha Richardson

1. Lateral line scales 70 . . . *I. leschenaulti*
2. Lateral line scales 40-53 . . . 3
3. Dorsal entirely over anal; origin opposite anal origin; depth of body 5.2 to 5.5 in total length. *I. sladeni*
4. Dorsal not entirely over anal; origin before anal origin; depth of body 3.2 to 4.7 in total length 5
5. Dorsal origin nearer to caudal origin than to snout end . . . *I. novacula*
6. Dorsal origin nearer to snout end than to caudal base or midway between them 7
7. Anal origin clearly behind posterior end of dorsal base . . . 9
8. Anal origin not behind posterior end of dorsal base . 11
9. Lower gill rakers 20—24; anal rays 40—41; depth of body 4.0 to 4.2 in total length *I. motius*
10. Lower gill rakers 16; anal rays 46—51; depth of body 3.2 to 3.5 in total length *I. brachysoma*
11. Depth 3.2 to 3.7 in total length . 13
12. Depth 4.2 to 4.7 total length 15
13. Anal rays 46—50; lower gill rakers 18—19; pelvic origin nearer to pectoral base than to anal origin *I. filigera*
14. Anal rays 39—40; lower gill rakers 22—24; pelvic origin midway between pectoral base and anal origin *I. indica*
15. Dorsal origin midway between snout end and caudal; base anal origin just below posterior end of dorsal base or a little before it. *I. elongata*

16. Dorsal origin nearer to snout end than to caudal base; anal origin below middle of dorsal base 17
17. Depth of body 4.3 total length; pelvic origin nearer to pectoral base than to anal origin *I. melastoma*
18. Depth of body 4.7 in total length, pelvic origin midway between pectoral base and anal origin. *I. kampeni*

142. *Ilisha brachysoma* (Bleeker)*

1852. *Pellona brachysoma* Bleeker, *Verh. Bat. Gen.*, 24, p. 22 (type locality : Batavia).
1878. *Pellona brachysoma* Day, *Fish. India*, p. 645, pl. 164, fig. 2 (seas of India to the Malay Archipelago; the example figured was from Cochin).
1889. *Pellona brachysoma* Day, *Fauna Brit. India, Fish.*, 1, p. 382.
1913. *Pellona brachysoma* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 87 (Java, Sumatra, Singapore).
1916. *Pellona brachysoma* Govindan, *Madras Fish. Bull.*, 9, p. 113.
1923. *Ilisha brachysoma* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 3.
1929. *Pellona brachysoma* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Pellona brachysoma* Tirant, *Service Oceanogr. Peches Indo-China*, 6^onote, p. 121 (Cochin-China).
1930. *Ilisha brachysoma* Fowler, *Proc. Acad. nat. Sc. Philad.* p. 599 (Hong Kong).
1932. *Pellona brachysoma* Chevey, *Inst. Oceanogr. Indo-China*, 19^onote, p. 10 (Indo-China).
1933. *Clupea (Harengula) brachysoma* Deraniyagala, *Ceylon J. Sci. (C)*, 5, p. 82 (Ceylon).
1938. *Ilisha brachysoma* Fowler, *List Fish Malaya*, p. 28 (Patani, Jhering, Singapore).
1941. *Ilisha brachysoma* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 653.
1949. *Ilisha brachysoma* Misra, *Rec. Indian Mus.*, 45, p. 392.
1953. *Ilisha brachysoma* Misra, *Rec. Indian Mus.*, 50, p. 379.

*Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, p. 115) treated this species as a junior synonym of *Ilisha micropus* (Val., 1847).

Vernacular names.—INDIA : *Matthi*, Malayalam; *Pauria Puiee*, Oriya.

B. 6; D. 16—17; P. 16; V. 7; A. 46—51; C. 17; L. 1. 40-42; L. tr. 15—16; Predorsal scales 14.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 4.5—4.8, depth 3.2—3.5 in total length. Eyes with narrow adipose lid, 3.0 in head, 0.7 in snout, 0.5 in interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching midorbit. Teeth small, uniserial in jaws, slightly longer medianly. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.3 in head. Pelvics small, 4.0 in head, origin midway between pectoral base and anal origin and before dorsal origin. Anal base 3.0 times longer than dorsal base, 3.5 in total length, 2.5—2.7 in standard length; origin nearer to pelvic origin than to caudal base, behind posterior end of dorsal base. Caudal deeply forked, equal to head. Lateral line absent. Scales, moderate, hind margin smooth. Abdominal scutes, preventral 18, postventral 8. Gill raker 14+16, slender, half eye.

Golden, glazed with purple.

It attains 190 mm. in length; littoral.

Distribution.—India, Sri Lanka.—Malaya, Indonesia, Siam, Cochin-China, Hong Kong; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 22°N.—7°S., 76°—114°E. in the Indo-Pacific=(6°—13°N., 76°—80°E. in the Indian Ocean +14°N.—7°S., 103°—114°E. in the Pacific Ocean).

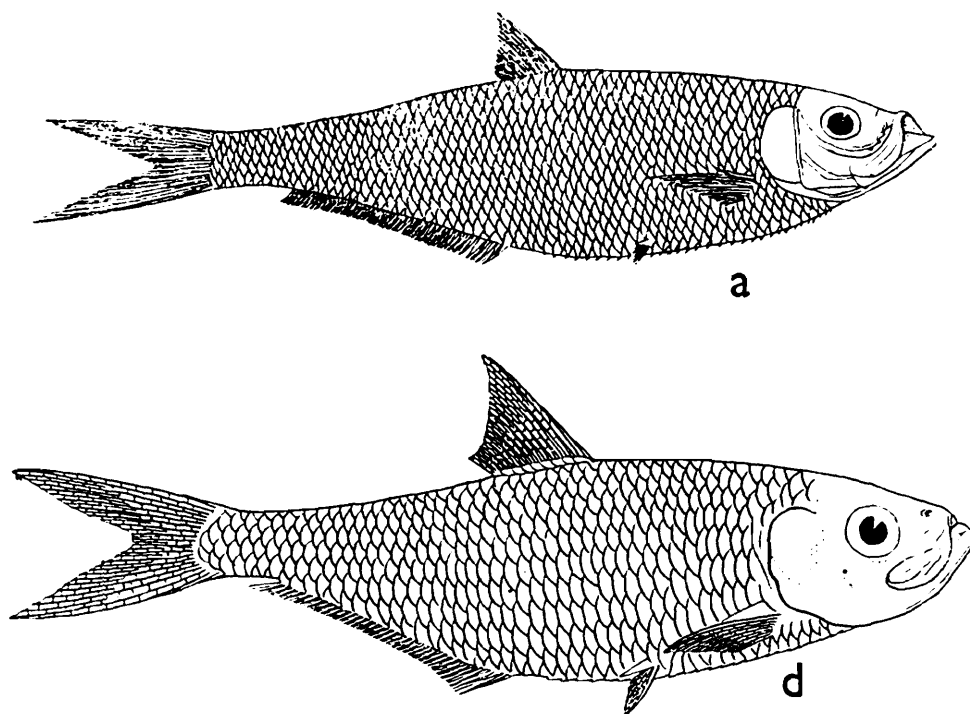
143. *Ilisha elongata* (Bennett)

(Text-fig. 19)

1830. *Alosa elongata* Bennett, *Mem. Life Raffles*, p. 691 (type locality : Sumatra).
 1833-34. *Clupea affinis* Gray, *Ill. Indian Zool. Hardwicke*, 2, pl. 96, fig 2 (type locality : India).
 1846. *Ilisha abnormis* (Gray) Richardson, *Ichth. China Japan*, p. 306 (type locality : Chinese Sea).

1847. *Pellona grayana* Valenciennes, *Hist. nat. Poiss.*, 20, p. 315 (On Gray).
1847. *Pellona vimbella* Valenciennes, *Hist. nat. Poiss.*, 20, p. 317 (type locality : Macao).
1853. *Pellona schlegelii* Bleeker, *Verh. Bat. Gen. (Japan)*, 25, p. 18 (type locality : Nagasaki).
1855. *Pristigaster chinensis* Basilewski, *Nouv. Mem. Soc. nat. Moscow*, 10, p. 243 (type locality : Gulf of Tschiliensis, China).
1878. *Pellona elongata* Day, *Fish. India*, p. 643, pl. 164, fig. 3, pl. 165, fig. 1 (seas of India to the Malay Archipelago, China, and Japan).
1881. *Pristigaster (Pristigaster) sinensis* Sauvage, *Bull. Soc. Philom. Paris*, (7) 5, p. 107 (type locality : Swatow).
1889. *Pellona elongata* Day, *Fauna Brit. India*, *Fish.*, 1, p. 380, fig. 117.
1913. *Pellona elongata* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 90, fig. 30.
1917. *Pellona elongata* Hornell, *Madras Fish. Bull.*, 11, p. 92 (Tuticorin).
1923. *Ilisha elongata* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 7, (India).
1928. *Ilisha elongata* Fowler, *J. Bombay nat. Hist. Soc.*, 33, p. 103. (Bombay).
1929. *Pellona elongata* Pillay J. *Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Pellona elongata* Tirant, *Service Oceanogr. Peches Indo-China*, 6^onote, pp. 120, 174.
1931. *Ilisha elongata* Chu, *Biol. Bull. St. John's Univ.*, (1), p. 14 (Amoy, Chefoo, Hongkong, Liao-ho, Ningpo).
1933. *Ilisha elongata* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
1936. *Pellona elongata* Suvatti, *Index Fish. Siam.*, p. 11 (Singora).
1938. *Ilisha elongata* Fowler, *List Fish. Malaya*, p. 28.
1941. *Ilisha elongata* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 661.
1949. *Ilisha elongata* Misra, *Rec. Indian Mus.*, 45, p. 393.
1952. *Ilisha elongata* Mori, *Mem. Hyogo Univ. Agric.* 1 (3), p. 32 (Fusan; West coast of Korea).
1953. *Ilisha elongata* Misra, *Rec. Indian Mus.*, 50, p. 379.
1955. *Pellona elongata* Anonymous, *Mar. Fish. Karachi Sind & Makran*, p. 17 (coasts of Sind and Makran).
1955. *Ilisha elongata* Munro, *Mar. Freshwater Fish. Ceylon*, p. 27 (coastal waters).

Vernacular names.—INDIA: *Matthi*, Malayalam. BANGLADESH: *Ram gasha*, Chittagong. BURMA: *Nga thyngye*, *Khebowk thyn*, Arracan; *Ngapya* Burmese. SRI LANKA: *Puvalaya*, Singhalese; *Puvali*, Tamil.



TEXT-FIG. 19.—(a) Lateral view of *Ilisha elongata* (Benn.) (After F. Day) (From Bombay)

(b) Lateral view of same (After F. Day) (From Sind)

B. 6; D. 15—17; P. 15—17; V. 7; A. 40—50; C. 17; L. 1. 46—53; L. tr. 14—16; Predorsal scales 17.

Body oblong, compressed; abdomen keeled serrated. Ventral profile slightly more convex than dorsal profile. Head 4.7—5.2, depth 4.2—4.5 in total length. Eyes with adipose lid, 3.2—4.0 in head, 1.0 in snout, 0.5 in interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching midorbit. Teeth villiform, in narrow bands in jaws and palatines, broad band on tongue and none on vomer. Single dorsal fin, origin midway between snout end and caudal base. Pectorals low, 1.4 in head. Pelvic small, 3.1—4.0 in head; origin nearer to anal origin than to pectoral base or midway between pectoral base and anal origin, and before dorsal origin. Anal base 2.7 times longer than dorsal base, 3.7—3.9 in total length, 3.0—3.2 in standard length; origin just below posterior end of dorsal base or a little before it. Caudal deeply forked, equal to head. Lateral line absent. Scales deciduous, moderate. Abdominal scutes, preventral 20—24, postventral 8—10. Gill rakers 8+20, lanceolate, half eye.

Silvery shot with mother of pearl; fins yellowish; edge of dorsal black tipped.

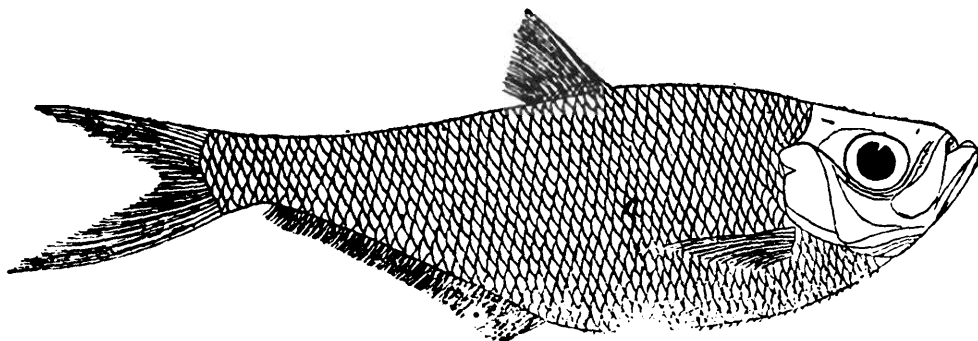
It grows to 245 mm. in length; littoral.

Distribution.—India, Pakistan, Sri Lanka—Malaya, Indonesia, Thailand, Indo-China, Formosa, China, Japan, Korea; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35°N.—7°S., 62°—135°E. in the Indo-Pacific=(6°—25°N., 62°—100°E. in the Indian Ocean+35°N.—7°W., 101°—135°E. in the Pacific Ocean).

144. *Ilisha filigera* (Valenciennes)

(Text-fig. 20)

1847. *Pellona filigera* Valenciennes, *Hist. nat. Poiss.*, 20, p. 322. (type locality : Coromandel; Bombay).
 1878. *Pellona filigera* Day, *Fish. India*, p. 643, pl. 165, fig. 4 (Bombay).
 1889. *Pellona filigera* Day, *Fauna Brit. India*, Fish., 1, p. 380 (Bombay).
 1917. *Pellona filigera* Hornell, *Madras Fish. Bull.*, 11, p. 92 (Tuticorin).
 1923. *Ilisha filigera* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 10 (coasts of India).
 1932. *Pellona filigera* Chevey, *Inst. Oceanogr. Indo-China*, 19° note, p. 9 (Indo-China).
 1941. *Ilisha filigera* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 658.
 1949. *Ilisha filigera* Misra, *Rec. Indian Mus.*, 45, p. 393.
 1953. *Ilisha filigera* Misra, *Rec. Indian Mus.*, 50, p. 379.
 1955. *Ilisha filigera* Munro, *Mar. Freshwater Fish. Ceylon*, p. 27, (coastal waters).



TEXT-FIG. 20.—Lateral view of *Ilisha filigera* (V.) (After F. Day)

B. 6; D. 18—19; P. 17; V 8; A. 46—50; C. 19; L. 1. 50; L. tr. 15—16.

Body oblong, compressed; abdomen keeled, serrated; ventral profile more convex than dorsal profile. Head 4.8—5.2, depth 3.7 in total length. Eyes 3.0 in head, 0.7 in snout, 0.3 in interorbital. Lower jaw prominent. Cleft of mouth oblique, maxilla reaching midorbit. Teeth in jaws, palatines and tongue. Single dorsal fin; origin nearer snout end than to caudal base. Pectorals low, 1.5 in head. Pelvics minute, 6.0 in head; origin nearer to pectoral base than to anal origin and much before dorsal origin. Anal base 3.2 times dorsal base, 3.4 in total length, 2.6 in standard length; origin before posterior end of dorsal base. Caudal deeply forked, lower lobe longer than head. Lateral line absent. Scales moderate, deciduous. Abdominal scutes, pre-ventral 20—23, postventral 10—12. Lower gill rakers 18—19.

Coppery on back becoming silvery shot with mother of pearl colouration on sides; dorsal and pectorals black tipped.

It attains 305 mm. in length; littoral.

Distribution.—India, Sri Lanka.—Indo-China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 6°—18°N., 72°—108°E. in the Indo-Pacific=(6°—18°N., 72°—80°E. in the Indian Ocean+15°N.—108°E. in the Pacific Ocean).

145. *Ilisha indica* (Swainson)

- 1839. *Platygaster indicus* Swainson, *Nat. Hist. Animals.*, 2, p. 294 [on *Ditchoe* Russell, 1883, *Fish. Coromandel*, 2, p. 74, pl. 192, upper fig. (type locality : Vizagapatam)]
- 1847. *Pellona ditchoa* Valenciennes, *Hist. nat. Poiss.*, 20, p. 313 [on *Ditchoe* Russell, *Fish. Coromandel*, 2, p. 74, pl. 192, upper fig., 1803 (type locality : Vizagapatam)]
- 1868. *Pellona ditchoa* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 455 (Java, Zanzibar, E. Africa).
- 1878. *Pellona indica* Day, *Fish. India*, p. 644, pl. 164, fig. 4 (East coast of Africa, seas of India to the Malay Archipelago).
- 1889. *Pellona indica* Day, *Fauna Brit. India*, Fish., 1, p. 381 (East coast of Africa, seas of India to the Malay Archipelago).
- 1907. *Pellona indica* Lloyd, *Rec. Indian Mus.*, 1, p. 220 (Akyab).
- 1912. *Pellona indica* Jenkins, *Rec. Indian Mus.*, 7, p. 57 (Akyab).
- 1913. *Pellona ditchoa* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 88 (Java, Sumatra, Madura, Singapore, Banka).

1923. *Ilisha indica* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 4 (India, Malay Peninsula, China)
1929. *Ilisha indica* Tirant, *Service Oceanogr. Peches Indo-China*, 6° note, pp. 121, 174 (Cochin China).
1932. *Pellona ditchoa* Chevey, *Inst. Oceanogr. Indo-China*, 19° note, p. 10 (Cochin China).
1936. *Pellona ditchoa* Suvatti, *Index Fish. Siam*, p. 10 (Gulf of Siam).
1937. *Pellona ditchoa* Herre & Myers, *Raffles Mus. Bull.*, No. 13, p. 13 (Singapore).
1938. *Ilisha indica* Fowler, *List Fish. Malaya*, p. 29.
1941. *Ilisha indica* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 652.
1949. *Ilisha indica* Misra, *Rec. Indian Mus.*, 45, p. 393.
1953. *Ilisha indica* Misra, *Rec. Indian Mus.*, 50, p. 379.
1953. *Ilisha ditchoa* Herre, *Check List Philippine Fish.*, p. 64 (Philippines).
1955. *Pellona indica* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 17 (coasts of Sind and Makran).
1955. *Euplatygaster indica* Munro, *Mar. Freshwater Fish. Ceylon*, p. 27 (coastal waters).

Vernacular names.—INDIA : *Poo na no dah*, Andamanese; *Ditchoe*, Telegu. SRI LANKA : *As bokka*, Venganawa, Sinhalese.

B.6; D. 17; P. 16; V 7; A. 39-40; C. 17; L. 1. 44; L. tr. 13—14; Predorsal scales 14—16.

Body oblong, compressed, abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 4.3—4.7, depth 3.2—3.5 in total length. Eyes with adipose lid, 2.6—3.0 in head, 0.6 in snout, 0.5 in interorbital. Lower jaw prominent. Cleft of mouth oblique, maxilla reaching to one third orbit. Teeth obsolete or absent. Single dorsal fin; origin nearer to snout than to caudal base. Pectorals low, 1.3 in head. Pelvics small, 3.5 in head; origin midway between pectoral base and anal origin and much before dorsal origin. Anal base 3.9 in total length, 2.7—3.0 in standard length; origin before posterior end of dorsal base. Caudal deeply forked, a little longer than head. Lateral line absent. Scale edges rather roughened. Abdominal scutes, preventral 18—20, postventral 9—10. Gill rakers 12+22—24, slender, lanceolate, 2.3 in eye.

Greenish along back, becoming silvery shot with purple and gold on sides and below; dorsal fin often tipped black.

It attains 250 mm in length; littoral.

Distribution.—India, Pakistan, Burma, Sri Lanka.—East coast of Africa, Zanzibar, Malaya, Indonesia, Thailand, Indo-China, the Philippines, China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 38°—123°E. in the Indo-Pacific=(25°N.—5°S., 38°—100°E. in the Indian Ocean +22°N.—7°S., 101°—125°E. in the Pacific Ocean).

146. *Ilisha kampeni* (Weber & de Beaufort)

1913. *Pellona kampeni* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 87 (type locality : Java, Borneo).
 1923. *Ilisha kampeni* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 5 (Madras).
 1933. *Pellona kampeni* Hardenberg, *Treubia, Livr.*, 2, 14, p. 219 (Kumal; Muara Kebas, N. Borneo).
 1936. *Pellona kampeni* Suvatti, *Index Fish. Siam*, p. 11 (Maenam Tapi below Bandon, Thalesap, Song Khola, Thale Noi).
 1941. *Ilisha kampeni* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 654.
 1949. *Ilisha kampeni* Misra, *Rec. Indian Mus.*, 45, p. 394.
 1953. *Ilisha kampeni* Misra, *Rec. Indian Mus.*, 50, p. 379.

B. 6; D. 15—16; P. 15; V 7; A. 42; L. 1. *ca* 44; L. tr. *ca* 15.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile a little more convex than dorsal. Head 4·8, depth 4·7 in total length (3·8 and 3·7 in standard length). Eye 3·0 in head, 1·0 in snout. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching nearly midorbit. Single dorsal fin; origin nearer to snout end than to caudal base. Pelvics shorter than eye; origin midway between anal origin and pectoral base, before dorsal origin. Anal base 3·0 in standard length; origin just below middle of dorsal base. Caudal deeply forked. Lateral line absent. Scales deciduous, thin, smooth. Abdominal scutes, preventral 18—19, postventral 7—8. Lower gill rakers 20, 3/4 of eye.

Caudal dark edged.

It attains 160 mm in length.

Distribution.—India, Indonesia, Thailand; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 13°N.—7°S. 70°—118°E. in the Indo-Pacific=(13°N., 80°E. in Bay of Bengal+7°N.—7°S., 110°—118°E. in the Pacific Ocean).

147. *Ilisha leschenaulti* (Valenciennes)*

1847. *Pellona leschenaulti* Valenciennes, *Hist. nat. Poiss.*, 20, p. 311 (type locality : Pondicherry).
 1868. *Pellona leschenaultii* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 459 (Pondicherry).
 1878. *Pellona leschenaulti* Day, *Fish. India*, p. 646 (Pondicherry).
 1889. *Pellona leschnaultii* Day, *Fauna Brit. India*, Fish., 1, p. 383 (Pondicherry).
 1923. *Ilisha leschenaultii* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 6 (Pondicherry).
 1941. *Ilisha leschenaulti* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 651.
 1949. *Ilisha leschenaulti* Misra, *Rec. Indian Mus.*, 45, p. 394.
 1953. *Ilisha leschenaulti* Misra, *Rec. Indian Mus.*, 50, p. 379.

B. 6; D. 21; P. 17; A. 42; C. 27; L. 1. 70.

Body oblong, compressed; abdomen keeled, serrated. Depth 4.0 in total length. Teeth very distinct in premaxillaries and mandibles. Single dorsal fin; origin nearer to caudal base than to snout end and partly opposite to anterior anal rays. Pectorals large, reaching beyond pelvic base. Pelvics small. Caudal forked. Lateral line absent.

Silvery with traces of 10—12 obscure longitudinal greyish lines.

It attains 510 mm in length; littoral.

Distribution.—India; in the mean annual isotherm of 20°C in 11° N., 79°E. in the Bay of Bengal.

*Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl., 2, p. 118) considered it conspecific with *Ilisha elongata* (Bennett, 1830). *ed.*

148. *Ilisha melastoma* (Cuvier)*

1829. *Clupea melastoma* Cuvier, *Régne Animal.*, 2, ed. 2, p. 319 [Jangarloo Russell, *Fish. Coromandel*, p. 73, pl. 191, 1803 (type locality : Vizagapatam)].
1839. *Platygaster magaloptera* Swainson, *Nat. Hist., Animal.*, 2, p. 294 (on Jangarloo Russell).
1847. *Pellona dussumieri* Valenciennes, *Hist. nat. Poiss.*, 20, p. 316, pl. 596 (type locality : Malabar; Coromandel).
1847. *Pellona micropus* Valenciennes, *Hist. nat. Poiss.*, 20, p. 320, (type locality : Coromandel; Bengal).
1849. *Pellona russellii* Bleeker, *Verh. Bat. Gen.* 24, p. 32 (type locality : Batavia, Somarang, Surabaya, Pasuruan).
1868. *Pellona dussumieri* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 457.
1878. *Pellona megaloptera* Day, *Fish. India*, p. 645, pl. 165, fig. 2 (Seas of India to the Malay Archipelago).
1889. *Pellona megaloptera* Day, *Fauna Brit. India, Fish.*, 1, p. 382.
1913. *Pellona dussumieri* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 92 (Java, Singapore, Sumatra, Bintaug, Borneo, Ambon).
1916. *Pellona megaloptera* Govindan, *Madras Fish. Bull.*, 9, p. 133.
1923. *Ilisha megaloptera* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 10 (India).
1936. *Pellona dissumieri* Suvatti, *Index Fish. Siam*, p. 10 (Gulf of Siam, Bangkok).
1941. *Ilisha melastoma* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 659.
1949. *Ilisha melastoma* Misra, *Rec. Indian Mus.*, 45, p. 394.
1953. *Ilisha melastoma* Misra, *Rec. Indian Mus.*, 50, p. 379.

Vernacular name.—INDIA : Jangarloo, Telegu.

B. 6; D. 17—18; P. 17; V 7; A. 43—50; C. 17; L. 1. 48—50; L. tr. 14—15; Predorsal scales 21.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 4.2—4.6, depth 4.3 in total length. Eyes 2.6—3.0 in head, 0.7 in snout, 0.2 in interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching one-

*Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, pp 113-115) has shown that the correct scientific name of this species is *Ilisha megaloptera* (Swainson, 1839). *ed.*

third orbit. Teeth a few, small, short, low, prominent in front of each jaw; patch of villiform teeth on palatines, pterygoids, none on vomer or tongue. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1.5 in head. Pelvics small, 5.6 in head, less than half eye; origin nearer to pectoral base than to anal origin and much before dorsal origin. Anal base 3.5 in total length, 2.8 in standard length; origin below middle of dorsal base. Caudal deeply forked, nearly equal to head. Lateral line absent. Abdominal scutes, preventral 19–24, postventral 8–12. Gill rakers 10+19–21, twice gill filaments, 1.4 in eye.

Dull brown above, silvery on sides and below; fins pale brownish; dorsal and caudal a little darker.

It attains over 300 mm. in length; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, Malaya, Indonesia, Thailand, Cochin-China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 62°—128°E. in the Indo-Pacific = (10°—25°N., 62°—98°E. in the Indian Ocean + 10°N.—7°S., 101°—128°E. in the Pacific Ocean).

149. *Ilisha motius* (Hamilton)*

- 1822. *Clupanodon motius* Hamilton, *Fish. Ganges*, pp. 251, 383 (type locality: Brahmaputra River).
- 1833-34. *Clupea motius* Gray, *Ill. Indian. Zool. Hardwicke*, 2, pl. 91, figs. 3-4 (India).
- 1847. *Pellona motius* Valenciennes, *Hist. nat. Poiss.*, 20, p. 323 (Ganges mouth).
- 1878. *Pellona motius* Day, *Fish. India*, p. 643, pl. 165, fig. 3 (Assam, Bengal and Orissa, descending as low as coast; the example figured, life size, was from Orissa).
- 1889. *Pellona motius* Day, *Fauna Brit. India, Fish.*, 1, p. 381.
- 1923. *Ilisha motius* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 5 (Assam; Bengal).
- 1941. *Ilisha motius* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 655.
- 1949. *Ilisha motius* Misra, *Rec. Indian Mus.*, 45, p. 394.
- 1953. *Ilisha motius* Misra, *Rec. Indian Mus.*, 50, p. 379.

*Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, p. 115) regarded *Clupanodon motius* Hamilton as unidentifiable. Talwar & Whitehead (1971, *Bull. Br. Mus. nat. Hist. (Zool.)*, 22 (2), p. 81) considered Day's (*nec.* Hamilton) *motius* identical with *Ilisha indica* (Swainson, 1839). *ed.*

Vernacular name.—INDIA : *Ursi*, *Alise*, *Oriya*.

B. 6; D. 16—17; P. 15; V 7; A. 40—41; L. 1. 43—45; L. tr. 12—13; Predorsal scales 14.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile a little more convex than dorsal profile. Head 4.4—5.0, depth 4.0—4.2 in total length. Eyes 3.0 in head, 0.6 in snout, 0.5 in interorbital. Lower jaw prominent. Cleft of mouth oblique, maxilla reaching midorbit. Teeth on jaws, tongue and palatines. Single dorsal fin; origin nearer snout end than to caudal base. Pectorals low, 1.8 in head. Pelvics small, a little less than eye, 3.8 in head; origin midway between pectoral base and anal origin and much before dorsal origin. Anal base 3.6 in total length, 3.0 in standard length; origin just behind posterior end of dorsal base. Caudal deeply forked, less than head. Lateral line absent. Abdominal scutes, preventral 15—17, postventral 7—8. Lower gill rakers 20—24.

Silvery with mother-of-pearl reflections with burnished lateral band; a dark band along middle of dorsal.

It does not exceed 102 mm. in length; littoral, euryhaline.

Distribution.—India, Pakistan; in the mean annual isotherm of 20°C with the latitudinal and longitudinal range of 90°—27°N., 85°—95°E. in the Bay of Bengal.

150. *Ilisha novacula* (Valenciennes)*

- 1847. *Pellona novacula* Valenciennes, *Hist. nat. Poiss.*, 20, p. 319. (type locality : Rangoon).
- 1913. *Pellona novacula* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 92 (Java, China).
- 1923. *Ilisha novacula* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 8 (Java).
- 1931. *Ilisha novacula* Chu, *Biol. Bull. St. John's Univ.*, p. 14 (China).
- 1941. *Ilisha novacula* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 657.
- 1949. *Ilisha novacula* Misra, *Rec. Indian Mus.*, 45, p. 394.
- 1953. *Ilisha novacula* Misra, *Rec. Indian Mus.*, 50, p. 379.

*Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, p. 121) treated it as a junior synonym of *Ilisha elongata* (Bennett, 1830). *ed.*

B. 6; D. 17—18; P. 16; V. 7; A. 42; L. 1. 45—50; L. tr. 14—15.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal. Head 5·0, depth 4·5 in total length (3·7—4·0 and 3·5 in standard length). Eyes 4·0 in head; equal to snout. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching before hinder half of eye. Teeth on palatines, pterygoids and tongue. Single dorsal fin; origin nearer to caudal origin than to snout end. Pectorals low, smaller than head. Pelvics small, smaller than eye; origin nearer to pectoral base than to anal origin and much before dorsal origin. Anal base 3·0 in standard length; origin below posterior half of dorsal. Caudal deeply forked. Lateral line absent. Abdominal scutes, preventral 23—24, postventral 10. Lower gill rakers 20, one-third longer than filaments.

Dark above, silvery below; fins yellowish.

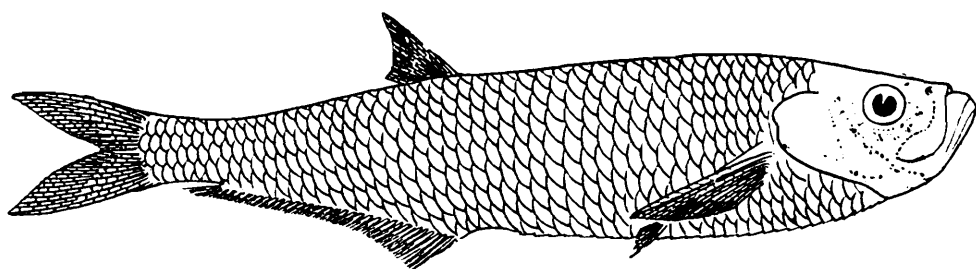
It attains 230 mm in length; littoral.

Distribution.—Burma, Indonesia, China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 22°N.—7°S., 96°–114°E in the Indo-Pacific=(16°N.—96°E., in the Bay of Bengal+22°N.—7°S., 110°–114°E. in the Pacific Ocean).

151. *Ilisha sladeni* (Day)

(Text-fig. 21)

- 1869. *Pellona sladeni* Day, *Proc. zool. Soc. Lond.*, p. 623 (type locality: Irrawaddi at Mandalay, Burma; type in the Zoological Survey of India).
- 1878. *Pellona sladeni* Day, *Fish. India*, p. 645, pl. 164, fig. 1 (Irrawaddi as high as Mandalay).
- 1889. *Pellona sladeni* Day, *Fauna Brit. India*, Fish., 1, p. 383.
- 1923. *Ilisha sladeni* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 6 (Irrawaddi and Sittang Rivers).
- 1941. *Ilisha sladeni* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 657.
- [1949. *Ilisha sladeni* Misra, *Rec. Indian Mus.*, 45, p. 395.
- 1953. *Ilisha sladeni* Misra, *Rec. Indian Mus.*, 50, p. 379.



TEXT-FIG. 21.—Lateral view of *Ilisha sladeni* (Day) (After F. Day)

B. 6; D. 13; P. 11; V. 7; A. 44; C. 21; L. 1. 48; L. tr. 10.

Body elongate, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal. Head 4.8—5.0, depth 5.2—5.5 in total length. Eyes 4.0—4.8 in head, 1.0 in snout. Lower jaw very prominent. Cleft of mouth very oblique; maxilla reaching midorbit. Single dorsal fin; origin much nearer to caudal base than to snout end. Pectorals a little less than head. Pelvics small, 4.1 in head; origin nearer to pectoral base than to anal origin; much before dorsal origin. Anal base 3.8 in total length, 3.3 in standard length; origin nearly opposite dorsal origin. Caudal deeply forked, less than head. Lateral line absent. Abdominal scutes, pre-ventral 23—24, postventral 10—11. Lower gill rakers 20—22.

Silvery; opercles golden; caudal tipped black.

It attains 340 mm in length; littoral, euryhaline.

Distribution.—Burma, in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 16°—21°N., 96°—98°E.

62. Genus *Pellona* Valenciennes

1847. *Pellona* Valenciennes, *Hist. nat. Poiss.*, **20**, p. 300 (type, *P. orbignyana* V., designated by Gill, *Proc. Acad. nat. Sci. Philad.*, p. 38, 1861).

1923. *Neosteus* Norman, *Ann. Mag. nat. Hist.* (9) **11**, p. 17 (type, *Pellona ditchela* V., designated by Norman, *Zool. Rec. Pisces*, p. 25, 1923).

This genus differs from genus *Ilisha* in having a toothed bone between the premaxillary and maxillary and in having the occipital ridges converging behind or parallel.

Distribution.—East and South Africa, Madagascar, Delagoa Bay, India, Sri Lanka, Burma, Malaya, Indonesia, Thailand, the Philippines, Queensland, and Brazil.

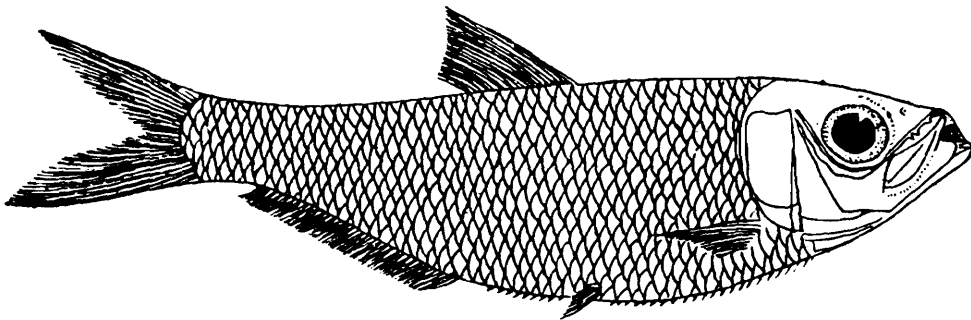
Key to the species of genus Pellona Valenciennes

1. Preventral abdominal scutes 23	<i>P. ditchela</i>
2. Preventral abdominal scutes 13	<i>P. hoevenii</i>

152. *Pellona ditchela* Valenciennes

(Text-fig. 22)

- 1847 *Pellona ditchela* Valenciennes, *Hist. nat. Poiss.*, 20, p. 314 [on *Ditchelee* Russell, *Fish. Coromandel*, 2, p. 72, pl. 188. 1803 (type locality : Vizagapatam)]
1878. *Pellona ditchela* Day, *Fish. India*, p. 644, pl. 165, fig. 5 (Coromandel coast; Madras).
- 1889 *Pellona ditchela* Day, *Fauna Brit. India*, Fish., 1, p. 381 (Coromandel coast).
1923. *Neosteus ditchela* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 17 (East Africa to Indo Australian Archipelago).
1928. *Pellona ditchela* Whitley, *Rec. Austral. Mus.*, 18, p. 214 (Edward Pellew Group, Gulf of Carpentaria).
1933. *Neosteus ditchela* Deraniyagala, *Ceylon J. Sci. (C)*, 5, p. 83 (Ceylon).
1940. *Ilisha ditchela* Herre, *Rec. Indian Mus.*, 42, p. 9 (Julia Island; Mergui Market).
1941. *Pellona ditchela* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 648.
1949. *Pellona ditchela* Misra, *Rec. Indian Mus.*, 45, p. 395.
1953. *Pellona ditchela* Misra, *Rec. Indian Mus.*, 50, p. 380.
1953. *Pellona ditchela* Smith, *Sea Fish. South. Africa*, p. 93 (Natal).
1955. *Pellona ditchela* Munro, *Mar. Freshwater Fish. Ceylon*, p. 26 (coastal waters).



TEXT-FIG. 22.—Lateral view of *Pellona ditchela* (V.) (After F. Day)

Vernacular names.—INDIA : *Ditchelee*, Telegu; Standardised name; *Ditchelee*.

B. 6; D. 18; P. 16; V 7; A. 36—40; C. 19; L. 1. 40—44; L. tr. 14; Predorsal scales 14.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal profile. Head 4.0, depth 4.3 in total length. The posterior half of the occipital ridges parallel. Eyes with narrow adipose lid, 3.0 in head, 1.0 in snout, 0.5 in

interorbital. Lower jaw prominent. Cleft of mouth oblique; maxilla reaching $\frac{1}{3}$ orbit. Teeth uniserial, minute in jaws, tongue and pterygoid; vomer and palatines edentulous. Single dorsal fin; origin midway between snout end and caudal base. Pectorals low, 1.7 in head. Pelvics small, 4.0 in head, less than eye; origin nearer to pectoral base than to anal origin and an eye diameter before dorsal origin. Anal base 4.2 in total length, 3.5 in standard length; origin nearer to pelvic origin than to caudal base and below the last one or three dorsal rays. Caudal deeply forked, a little smaller than head. Lateral line absent. Abdominal scutes, preventral 23, postventral 10. Lower gill rakers 27.

Silvery with a burnished lateral band, the upper edge of dorsal fin rather dark.

It attains 195 mm in length; littoral.

Distribution.—India, Burma, Sri Lanka.—South Africa, Madagascar, Malaya, Indonesia, Palaw, Gulf of Carpentaria; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 17°N.—29°S., 30°—140°E. in the Indo-Pacific=(17°N.—29°S., 30°—140°E. in the Indian Ocean+5°N.—7°S., 103°—135°E. in the Pacific Ocean).

153. *Pellona hoevenii* Bleeker*

- 1852. *Pellona hoevenii* Bleeker, *Verh. Bat. Gen.* 25, p.21 (type locality: Batavia).
- 1868. *Pellona hoevenii* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 455.
- 1878. *Pellona hoevenii* Day, *Fish. India*, p. 644, pl. 165, fig. 6 (Coromandel coast to the Malay Archipelago).
- 1889. *Pellona hoevenii* Day, *Fauna Brit. India, Fish.*, 1, p. 381 (Coromandel coast to the Malay Archipelago).
- 1913. *Pellona hoevenii* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 86, fig. 29 (Java, Ambon).
- 1931. *Pellona hoevenii* Bleeker, *Proc. Acad. nat. Sci. Philad.*, 83, p. 443 (Singapore).
- 1936. *Pellona hoeveni* Suvatti, *Index Fish. Siam*, p. 11 (Siam).
- 1953. *Ilisha hoeveni* Herre, *Check List Philippine Fish.*, p. 65 (Philippines).

B. 6; D. 17—18; P. 17—18; V 7; A. 33—37; L. 1. 40—45; L. tr. 12—13; Predorsal scales 16.

*Considered a junior synonym of *Pellona ditchela* Val., 1847 (vide Whitehead. *et. al.*, 1966, *Zool. Verhandl. Leiden*, (84), p. 91).ed.

Body oblong, compressed; abdomen keeled, serrated. Ventral and dorsal profile equally convex. Head 3·9, depth 3·3 in total length. The posterior half of the occipital ridges converging hindwards. Eyes with narrow adipose lid, 2·7 in head, 0·6 in snout, 1·0 in interorbital. Lower jaw very prominent. Cleft of mouth oblique; maxilla reaching midorbit. Teeth on jaws tongue, palatines, pterygoids and also on accessory bone. Single dorsal fin; origin nearer to snout end than to caudal base. Pectorals low, 1·7 in head. Pelvics small, 3·4 in head, smaller than eye; origin nearer to pectoral base than to anal origin and an eye diameter before dorsal origin. Anal base 4·5 in total length, 3·6 in standard length; origin nearer to pelvic origin than to caudal base and about a third below the hind end to dorsal base, caudal deeply forked, a little smaller than head. Lateral line absent. Abdominal scutes, preventral 13, postventral 9. Lower gill rakers 20—23.

Greenish on back, becoming silvery with mother-of-pearl reflections on sides and below.

It attains 180 mm in length; littoral.

Distribution.—India, Malaya, Indonesia, Thailand, Annam coast, the Philippines; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 17°N. —7°N., 83°—123°E. in the Indo-Pacific=(5°—17°N., 83°—100°E. in the Indian Ocean+15°N.—7°S., 103°—123°E. in the Pacific Ocean.)

63. Genus *Opisthopterus* Gill

1861. *Opisthopterus* Gill, *Proc. Acad. nat. Sci. Philad.*, p. 38. (type, *Pristigaster tartoor* C., orthotypic.).

Body oblong, compressed; scales thin, moderate, deciduous. Maxilla extending obliquely to midorbit. Two supplemental bones present. Eyes without adipose lid. Pseudobranchiae. Branchiostegals 6. Gill rakers 20—30, longer than filaments. Abdomen keeled and serrated. Pelvics absent. Anal single, very long. Anal origin in front of dorsal origin. Adipose fin absent. Caudal forked.

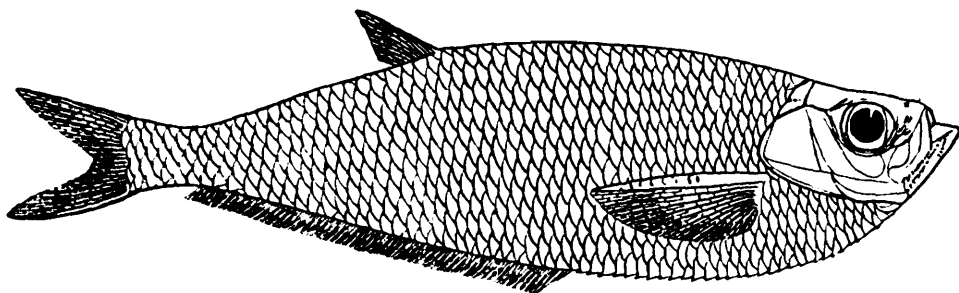
Distribution.—India, Pakistan, Burma, Sri Lanka, Malaya, Indonesia, Siam, Indo-China, Formosa, China, Pacific coast of Mexico.

154. **Opisthopterus tardoore** (Cuvier)

(Text-fig. 23)

1829. *Pristigaster tardoore* Cuvier, *Régne Animal*, 2, ed. 2, p. 321 [on *Tartoore* Russell, *Fish. Coromandel*, 2, p. 74, pl. 193, lower fig. 1803 (type locality : Vizagapatam)].
1839. *Pristigaster indicus* Swainson, *Nat. Hist. Animals.*, 2, p. 294 [on *Tartoore* Russell, *Fish. Coromandel*, 2, p. 74, pl. 193, 1803 (type locality : Vizagapatam)].
1847. *Pristigaster tartoor* Valenciennes, *Hist. nat. Poiss.*, 22, p. 328 (type locality : Coromandel, Malabar).
1865. *Pristigaster tartoor* Day, *Fish. Malabar*, p. 232 (Malabar).
1866. *Opisthopterus macrogathus* Bleeker, *Ned. Tijds. Dierk.*, 3, p. 299.
1868. *Pristigaster tartoor* Günther *Cat. Fish. Brit. Mus.*, 7, p. 460.
1868. *Pristigaster macrogathus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 461.
1878. *Opisthopterus tartoor* Day, *Fish. India*, p. 646, pl. 163, fig. 5 (from Gwadur in Baluchistan and Sind through the seas of India to the Malay Archipelago).
1889. *Opisthopterus tartoor* Day, *Fauna Brit. India*, *Fish.*, 1, p. 384.
1913. *Opisthopterus tartoor* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 95, fig. 31 (Java, Sumatra).
1917. *Opisthopterus tartoor* Hornell, *Madras Fish. Bull.*, 11, p. 93 (Tuticorin).
1923. *Opisthopterus tartoor* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 12 (coasts of India).
1924. *Opisthopterus tartoor* Fowler, *J. Bombay nat. Hist. Soc.*, 30, p. 38 (Calicut).
1929. *Opisthopterus tartoor* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Opisthopterus macrogathus* Deraniyagala, *Spolia Zeylan.*, 15, p. 45 (Ceylon).
1932. *Opisthopterus tartoor* Chevey, *Inst. Oceangr. Indochine*, 19° note, p. 10 (Indo-China).
1933. *Opisthopterus indicus* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 83 (Ceylon).
1936. *Opisthopterus macrogathus* Suvatti, *Index Fish. Siam*, p. 11 (Gulf of Siam).
1938. *Opisthopterus indicus* Fowler, *List Fish Malaya*, p. 30 (Singapore, Patani, Jhering).
1941. *Opisthopterus tardoore* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 663 (Hong Kong).
1941. *Opisthopterus macrogathus* Herre, *Rec. Indian Mus.*, 42, p. 9 (Julia Island, Mergui Archipelago).
1949. *Opisthopterus tardoore* Misra, *Rec. Indian Mus.*, 45, p. 395.

1953. *Opithopterus tardoore* Misra, *Rec. Indian Mus.*, 50, p. 381.
 1955. *Opithopterus tartoor* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 17, fig. 31.
 1955. *Opithopterus tardoore* Munro, *Mar. Freshwater Fish. Ceylon*, p. 27 (coastal waters).



TEXT-FIG. 23.—Lateral view of *Opisthopterus tardoore* (C.)
 (After F. Day)

Vernacular names.—INDIA : *Ambattike*, Kanarese; *Ambatta*, Malayalam; *Poovalai*, *Thota*, Tamil; *Katti Chapulu*, Telegu; Standardised name : *Katti*. PAKISTAN : *Koor*. SRI LANKA : *Maisthre lagga*, *Panniki lagga*, *Thottawa*, Singhalese;

B. 6; D. 15—17; P. 14—16; A. 53—66; L. 1. 43—54; L. tr. 12—15; Predorsal scales 29.

Body elongate, very much compressed; abdomen keeled, serrated. Dorsal profile of head concave becoming slightly convex on back; ventral profile convex from chin to anal fin. Head 4.7—5.7, depth 3.6—4.1 in total length. Eyes without adipose lid, 2.7—3.2 in head, 0.6 in snout, 0.3 in interorbital. Lower jaw very prominent, projecting over upper. Cleft of mouth oblique; maxilla reaching $\frac{1}{2}$ to $\frac{2}{3}$ eye. Teeth very minute, single row in jaws and along entire lower maxillary edge. Single dorsal fin; origin behind middle of body, nearer to caudal base than to pectoral base. Pectorals large, equal or a little smaller than head, just reaching or not reaching anal. No pelvics. Anal long, base 2.4—2.6 in total length, 2.3 in standard length; much before dorsal origin. Caudal deeply forked, 1.1—1.4 in head. No lateral line. Scales deciduous. Abdominal scutes 28—32. Gill rakers 20—30, smaller than eye, finely lanceolate.

Silvery on sides and greyish above, fins hyaline; caudal tipped dark.

It attains at least 228 mm. in total length; littoral.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Malaya, Indonesia, Singapore, Thailand, Indo-China, Hongkong; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 62°—114°E. in the Indo-Pacific =(25°N.—0°55' S., 62°—100°E. in the Indian Ocean+14°N.—7°S., 101°—114°E. in the Pacific Ocean).

64. Genus *Raconda* Gray

1831. *Raconda* Gray, *Zool. Miscell.*, 1, p. 9 (type *R. russelliana* Gray, monotypic).

1833-34. *Apterygia* Gray, *Ill. Indian Zool. Hardwicke*, 2, pl. 92, fig. 1, (type, *A. ramcarate* Gray, monotypic).

This genus differs from genus *Opisthopterus* in having no dorsal fin.

Distribution.—India, Pakistan, Burma, Sri Lanka, Malay Peninsula, Indonesia, and Cochin-China.

155. *Raconda russelliana* Gray

(Text-fig. 24)

1831. *Raconda russelliana* Gray, *Zool. Miscell.*, 1, p. 9 (type locality : Saugor Rocks; according to Norman the type in the British Museum).

1833-34. *Apterygia ramcarate* Gray, *Ill. Indian Zool. Hardwicke*, 2, pl. 92, fig. 1 (type locality : Saugor Rocks; according to Norman the type in the British Museum).

1847. *Apterygia hamiltoni* Valenciennes, *Hist. nat. Poiss.*, 20, p. 333 (on Gray).

1868. *Pristigaster russellianus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 462 (Bengal).

1878. *Raconda russelliana* Day, *Fish. India*, p. 646, pl. 163, fig. 4. (Bay of Bengal to the Malay Archipelago, the young are common in the Sunderbunds).

1889. *Raconda russelliana* Day, *Fauna Brit. India*, Fish., 1, p. 384.

1912. *Raconda russelliana* Jenkins, *Rec. Indian Mus.*, 7, p. 58 (Akyab).

1913. *Raconda russelliana*, Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 97, fig. 33 (Sumatra, Singapore).

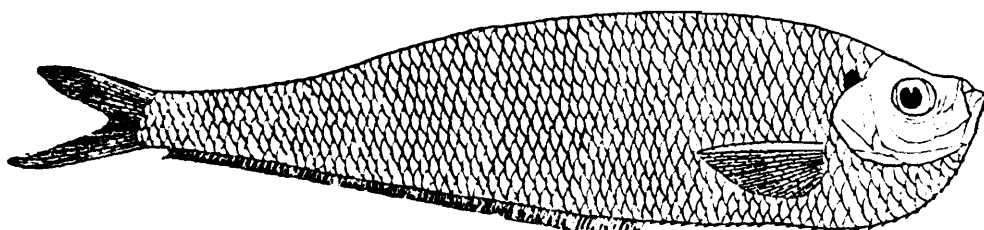
1923. *Raconda russelliana* Norman, *Ann. Mag. nat. Hist.*, (9) 11, p. 16 (Bay of Bengal).

1932. *Raconda russelliana* Chevey, *Inst. Oceanogr. Indo-chine*, 19° note, p. 10 (Indo-China).

1933. *Raconda russelliana* Sorley, *Marine Fish. Bombay Presidency*, p. 160 (Bombay).

1938. *Raconda russelliana* Fowler, *List Fish. Malaya*, p. 30 (Penang, Singapore).

1941. *Raconda russelliana* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 665.
 1949. *Raconda russelliana* Misra, *Rec. Indian Mus.*, 45, p. 396.
 1953. *Raconda russelliana* Misra, *Rec. Indian Mus.*, 50, p. 381.
 1955. *Raconda russelliana* Munro, *Mar. Freshwater Fish. Ceylon*, p. 28 (Palk Strait).



TEXT-FIG. 24.—Lateral view of *Raconda russelliana* Gray
(After F. Day)

Vernacular names.—INDIA : *Patulda* Kanarese; *Badasha*, Marathi;
 Standardised name : *Raconda*. BURMA : *Nya thendoong*, Burmese.

B. 6; P. 13; A. 83—92; L. 1. 60—64; L. tr. 12.

Body elongate, strongly compressed; anterior part of ventral profile very convex, dorsal profile concave above orbit. Head 6.2—7.0, depth 4.2—4.5 in total length. Eyes 3.0—3.3 in head, 0.8 in snout. Lower jaw projecting upwards forming a portion of dorsal profile. Cleft of mouth more or less vertical; maxilla reaching below anterior part of eye or midorbit. Teeth minute, single series in jaws, patches on palatines, pterygoids and tongue, none on vomer. No dorsal fin. Pectorals equal to head, not reaching anal. No pelvics. Anal very long, base 2.0 in total length, 1.8 in standard length. Caudal deeply forked, lower lobe longer, nearly equal to head. Scales moderate, deciduous. Abdominal scutes feeble, 31—38. Lower gill rakers 22—26, less than half eye.

A narrow, dark bluish band on back; sides yellowish becoming silvery below; a deep brown or black spot on shoulder; the young purple with silvery band on sides.

It attains 200 mm. in length; littoral.

Distribution.—India, Pakistan; Burma; Sri Lanka.—Malay Peninsula, Indonesia, Cochin-China; in the mean annual isotherm of 20°C. with the latitudinal and longi-

tudinal range of 0° — 25° N., 62° — 105° E. in the Indo-Pacific= $(5^{\circ}$ — 25° N., 62° — 100° E. in the Indian Ocean + 0° = 10° N., 103° — 105° E. in the Pacific Ocean).

viii. Subfamily *DOROSOMATINI*

Abdomen keeled, serrated. Dorsal fin with or without its last ray produced into filament.^f Mouth toothless. No enlarged scales at caudal base.

The subfamily *DOROSOMATINI* is represented by 4 genera in the Indian region.

Key to genera of subfamily DOSOSOMATINI

1. Last dorsal ray prolonged into a filament 3
2. Last dorsal ray not prolonged into a filament. 5
3. Dentary edge reflected outward in front of maxillary end; lateral line scales 44—50 ; transverse scales 14—21 *Nematalosa*
4. Dentary edge not reflected outward in front of maxillary end ; lateral line scales 48—58; transverse scales 17 *Clupanodon*
5. Pelvic origin behind dorsal origin; lateral line scales 40—42 ; transverse scales 12-15 *Anodontostoma*
6. Pelvic origin a little in front of or behind dorsal origin ; lateral line scales 45-65 ; transverse scales 16-25 *Gonialosa*

65. Genus *Clupanodon* Lacépède

1803. *Clupanodon* Lacépède, *Hist. nat. Poiss.*, 5, p. 468 (type, *Clupea thrissa* L., designated by Bleeker, *Atlas Ichth. Neerland*, 6, p. 112, 1866-72).
1815. *Thrissa* Rafinesque, *Analyse de la nature*, p. 88 (type, *Clupea thrissa* L.)
1900. *Konosirus* Jordan & Snyder, *Proc. U. S. nat. Mus.*, 23, p. 349 (type *Chatoessus punctatus* Schlegel, orthotypic).
1901. *Konoshirus* Jordan & Snyder, *Annot. Zool. Japan*, 3, p. 53 (type, *Chatoessus punctatus* Schlegel).
1931. *Nealosa* Herre & Myers, *Lingnan Sci. J.*, (10), p. 236 (type *Chatoessus punctatus* Schlegel, orthotypic).

Body oblong, compressed. Scales large. Mouth toothless. Eye with adipose lid. Maxilla extending to below

anterior part of or middle of eye. One supplemental bone present. Gill rakers slender, numerous. Abdomen keeled and serrated. Last dorsal ray prolonged into a filament. Pelvic origin behind dorsal base. Anal single, moderate. Adipose fin absent. Caudal forked.

Distribution.—India, Sri Lanka, China, Philippines, Indo-China, Formosa, Japan, Korea, and Polynesia.

Key to species of genus Clupanodon Lacépède.

1. Lateral line scales 47-49 ; height of body $2\frac{1}{2}$ — $3\frac{1}{4}$ in total length *C. thrissa*
2. Lateral line scales 46—51; height of body 3 — $3\frac{1}{2}$ in total length *C. punctatus*

156. *Clupanodon punctatus* (Schlegel)

1846. *Chatoessus punctatus* Schlegel, in Siebold's *Fauna Japonica*, Poiss., pts. 10-14, p. 240, pl. 109, fig. 1 (type locality : Bays on coast of S. W. Japan).
1846. *Chatoessus aquosus* Richardson, *Ichth. China Japan*, p. 307 (type locality : Chinese Sea).
1865. *Chatoessus punctatus* Kner, *Reise, Novara Fische*, p. 336 (Madras).
1917. *Clupanodon punctatus* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 309 (China, Japan).
1928. *Clupanodon punctatus* Fowler, *Mem. Bishop Mus.*, 10, p. 32 (Tahiti).
1931. *Clupanodon punctata* Chu, *Biol. Bull. St. John's Univ.*, p. 15 (Amoy, Chefoo, Swatow, New Chwang).
1941. *Clupanodon punctatus* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 559.
1949. *Clupanodon punctatus* Misra, *Rec. Indian Mus.*, 45, p. 379.
1952. *Clupanodon punctatus* Mori, *Mem. Hugo Univ. Agric.*, 1, (3), p. 29 (Fusan, Mokpo, Chemulpo).
1953. *Clupanodon punctatus* Misra, *Rec. Indian Mus.*, 50, p. 382.

B. 6; D. 18; V 8; A. 21; L. 1. 46-51; L. tr. 17 : Pre-dorsal scales 20—26.

Body oblong, compressed; abdomen keeled, serrated. Head 3.2—4.0, depth 3.1—3.4 in standard length. Eyes with broad adipose lid, 4.6—5.7 in head. 1.1—1.2 in snout, 1.2—1.5 in interorbital. Upper jaw conical, projecting beyond cleft of mouth; maxilla extending to midorbit; dentary edge not reflected outward in front of maxillary end. Toothless. Single dorsal fin

with the last ray prolonged and reaching to end of anal fin or to the caudal; last ray 1.1—2.6 in standard length; origin nearer to snout end than to caudal base. Pectorals 1.6—1.8 in head. Pelvics moderate, 2.4—2.5 in head; origin behind dorsal base. Anal moderate, first branched ray 3.6—4.0 in head. Caudal forked, 1.1 in head. No lateral line. Abdominal scutes, pre-ventral 20, postventral 13—15. Lower gill rakers 170, setiform, equal to gill filaments, 1.5 in eye.

Gray or brown above with metallic bluish reflections sides of body and head silvery; each scale on back with small round dusky basal spot; often a dark humeral blotch or bar.

It attains 245 mm in total length.

Distribution.—India, China, Japan, Korea, Tahiti; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35°N.—18°S., 80°E.—149°W in the Indo-Pacific=(13°N.—80°E. in the Bay of Bengal +35°—18°S., 114°E.—149°W in the Pacific Ocean).

157. *Clupanodon thrissa* (Linnaeus)

- 1758. *Clupea thrissa* Linnaeus, *Syst. Nat.*, 1, ed., 10, p. 318 (type locality : Indian Ocean).
- 1846. *Chatoessus triza* Richardson, *Ichth. China Japan*, p. 307 (type locality : China Sea).
- 1846. *Chatoessus chrysopterus* Richardson, *Ichth. China Japan*, p. 308 (type locality : China Sea).
- 1846. *Chatoessus maculatus* Richardson, *Ichth. China Japan*, p. 308 (type locality : Canton).
- 1902. *Clupanodon maculatus* Jordan & Evermann, *Proc. U. S. nat. Mus.*, 25, p. 327 (Formosa).
- 1917. *Clupanodon thrissa* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 309 (Formosa, China).
- 1928. *Clupanodon thrissa* Fowler, *J. Bombay nat. Hist. Soc.*, 33, p. 103 (Bombay).
- 1931. *Clupanodon thrissa* Chu, *Biol. Bull. John's Univ.*, p. 15 (China, Canton, Swatow).
- 1931. *Clupanodon thrissa* Fowler, *Hongkong Nat*, 2, p. 54 (Hongkong).
- 1933. *Clupanodon thrissa* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
- 1941. *Clupanodon thrissa* Fowler, *Bull. U. S. nat. Mus.*, (100), 13, p. 557.
- 1949. *Clupanodon thrissa* Misra, *Rec. Indian Mus.*, 45, p. 397.

1953. *Clupanodon thrissa* Misra, *Rec. Indian Mus.*, 50, p. 381.

1953. *Clupanodon thrissa* Herre, *Check List Philippine Fish.*, (Philippines).

B. 6; D. 16—18; V 8; A. 22—27; L. 1. 47—49; L. tr. 17; Predorsal scales 16.

Body oblong, compressed; abdomen keeled, serrated. Head 3.1—3.6, depth 2.7—3.2 in standard length. Eyes with broad adipose lid, 3.4—4.2 in head, 1.1—1.2 in snout, 1.0 in interorbital. Lower jaw but slightly prominent, maxilla extending beyond front margin of eye. No teeth on palate, a very narrow band of minute teeth in tongue. Single dorsal fin; last ray prolonged, 2.8 in standard length; origin much nearer to snout end than to caudal base. Pectorals 1.3—1.6 in head. Pelvics moderate, 2.2—2.7 in head; origin below middle of dorsal base. Anal moderate, first branched ray 3.4—4.2 in head. Caudal forked, 1.0 in head. No lateral line. Abdominal scutes, preventral 17—19, postventral 10—12. Lower gill rakers 220, fine, setiform, longer than filaments, 1.2—2.2 in eye.

Slaty grey above, silvery on sides and below; 6 dark blotches on back from behind, shoulder towards caudal, the first longest, others gradually smaller.

It attains 210 mm. in length, littoral.

Distribution.—India, Sri Lanka, Philippines, Indo-China, China, Hongkong, Formosa, Japan, New Guinea; in the mean annual isotherm of 20°C with the latitudinal and longitudinal range of 35°N.—3°S., 72°—135°E. in the Indo-Pacific (6°—18°N., 72°—80°E. in the Indian Ocean + 35°N.—3°S., 108°—135°E. in the Pacific Ocean.)

66. Genus *Gonialosa* Regan

1917. *Gonialosa* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 315 (type, *Chatoessus modestus* Day, orthotypic).

1931. *Indialosa* Herre & Myers, *Lingnan Sci. J.*, (10), p. 238 (type, *Clupanodon manmina* Ham., orthotypic).

Body, oblong, compressed, scales small. Mouth toothless. Maxilla extending to below middle of orbit. One supplemental bone present. Vertebrae 44—46. Abdomen keeled and serrated. Last dorsal ray not prolonged into a filament. Pelvic origin before or behind

dorsal origin. Anal single, moderate. Adipose fin absent. Caudal deeply forked.

Distribution.—India, Pakistan, Bangladesh and Burma.

Key to species of genus Gonialosa Regan

1. Lateral line scales 45—47; lateral transverse scales 16-18 *G. modestus*
2. Lateral line scales 58-65 ; lateral transverse scales 21-25 *G. manmina*

158. ***Gonialosa manmina*** (Hamilton)
(Pl. III, fig. 4)

1822. *Clupanodon manmina* Hamilton, *Fish. Ganges*, pp. 247, 383 (type locality : most of the freshwater branches of the Ganges).
1822. *Clupanodon cortius* Hamilton, *Fish. Ganges*, pp. 249, 383 (type locality : the Brahmaputra, near Gayalpara).
1878. *Chatoessus manminna* Day, *Fish. India*, p. 633, pl. 160, fig. 2 (fresh waters of Sind, and the districts watered by the Indus and its branches, also the affluents and main streams of the Ganges, Jumna, Brahmaputra and Mahanuddi. It is spread through the tanks and estuaries of India and Assam, except the Deccan, Southern and Western India and Ceylon).
1889. *Chatoessus manminna* Day, *Fauna Brit. India, Fish.*, 1, p. 387.
1917. *Gonialosa manmina* Regan, *Ann. Mag. nat. Hist.*, (8) p. 315 (Northern India and Assam).
1937. *Gonialosa manminna* Shaw & Shebbeare, *J. roy. As. Soc. Bengal, Sci.*, 3, p. 14 (Northern Bengal).
1940. *Gonialosa manmina* Herre, *Rec. Indian Mus.*, 42, p. 1 (Andamans).
1941. *Gonialosa manminna* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 548.
1941. *Gonialosa manmina* Herre, *Mem. Indian Mus.*, 13, p. 335.
1949. *Gonialosa manmina* Misra, *Rec. Indian Mus.*, 45, p. 397.
1953. *Gonialosa manmina* Misra, *Rec. Indian Mus.*, 50, p. 383.
1955. *Chatoessus manminna* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 16 (coasts of Sind and Makran).
1955. *Gonialosa manminna* Munro, *Mar. Freshwater Fish. Ceylon*, p. 29 (coastal waters).

Vernacular names.—INDIA : *Khoria*, Bengali; *Mackundi*, Oriya.
BANGLADESH : *Khoria*.

B. 6; D. 14—15; P. 15; V. 8; A. 22—24; L. 1. 58—65; L. tr. 21—25.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile slightly more convex than dorsal profile. Head 4.6—5.0, depth 3.6—3.7 in total length. Eyes with broad adipose lid, 3.3 in head, 0.9 in snout. Upper jaw projecting over lower. Mouth transverse, small subinferior. Toothless. Single dorsal fin; origin much nearer to snout end than to caudal base or midway between hind end of anal base and snout end. Pectorals reaching pelvic base, 1.1 in head. Pelvics 2.0 in head; origin slightly behind dorsal origin and nearer to pectoral base than to anal origin. Anal moderate, base 1.1 in head; origin slightly nearer to pelvic origin than to caudal base. Caudal deeply forked 1.1 times head. No lateral line. Scales regularly arranged. Abdominal scutes, preventral 17, postventral 13.

Silvery shot with gold; cheeks purplish; a black humeral spot.

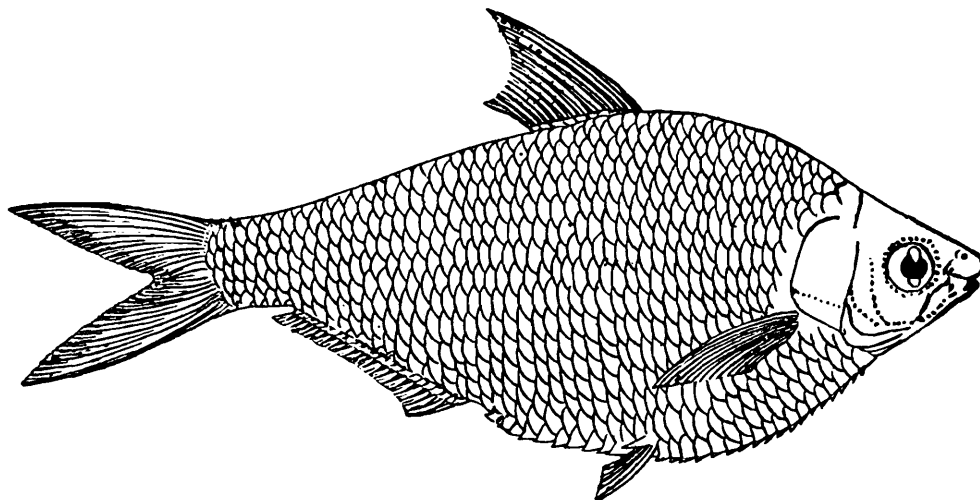
It attains 279 mm. in length, freshwater, euryhaline.

Distribution.—India, Pakistan, Sri Lanka, in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 6°—27°N., 62°—95°E. in the freshwater and estuaries of Indian region.

159. *Gonialosa modestus* (Day)
(Text-fig. 25)

- 1869. *Chatoessus modestus* Day, *Proc. zool. Soc. Lond.*, p. 622
(type locality : Bassein River as high as Een-gay-gyee Lake, Burma; type in the Zoological Survey of India).
- 1878. *Chatoessus modestus* Day, *Fish. India*, p. 633, pl. 160, fig. 1
(along the Bassein River as high as the Een-gay-gyee Lake, also the Salween at Moulmein).
- 1889. *Chatoessus modestus* Day, *Fauna Brit. India*, Fishes, 1, p. 386.
- 1917. *Gonialosa moesta* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 315 (Burma).
- 1941. *Gonialosa modesta* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 548.
- 1949. *Gonialosa modestus* Misra, *Rec. Indian Mus.*, 45, p. 397,

1953. *Gonialosa modestus* Misra, *Rec. Indian Mus.*, **50**, p. 383.



TEXT-FIG. 25.—Lateral view of *Gonialosa modestus* (Day)
(After F. Day)

B. 6; D. 14—16; P. 16, V 8; A. 27—28; C. 21; L. 1.
45—47; L. tr. 16—18.

Body oblong, compressed; abdomen keeled, serrated. Profile over nape concave, rising to dorsal base; ventral profile equally convex with dorsal. Head 4.8—5.2, depth 2.7—3.0 in total length. Eyes with broad adipose lid, 3.1 in head, 0.5 in snout. Upper jaw projecting over the lower one. Mouth transverse, small, subinferior. Toothless. Single dorsal fin; origin much nearer to snout end than to caudal base or midway between hind end of anal base and snout end. Pectorals reaching pelvic base, 1.1 in head. Pelvics 2.1 in head; origin before dorsal origin and midway between pectoral base and anal origin. Anal moderate, base equal to head; origin nearer to pelvic origin than to caudal base. Caudal deeply forked 1.1 times head. No lateral line. Scales regularly arranged. Abdominal scutes, preventral 17—18, postventral 11—12.

Yellowish shot with purple.

It attains 134 mm. in length, freshwater, euryhaline.

Distribution.—Burma; in the mean annual isotherm of 20°C with the latitudinal and longitudinal range of 16°—18°N., 94°—97°E. in freshwater and estuaries of Burma;

67. Genus *Nematalosa* Regan*

1917. *Nematalosa* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 312 (type, *Clupea nasus* Bl., orthotypic).

Body oblong, compressed, scales moderate. Mouth toothless. Maxilla short, not extending to even below anterior edge of orbit. One supplemental maxillary present. Abdomen keeled and serrated. Last dorsal ray prolonged. Pelvic origin below dorsal fin. Anal single, moderate. Adipose fin absent. Caudal forked.

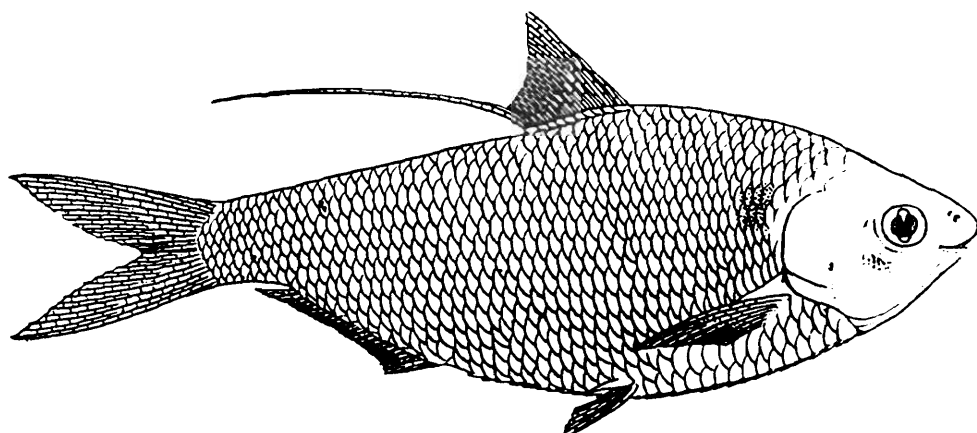
Distribution.—Arabia, Iraq, India, Burma, Sri Lanka, Malaya, Indonesia, Thailand, China, Philippines, Queensland, New South Wales, Japan.

160. *Nematalosa nasus* (Bloch)
(Text-fig. 26)

1795. *Clupea nasus* Bloch, *Naturg. ausland. Fische*, p. 116, pl. 429, fig. 1 (type locality : Malabar).
 1801. *Clupea nasus* Schneider, *Syst. Ichth. Bloch*, p. 426 (Malabar).
 1803. *Clupanodon nasica* Lacépède, *Hist. nat. Poiss.*, 5, pp. 468, 472 (Malabar).
 1833-34. *Chatoessus altus* Gray, *Ill. Indian Zool. Hardwicke*, 2, pl. 91, fig. 2 (type locality : India).
 1848. *Chatoessus nasus* Valenciennes, *Hist. nat. Poiss.*, 21, p. 104 (Pondicherry; Bombay).
 1865. *Chatoessus altus* Day, *Fish. Malabar*, p. 243 (Malabar).
 1868. *Chatoessus nasus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 407.
 1878. *Chatoessus nasus* Day, *Fish. India.*, p. 634, pl. 160, fig. 4 (seas of India, to the Malay Archipelago and the Philippine Is.)
 1889. *Chatoessus nasus* Day, *Fauna Brit. India, Fish.*, 1, p. 387.
 1910. *Chatoessus nasus* Jenkins, *Rec. Indian Mus.*, 5, pp. 131, 135 (Karachi : Chilka Lake).
 1912. *Chatoessus nasus* Jenkins, *Rec. Indian Mus.*, 7, p. 60 (Puri).
 1913. *Dorosoma nasus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 24, (Java, Banka, Celebes, Ambon, Ceram, New Guinea, Australia).
 1915. *Dorosoma nasus* Chaudhuri, *Mem. Indian Mus.*, 5, p. 417 (Chilka Lake).
 1917. *Nematalosa nasus* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 313 (Sind; Bombay; Canara; Madras; Calicut; Burma).

*Dr. Gareth Nelson is describing a new species of *Nematalosa*, close to *N. nasus*. One of Day's specimens of *N. nasus* in the British Museum is this new species, ex-Canara, BMNH. 1889, 2.1.1877. Ed.

1929. *Chatoessus nasus* Pillay, *J. Bombay. nat. Hist. Soc.*, 33, p. 355 (Travancore).
1929. *Dorosoma nasus* Deraniyagala, *Spolia Zeylan.*, 15, p. 45 (Ceylon).
1931. *Clupanodon nasus* Chu, *Biol. Bull. St. John's Univ.*, p. 15, (Canton, Hongkong, Hainan).
1936. *Anodontastoma nasus* Suvatti, *Index Fish. Saim.*, p. 14 (Siam).
1938. *Nematalosa nasus* Fowler, *List Fish. Malaya*, p. 25 (Singapore).
1941. *Nematalosa nasus* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 555.
1949. *Nematalosa nasus* Misra, *Rec. Indian Mus.*, 45, p. 398.
1953. *Nematalosa nasus* Misra, *Rec. Indian Mus.*, 50, p. 383.
1953. *Nematalosa nasus* Herre, *Check List. Philippine Fish.*, p. 63 (Philippines).
1953. *Nematalosa nasus* Smith, *Sea Fish. South. Africa*, p. 93, (Durban).
1955. *Chatoessus nasus* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 16 (coasts of Sind and Makran).
1955. *Nematalosa nasus* Munro, *Mar. Freshwater Fish. Ceylon*, p. 29.



TEXT-FIG. 26.—Lateral view of *Nematalosa nasus* (Bl.) (After F. Day)

Vernacular names.—INDIA : Noonah, Pananjaulay, Malayalam; Kome, Oriya; Muddu candai, Koi meen, Tamil; Kome, Telegu. SRI LANKA : Suthara koiya, Katu Goiya, Singhalese.

B.6; D 15-17; V. 8; A. 21-24; C. 19; L. 1. 44-50; L. tr. 15-19; Predorsal scales 21.

Body oblong, compressed; abdomen keeled, serrated. Ventral and dorsal profiles equally convex. Head 4.5-5.0, depth 3.2-3.5 in total length. Eyes with broad adipose lid, 3.7 in head, 0.7 in snout. Upper jaw projecting over lower.

Mouth small, transverse, subinferior. Toothless. Single dorsal fin with last ray much prolonged, reaching caudal base; origin much nearer to snout end than to caudal base and midway between hind end of anal base and snout end. Pectorals reaching pelvic base, 1.1 in head. Pelvics 2.0 in head; origin slightly behind dorsal origin, nearer to pectoral base than to anal origin. Anal moderate, base 1.1 in head; origin nearer to pelvic base than to caudal base. Caudal deeply forked 1.1 times head. No lateral line. Scales with serrated edges, regularly arranged. Abdominal scutes, preventral 15, postventral 12. Lower gill rakers 218, setiform, slender.

Grayish green above with steel blue reflections; centre of each scale in the first row from above the darkest forming horizontal lines; sides and below silvery; a bluish humeral spot.

It attains 255 mm. in length and is good eating though bony; ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Iraq, Muscat, S. Africa, Malaya, Indonesia, Thailand, Indo-China, China, the Philippines; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 34° N.-29° S., 30°-123° E. in the Indo-Pacific=(34° N.-29° S., 30°-100° E. in the Indian Ocean+23° N.-7° S., 103°-123° E. in the Pacific Ocean).

68. Genus *Anodontostoma* Bleeker

1849. *Anodontostoma* Bleeker, *Verh. Bat. Gen.*, 22, p. 15 (type, *A. hasseltii* Blkr.).

Body oblong, compressed, scales moderate. Mouth toothless. Maxilla short, not extending to middle of orbit. One supplemental maxillary present. Vertebrae 42. Abdomen keeled and serrated. Last dorsal ray not prolonged. Pelvic origin behind dorsal origin. Anal single, short. Adipose fin absent. Caudal forked.

Distribution.—India, Pakistan, Burma, Sri Lanka, Malay Peninsula, Indonesia, Thailand, Indo-China, China, Philippines and Melanesia.

161. *Anodontostoma chacunda* (Hamilton)

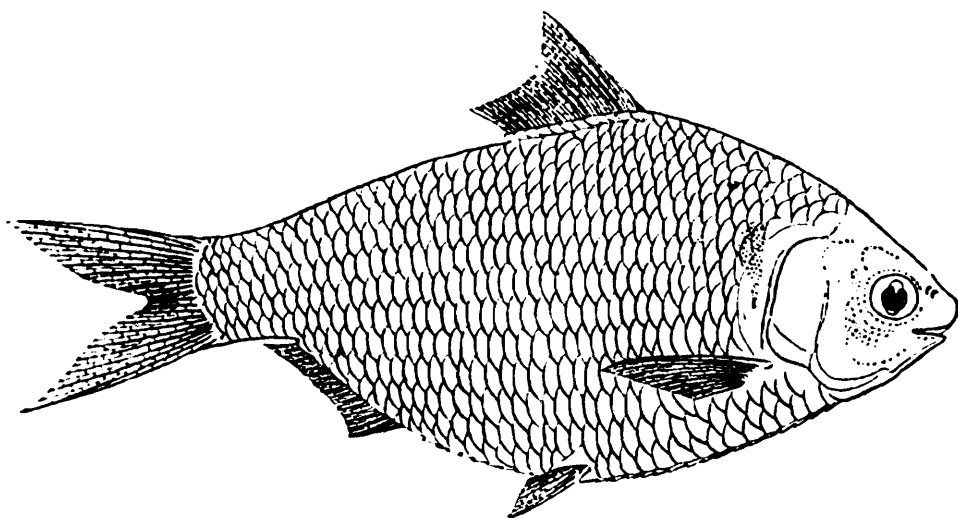
(Pl. III, fig. 2; Text-fig. 27)

1822. *Clupanodon chacunda* Hamilton, *Fish. Ganges*, pp. 246, 383 (type locality : Gangetic estuaries).

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1823. *Gonostoma javanicum* Kuhl & v. Hasselt, *Algem. Konst. Letterbode*, p. 329, (type locality : Java).
1849. *Anodontostoma hasseltii* Bleeker, *Verh. Bat. Gen.* 22, p. 15, (type locality : Madura Straits near Kammal and Surabaya).
1852. *Chatoessus selangkat* Bleeker, *Verh. Bat. Gen.*, 24, pp. 16, 47 (type locality : Batavia).
1865. *Chatoessus chacunda* Day, *Fish. Malabar*, p. 242 (Malabar).
1868. *Chatoessus chacunda* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 411 (Ganges).
1870. *Chatoessus chacunda* Day, *Proc. zool. Soc. Lond.*, p. 700 (Andamans).
1876. *Chatoessus chacunda* Mertens, *Preuss. Exped. Ost. Asien*, 1, p. 404 (Malabar).
1878. *Chatoessus chacunda* Day, *Fish. India*, p. 632, pl. 160, fig. 3 (seas and estuaries of India, Burma to the Malay Archipelago).
1889. *Chatoessus chacunda* Day, *Fauna Brit. India*, Fish., 1, p. 386.
1910. *Chatoessus chacunda* Jenkins, *Rec. Indian Mus.*, 5, p. 151 (Karachi).
1912. *Chatoessus chacunda* Jenkins, *Rec. Indian Mus.*, 7, p. 58 (Akyab).
1913. *Dorosoma chacunda* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 25, fig. p. 14.
1915. *Dorosoma indicus* Chaudhuri, *Mem. Indian Mus.*, 5, p. 419 (Chilka Lake).
1917. *Chatoessus chacunda* Hornell, *Madras Fish. Bull.*, 11, p. 92 (Tuticorin).
1917. *Anodontostoma chacunda* Regan, *Ann. Mag. nat. Hist.*, (8) 19, p. 316 (India).
1922. *Dorosoma indicus* Hora, *Mem. Indian Mus.*, 5, p. 754 (Chilka Lake).
1926. *Anodontostoma chacunda* Oshima, *Annot. Zool. Japan.*, 11, p. 2 (Hainan).
1928. *Anodontostoma chacunda* Fowler, *Mem. Bishop Mus.*, 10, p. 32 (New Guinea).
1929. *Chatoessus chacunda* Pillay, *J. Bombay nat. Hist. Soc.*, 35, p. 355 (Travancore).
1929. *Dorosoma chacunda* Tirant, *Serv. Oceanogr. Peches Indo-Chine*, 6° note, pp. 116, 174 (Cochin China).
1931. *Anodontostoma chacunda* Chu, *Biol. Bull. St. John's Univ.*, p. 15, (Hainan).
1935. *Chatoessus chacunda* Sorley, *Marine Fish. Bombay Presidency*, p. 160 (Bombay).
1936. *Anodontostoma chacunda* Suvarti, *Index Fish. Siam*, p.13 (Siam).

1938. *Anodontostoma chacunda* Fowler, *List Fish. Malaya*, p. 25 (Singapore, Penang).
 1940. *Anodontostoma chacunda* Herre, *Rec. Indian Mus.*, 42, p. 10 (Mergui market).
 1941. *Anodontostoma chacunda* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 459.
 1941. *Anodontostoma chacunda* Herre, *Mem. Indian Mus.*, 13, p. 335.
 1949. *Anodontostoma chacunda* Misra, *Rec. Indian Mus.*, 45, p. 398.
 1953. *Anodontostoma chacunda* Misra, *Rec. Indian Mus.*, 50, p. 384.
 1955. *Anodontostoma chacunda* Herre, *Check List Philippine Fish.* p. 62 (Philippines).
 1955. *Chatoessus chacunda* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 16 (coasts of Sind and Makran).
 1955. *Anodontostoma chacunda* Munro, *Mar. Freshwater Fish. Ceylon*, p. 30 (coastal waters).



TEXT-FIG. 27.—Lateral view of *Anodontostoma chacunda* (Ham.)
 (After F. Day)

Vernacular names.—INDIA : *Kore-paig-dah*, Andamanese; *Gubir*, Niv Marathi; *Muddeeru* Telegu. PAKISTAN : *Palli*. BURMA : *Nga-tey-mee*, Arracan.

B. 6; D17-19; P. 15; V. 8; A. 18-21; L. 1. 40-42; L. 11 12-15; Predorsal scales 10-11.

Body oblong, compressed; abdomen keeled, serrated. Ventral and dorsal profiles deep, more or less equally convex. Head 4.5 to 5.0, depth 2.5—2.6 in total length. Eyes with broad adipose lid, 3.0 in head, 0.6 in snout, 1.1 in interorbital. Upper jaw projecting over lower. Mouth small, transverse, subinferior. Toothless. Single dorsal fin; origin much nearer to snout end than to caudal

base and midway between hind end of anal base and snout end. Pectorals equal to head. Pelvics 1.9 in head; origin nearer to anal origin than to pelvic base and below middle of dorsal base. Anal moderate, base equal to dorsal base; origin midway between pelvic and caudal base. Caudal deeply forked, 1.2 times head. Scales smooth edged, in regular rows. No lateral line. Abdominal scutes, pre-ventral 16-17, postventral 11-12. Lower gill rakers 83, lanceolate, 2.5 in gill filaments.

Greyish silvery above becoming golden on sides and below; lines formed of spots along rows of scutes in upper third of body; a black humeral spot.

It attains 204 mm. in length; littoral, euryhaline.

Distribution—India, Pakistan, Burma, Sri Lanka—Malay Peninsula, Indonesia, Thailand, Indo-China, Hainan, the Philippines, Melanesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25° N.—7° S., 62°-142° E. in the Indo-Pacific (25° N., 62°-100° E. in the Indian Ocean+17° N.—7° S., 102°-142° E. in the Pacific Ocean).

XXIII. Family ENGRAULIDAE

.. Body elongate or oblong, compressed; abdomen keeled. serrated. Snout prominent, overhanging large mouth. Mouth bordered by very small premaxillaries and a very long, narrow, maxillary with two supramaxillaries. Teeth uniserial, rarely canine; small teeth on palatines, vomer, pterygoids and tongue. Gill membranes united, free from isthmus. Air bladder connected with ear. Pseudobranchiae. Scales thin, cycloid, deciduous. No lateral line. No adipose dorsal. Long anal. Caudal forked.

Tertiary to recent.

The family ENGRAULIDAE is represented by 5 genera in the Indian region.

Key to genera of family ENGRAULIDAE

1. Caudal forked, not united with anal; upper pectoral ray produced or not produced .. 3
2. Caudal pointed, united with anal; upper pectoral rays always produced **Coilia**

3. Upper pectoral ray produced ..	Setipinna
4. Upper pectoral ray not produced	5
5. Abdominal scutes restricted only between pectorals and pelvics; no lateral silvery band; anal short ..	Anchoviella
6. Abdominal scutes not restricted between pectorals and pelvics; no lateral silvery band; anal long ..	7
7. Teeth in jaws partly canine	Xenengraulis
8. Teeth in jaws minute, uniform ...	Thrissocles

69. Genus *Setipinna* Swainson

1839. *Setipinna* Swainson, *Nat. Hist. Animal.*, 2, p. 292 (type *S. megalura* Swns. = *Clupea phasa* (Ham.).).
1854. *Stethochaetus* Gray, *Cat. Fish. Gronow*, p. 174 (type, *S. biguttatus* Gronow, monotypic).
1868. *Telara* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 400 (type, *Clupea telara* Ham., tautotypic).
1868. *Heterothrissa* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 401 (type, *Engraulis breviceps* Cantor, monotypic).

Body elongate, compressed, tapering behind, scales large, deciduous. Maxilla extended behind, not reaching beyond gill-opening. Vertebrae 45—46. Abdomen keeled and serrated. Upper pectoral ray produced. Pelvic origin in advance of dorsal origin. Free spine before dorsal. Anal single, very long, origin just before or in front of dorsal origin. Adipose fin absent. Caudal forked not united with anal.

Distribution.—India, Bangladesh, Burma, Sri Lanka, Malaya Indonesia, Thailand, Indo-China, China, Korea.

*Key to species of genus Setipinna Swainson**

1. Anal origin in front of dorsal origin; lower gill-rakers 13-18; anal rays 60-80	3	
2. Anal origin behind dorsal origin; lower gill-rakers 15-16; anal rays 51-60		<i>S. taty</i>
3. Anal rays 70-80; lower gill-rakers 18; lateral line scales 52		<i>S. phasa</i>
4. Anal rays 60-66; lower gill-rakers 12-13; lateral line scales 54-56		<i>S. breviceps</i>

*Babu Rao (1962, *Proc. First All India Congress of Zoology*, Jabalpur, (2), p. 364) described a new species, *Setipinna godavari* from the Godavari estuary which is close to *S. taty* (Val.) but has a lower gillraker count (10—11+12—16 vs. 14—16+17—20). *ed.*

162. *Setipinna breviceps* (Cantor)

1849. *Engraulis breviceps* Cantor, *J. Asiatic. Soc. Bengal*, **18**, p. 1288 (type locality : Penang).
1852. *Engraulis pfeifferi* Bleeker, *Nat. Tijds. Ned. Ind.*, **3**, p. (408) 433 (type locality: Pontianak, Borneo).
1854. *Stethochaetus biguttatus* Gray, *Cat. Fish. Gronow*, p. 174 (type locality : India).
1878. *Engraulis breviceps* Day, *Fish. India*, p. 628 (Bay of Bengal to the Malay Archipelago).
1889. *Engraulis breviceps* Day, *Fauna Brit. India, Fish.*, **1**, p. 392.
1907. *Engraulis breviceps* Lloyd, *Rec. Indian Mus.*, **1**, p. 221 (Akyab).
1913. *Setipinna breviceps* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 29 (Sumatra, Borneo, Penang).
1926. *Setipinna breviceps* Chabanaud, *Service Oceanogr. Peches Indo-China*, 1° note, p. 8 (Cambodia).
1938. *Setipinna breviceps* Fowler, *List Fish. Malaya*, p. 34 (Penang).
1941. *Setipinna breviceps* Fowler, *Bull. U.S. nat. Mus.*, (100) **13**, p. 691.
1949. *Setipinna breviceps* Misra, *Rec. Indian Mus.*, **45**, p. 339.
1953. *Setipinna breviceps* Misra, *Rec. Indian Mus.*, **50**, [p. 384.

B. 16-19; D. 1+17; P. 1+13; V. 7, A. 60—66; C. 17; L. 54—56; L. tr. 14; Predorsal scales 25.

Body elongate, compressed; abdomen keeled, serrated; dorsal profile more convex between head and dorsal fin than ventral profile. Head 7.0—7.2, depth 4.0—4.5 in total length. Eyes with adipose lid, 5.5—6.5 in head, 0.7—1.0 in snout, 1.0—1.5 in interorbital. Lower jaw slightly longer. Cleft of mouth oblique; maxilla truncated behind, reaching mandibular joint. Teeth small, even. Single dorsal fin; origin nearer to snout than to caudal base and behind anal origin. Pectorals low, with upper ray produced and reaching to middle or hind part of anal base. Pelvics small; origin much before dorsal origin. Anal very long, base equal to half standard length; origin before dorsal base. Caudal forked, 4.5 in standard length. No lateral line. Abdominal scutes, preventral 16—17, postventral 9—11. Gill rakers 10+12—13, lanceolate, 2.0 times in gill filaments or 1.0 in eye.

Greenish yellow above becoming silvery on sides and below; body with some dark blotches in upper half; vertical with black margins.

It attains 300 mm. in length and ascends estuaries; littoral, euryhaline.

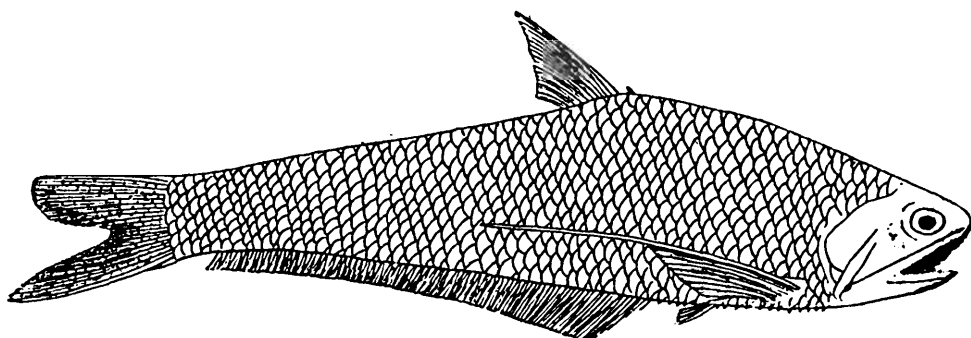
Distribution.—India, Bangladesh, Burma.—Malay Peninsula, Penang, Singapore, Indonesia, Indo-China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 0°–22° N., 88°–115° E. in the Indo-Pacific=(5° N–22° N., 88°–100° E. in the Bay of Bengal 0°–22° N., 103°–115° E. in the Pacific Ocean).

163. *Setipinna phasa* (Hamilton)

(Text-fig. 28)

- 1822. *Clupea phasa* Hamilton, *Fish. Ganges*, pp. 240, 382 (type locality : brackish rivers of Bengal).
- 1822. *Clupea telara* Hamilton, *Fish. Ganges*, p. 241, 382, pl. 2, fig. 72 (type locality : high up in the Ganges, and in most of its larger branches and tributary streams).
- 1839. *Setipinna truncata* Swainson, *Nat. Hist. Animals, Fish.*, 2, p. 292 (on *Clupea telara* Ham.).
- 1839. *Setipinna phasa* Swainson, *Nat. Hist. Animals, Fish.*, 2, p. 292 (on *Clupea phasa* Ham.).
- 1848. *Engraulis brevifilis* Valenciennes, *Hist. nat. Poiss.*, 21, p. 54, (type locality : Bengal).
- 1848. *Engraulis telara* Valenciennes, *Hist. nat. Poiss.*, 21, p. 56, pl. 608 (Ganges mouth; Irrawaddi, Rangoon)
- 1848. *Engraulis phasa* Valenciennes, *Hist. nat. Poiss.*, 21, p. 59, (Bengal).
- 1853. *Engraulis telara* Bleeker, *Verh. Bat. Gen.* 25, pp. 74, 147 (Calcutta).
- 1868. *Engraulis telara* Gunther, *Cat. Fish. Brit. Mus.*, 7, p. 410 (Bengal: Cachar; River Hooghly).
- 1870. *Engraulis telara* Day, *Proc. zool. Soc. Lond.*, p. 700 (Andamans).
- 1878. *Engraulis telara* Day, *Fish. India*, p. 627, pl. 158, fig. 2 (Orissa Bengal, Cachar and Burma; Day collected *E. telara* as high up as Mandalay; the example figured, life-size, was from Calcutta).
- 1889. *Engraulis telara* Day, *Fauna Brit. India, Fish.*, 1, p. 392.
- 1910. *Engraulis telara* Jenkins, *Rec. Indian Mus.*, 5, p. 140 (Monghyr).
- 1910. *Engraulis telara* De, *Rep. Fish. East Bengal & Assam*, p. 19 (Eastern Bengal; Malda).

1911. *Telara telara* Fowler, *Proc. Acad. nat. Sci. Philad.*, p. 220, (Ganges river).
 1926. *Setipinna telara* Jordan & Seale, *Bull. Harv. Mus. Comp. Zool.*, 67, p. 365 (Rangoon).
 1941. *Setipinna phasa* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 688 (Rangoon; Ganges river).
 1941. *Setipinna telara* Herre, *Mem. Indian Mus.*, 13, p. 335.
 1949. *Setipinna phasa* Misra, *Rec. Indian Mus.*, 45, p. 399.
 1953. *Setipinna phasa* Misra, *Rec. Indian Mus.*, 50, p. 384.



TEXT-FIG. 28.—Lateral view of *Setipinna phasa* (Ham.) (After F. Day)

Vernacular names.—INDIA : *Phansa*, Bengali; *Bindi*, Bihar; *Tampara*, Oriya; Standardised name : *Phasa*. BURMA : *Nga pya*. *Nga tannet*, *Nga out pha*.

B. 12—13; D. 1+14—15; P. 15; V. 7; A. 70—80; C. 19; L. 1. 52. Predorsal scales 30.

Body elongate, compressed; abdomen keeled, serrated. Dorsal profile from head to dorsal fin more convex than ventral. Head 6.0—7.0, depth 4.5 in total length. Eyes with adipose lid, 3.5—4.5 in head, 0.7 in snout, 1.5 in interorbital. Upper jaw prominent. Cleft of mouth oblique; maxilla reaching gill opening. Teeth small, even. Single dorsal fin; origin much nearer to snout end than to caudal base and behind anal origin. Pectorals low, with the upper ray produced and reaching to more than a third of anal base. Pelvics small, 2.3 in head; origin nearer to anal origin than to pectoral base and much before dorsal origin. Anal very long, base 1.7 in standard length; origin before dorsal origin. Caudal forked, lower lobe longer, 4.4 in standard length. No lateral line. Abdominal scutes, preventral 15—16, postventral 6—7. Gill rakers 14—15+18, slender, pointed, 1.2 in eye.

Greenish grey above becoming silver shot with gold on sides and below; upper lobe of caudal and upper margin of dorsal stained black; pectorals deep blue black in adult.

It attains 406 mm. in length and ascends tidal rivers; littoral, euryhaline.

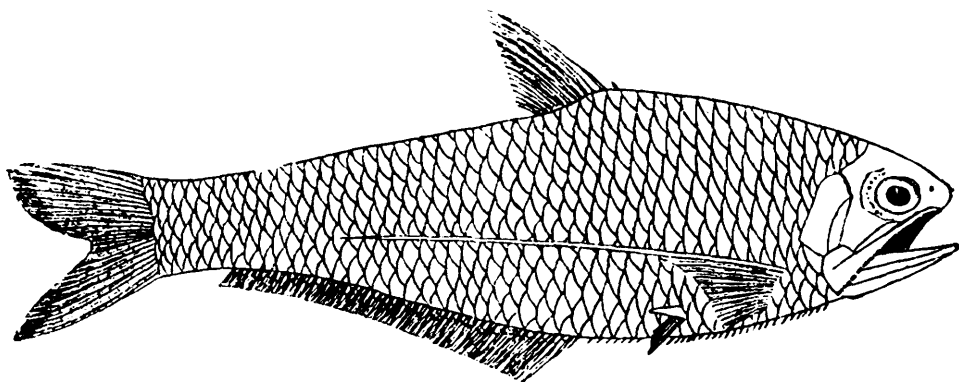
Distribution.—India, Bangladesh, Burma; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 16°—24°N, 85°—98°E. in the Bay of Bengal.

164. *Setipinna taty* (Valenciennes)

(Text-fig. 29)

- 1848. *Engraulis taty* Valenciennes, *Hist. nat. Poiss.*, 21, p. 60 (type locality : Pondicherry; Malacca).
- 1848. *Engraulis tenuifilis* Valenciennes, *Hist. nat. Poiss.*, 20, p. 62 (type locality : Rangoon).
- 1849. *Engraulis telaroides* Bleeker, *Verh. Bat. Gen.*, 22, p. 13 (type locality : Madura Straits).
- 1865. *Engraulis taty* Day, *Fish. Malabar*, p. 240 (Malabar).
- 1878. *Engraulis taty* Day, *Fish. India*, p. 628 pl. 158, fig. 5 (seas and estuaries of India and the Malay Archipelago; the example figured, life-size, was from Orissa).
- 1889. *Engraulis taty* Day, *Fauna Brit. India*, Fish., 1, p. 393.
- 1905. *Setipinna gilberti* Jordan & Starks, *Proc. U.S. nat. Mus.*, 28, p. 194, fig. 1 (type locality : Chemulpo, Korea).
- 1907. *Engraulis taty* Lloyd, *Rec. Indian Mus.*, 1, p. 221 (Akyab).
- 1913. *Setipinna taty* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 30 (Java, Madura, Borneo).
- 1917. *Engraulis taty* Hornell, *Madras Fish. Bull.*, 11, p. 91 (Tuticorin).
- 1926. *Setipinna taty* Jordan & Seale, *Bull. Harv. Mus. Comp. Zool.*, p. 366 (Siam; Java Colombo).
- 1936. *Setipinna taty* Suvatti, *Index Fish. Siam*, p. 17 (Gulf of Siam).
- 1938. *Setipinna taty* Fowler, *List Fish. Malaya*, p. 34 (Penang, Singapore).
- 1940. *Setipinna taty* Herre, *Rec. Indian Mus.*, 42, p. 10 (Mergui).
- 1941. *Setipinna taty* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 689.
- 1949. *Setipinna taty* Misra, *Rec. Indian Mus.*, 45, p. 399.
- 1953. *Setipinna taty* Misra, *Rec. Indian Mus.*, 50, p. 384.

1955. *Setipinna taty* Munro, *Mar. Freshwater Fish. Ceylon*, p. 31 (coastal waters).



TEXT-FIG. 29.—Lateral view of *Setipinna taty* (V.) (After F. Day)

Vernacular name.—INDIA : *Paikat*, MARATHI.

B. 11-12; D. 1+15—15; P. 13—14; V 7; A. 51—60; C.19; L. 1. 42—46; L. tr. 12; Predorsal scales 20—25.

Body oblong, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 5.5—6.5, depth 3.7—4.0 in total length. Eyes with adipose lid, 3.5—4.0 in head, 0.5—0.7 in snout, 1.5 in interorbital. Jaws subequal. Cleft of mouth oblique; maxilla truncated behind reaching beyond mandibular joint. Teeth small, even. Single dorsal fin; origin much nearer to snout end than to caudal base and before anal origin. Pectorals low, with upper ray produced and reaching beyond middle part of anal base. Pelvics small, 2.5 in head; origin nearer to pectoral base than to anal origin and before dorsal origin. Anal long, base 2.3 in standard length; origin behind dorsal origin. Caudal forked, 4.7 in standard length. No lateral line. Abdominal scutes, pre-ventral 20—23, post-ventral 10—12. Gill rakers 12—13+15—16 lanceolate, equal to eye.

Greenish grey above, silvery on sides and below; fins hyaline.

It attains 170 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Bangladesh, Burma, Sri Lanka.—Malaya, Indonesia, Thailand, Indo-China, Korea; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35°N.—7°S., 76°—130°E. in the Indo-Pacific=(5°—18°N., 76°—100°E. in the Indian Ocean+35°N.—7°S., 101°—130°E. in the Pacific Ocean).

70. Genus *Coilia* Gray

1831. *Coilia* Gray, *Zool. Miscell.*, p. 9 (type, *C. hamiltonii* Gray, monotypic).
 1843. *Choetomus* McClelland, *Calcutta J. nat. Hist.*, 4, p. 405 (type, *C. playfairii* McClelland, monotypic).
 1846. *Coilia* Scheegel, *Fauna Japon. Poiss.*, pts. 10—15, p. 243 (type, *Coilia hamiltonii* Gray).
 1849. *Leptonurus* Bleeker, *Verh. Bat. Gen.*, 22, p. 14 (type, *L. chrysostigma* Blkr.).
 1903. *Mystus* (nec Gronow, 1763, Klein, 1775, Scopoli, 1777) Lacépède, *Hist. nat. Poiss.*, 5, p. 406 (type, *M. clupeoides* Lac=*Clupea mystus* L., monotypic).
 1925. *Demicoilia* Jordan & Seale, *Copeia*, No. 141, p. 28 (type, *Coilia quadragesimalis* V., orthotypic).

Body elongate, compressed, tapering behind to a long slender tail. Scales moderate or small. Maxilla more or less extended, but not reaching gill-opening. Lower gill-rakers 20—30. Abdomen keeled and serrated. Dorsal origin more or less opposite to pelvic origin. Five to twelve pectoral rays filamentous and much produced. Anal single, very long, united with caudal. Adipose fin absent. Caudal pointed.

Distribution.—India, Pakistan, Sri Lanka, Burma, Malaya, Indonesia, Thailand, China, Japan, Korea.

Key to species of genus Coilia Gray*

1. Maxillary extending to head or to gill opening	3	
2. Maxillary not extending to head or gill opening	5	
3. 5-6 free pectoral filaments ; anal rays 105		<i>C. dussumieri</i>
4. 12-14 free pectoral filaments ; anal rays 82-87		<i>C. borneensis</i>
5. 12 free pectoral filaments		<i>C. reynaldi</i>
6. 6 free pectoral filaments	7	
7. Anal rays 95-110.		<i>C. ramcarati</i>
8. Anal rays 35—75	9	

*Besides these, the following species of *Coilia* are also reported from India : *C. neglecta* Whitehead, 1967 (vide Whitehead, 1967, *J. mar. biol. Ass. India*, 9 (1) p. 33) and *C. korua* Dutt & Seshagiri Rao, 1972 (vide Dutt & Seshagiri Rao, 1972, *J. Bombay nat. Hist. Soc.*, 69 (1), p. 136). ed.

9. Height of body $4\frac{3}{4}$ in total length ; anal rays 35—42 *C. quadragesimalis*
 10. Height of body $6\frac{1}{3}$ in total length ; anal rays 75 *C. cantoris*

165. *Coilia borneensis* Bleeker*

1851. *Coilia borneensis* Bleeker, *Nat. Tijd. Ned. Ind.*, 2, p. 58 (type locality : Bandjermassing).
 1878. *Coilia borneensis* Day, *Fish. India*, p. 632 pl. 159. fig. 1 (Madras Burma where it is common in the Irrawaddy river, also the Malay Archipelago).
 1889. *Coilia borneensis* Day, *Fauna Brit. India*, Fish., 1, p. 398.
 1890. *Coilia borneensis* Vinciguerra, *Ann. Mus., Civ. Stor. Nat. Genova*, (2) 9, p. 552 Rangoon).
 1913. *Coilia borneensis* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 52 (Sumatra, Borneo).
 1932. *Coilia borneensis* Chevey, *Inst. Oceanogr. Indo-Chine*, 19° note, p. 9 (Cochinchina; Cambodia).
 1936. *Coilia borneensis* Hardenberg, *Treubia*, 15, (3), p. 228 (Pon niti river, Borneo).
 1936. *Coilia borneensis* Suvatti, *Index Fish. Siam*, p. 16 (Siam) (Error in spelling)
 1941. *Coilia borneensis* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 717.
 1949. *Coilia borneensis* Misra, *Rec. Indian Mus.*, 45, p. 400.
 1953. *Coilia borneensis* Misra, *Rec. Indian Mus.*, 50, p. 384.

B. 9—10; D. 1 ± 13 —14; P.xii —xiv ± 6 ; V. 7; A. 82—87; L. 1. 58—60; L. tr. 10—11.

Body elongate, compressed, tapering towards tail; abdomen keeled, serrated. Dorsal profile convex upto dorsal base and ventral less convex upto anal origin. Head 5.5—7.0, depth 5.0—5.7 in total length. Eyes 3.5—4.0 in head, 0.5 in snout. Upper jaw projecting. Cleft of mouth slightly oblique, maxilla reaching gill opening. Teeth on jaws, vomer, palatines, pterygoids and tongue. Single dorsal fin; origin in the second fourth of total length. Pectorals low, with 12—14 free upper rays, produced and reaching beyond anal origin. Pelvics small, 2.0 in head; origin before dorsal origin, nearer to

*Junior synonym of *Coilia ramcarati* (Ham., 1822) (vide Whitehead et. al., 1966, *Zool. Verhandl. Leiden*, (84), p. 136). ed.

pectoral base than to anal origin. Anal very long, confluent with caudal; origin about an eye diameter behind last dorsal ray, base 1.6—1.7 in total length. Caudal equal to postorbital, pointed. No lateral line. Scales small, deciduous. Abdominal scutes, preventral 7, postventral 4, none of preventrals before pectorals. Lower gill rakers 26—28, equal to eye.

Golden green or yellowish green above; yellowish silvery below; fins yellowish.

It attains 140 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Burma.—Indonesia, Thailand, Indo-China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 16°N.—2°S., 80°—115°E. in the Indo-Pacific=(13°—16°N., 80°—96°E. in the Bay of Bengal+12°N.—2°S., 103°—115°E. in the Pacific Ocean).

166. *Coilia cantoris* Bleeker*

- 1853. *Coilia cantoris* Bleeker, *Verh. Bat. Gen.*, 25, pp. (74) 148 (type locality : River Hooghly at Calcutta).
- 1868. *Coilia cantoris* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 402 (River Hooghly).
- 1878. *Coilia cantoris* Day, *Fish. India*, p. 631 (Hooghly river).
- 1889. *Coilia cantoris* Day, *Fauna Brit. India*, Fish., 1, p. 396.
- 1941. *Coilia cantoris* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 715.
- 1949. *Coilia cantoris* Misra, *Rec. Indian Mus.*, 45, p. 400.
- 1953. *Coilia cantoris* Misra, *Rec. Indian Mus.*, 50, p. 384.

Vernacular names.—BURMA : *Nya Kyang wet*, Burmese.

B. 9; D. 1+13; P. vi+6; V. 7; A. 75; C. 10; L. 1.58.

Body elongate, compressed, tapering towards tail; abdomen keeled, serrated. Head 6.0, depth 6.3 in total length. Eyes 4.5 in head, 0.6 in snout. Upper jaw projecting. Cleft of mouth slightly oblique; maxilla not extending to gill opening. Teeth in jaws, vomer, palatines, pterygoids and tongue. Single dorsal fin; origin in the second fourth of total length. Pectorals low, with 6 free, short upper rays, not reaching anal origin.

*Conspecific with *Coilia ramcarati* (Ham., 1822) (vide Whitehead 1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, p. 152). ed.

Pelvics small, not half as long as head; origin before dorsal. Anal long, base over half total length. Caudal confluent with anal, pointed. No lateral line. Scales small, deciduous. Abdominal scutes, proventral 5, postventral 10.

Silvery without marks.

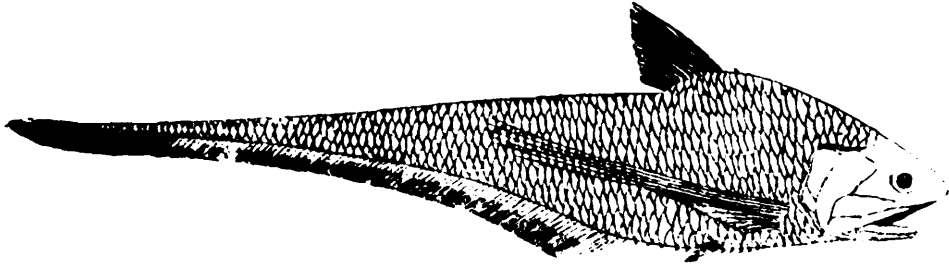
It attains 100 mm. in total length ; littoral, euryhaline.

Distribution.—India, in the mean annual isotherm of 20°C., Lat. 20°N., Long. 88°E. in Bay of Bengal.

167. *Coilia dussumieri* Valenciennes

(Text-fig. 30)

- 1848. *Coilia dussumieri* Valenciennes, *Hist. Nat. Poiss.*, **21**, p. 81, pl. 610 (type locality : Bombay, Mahe, Pondicherry).
- 1865. *Coilia dussumieri* Day, *Fish. Malabar*, p. 242 (Malabar).
- 1858. *Coilia quadrifilis* Günther, *Cat. Fish. Brit. Mus.*, **7**, p. 403 (type locality : Penang).
- 1878. *Coilia dussumieri* Day, *Fish. India*, p. 631, pl. 158, fig. 8 (numerous at Bombay, seas and estuaries of India to the Malay Archipelago; the example figured, life-size, was from Orissa).
- 1889. *Coilia dussumieri* Day, *Fauna Brit. India, Fish.*, **1**, p. 397 fig. 122.
- 1913. *Coilia dussumieri* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 50, fig. 20 (Java, Sumatra, Madura, Banka).
- 1917. *Coilia dussumieri* Kemp. *Rec. Indian Mus.*, **13**, p. 234, (Matla river.).
- 1924. *Coilia dussumieri* Hora, *Mem. Asiatic. Soc. Bengal*, **6**, p. 482, (Singapore).
- 1926. *Coilia dussumieri* Chabanaud, *Serv. Oceanogr. Peches Indo-Chine*, 1^o note, p. 8 (Cochin China).
- 1927. *Coilia dussumieri* Fowler, *J. Bombay nat. Hist. Soc.*, **32.**, p. 254 (Bombay).
- 1941. *Coilia dussumieri* Fowler, *Bull. U. S. nat. Mus.*, (100) **13**, p. 714 (Bombay).
- 1949. *Coilia dussumieri* Misra, *Rec. Indian Mus.*, **45**, p. 400.
- 1953. *Coilia dussumieri* Misra, *Rec. Indian Mus.*, **50**, p. 384.
- 1955. *Coilia dussumieri* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 18 (coasts of Sind and Makran).



TEXT-FIG.30.—Lateral view of *Coilia dussumieri* V. (After F. Day)

Vernacular names.—INDIA : *Mandeli*, Marathi; *Oorialli*, Oriya; Standardised name: *Mandeli*.

B.11; D. 1+13-14; P. v-vi+8-9; V. 7; A. 105; C. 12; L.1. 65-88; L. tr. 10-11; Predorsal scales 11-12.

Body elongate, compressed, tapering towards tail; abdomen keeled, serrated. Dorsal profile convex upto dorsal base and ventral less convex upto anal origin. Head 6.0—6.3, depth 5.1—5.3 in total length. Eyes. 4.0—4.5 in head, 0.7 in snout, 1.2 in interorbital. Upper jaw projecting. Cleft of mouth slightly oblique; maxilla reaching to gill opening. Teeth on jaws, vomer, palatines, pterygoids and tongue. A single dorsal fin; origin in the second fourth of total length. Pectorals low, with 5-6 free upper rays produced and reaching half way in total length. Pelvics small, 2.8 in head; origin opposite the 1st spine of dorsal. Anal long, base 1.7 total length, confluent with caudal; origin less than an eye diameter, behind last dorsal ray. Caudal pointed, 1.7 in head. No lateral line. Scales small, deciduous. Abdominal scutes, pre-ventral 5-6, postventral 6-8, none before pectorals. Lower gill rakers 23, lanceolate, slender.

Golden with 2 or 3 rows of round burnished golden spots along lower half of side.

It attains 178 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Pakistan.—Malaya, Penang, Singapore, Indonesia, Thailand, Indo-China; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range 25°N.-7°S., 62°-108°E. in the Indo-Pacific= (5°-25° N., 62°-100°E. in the Indian Ocean+12°N.-7°S., 103°-108°E. in the Pacific Ocean).

168. *Coilia quadragesimalis* Valenciennes

1848. *Coilia quadragesimalis* Valenciennes, *Hist. nat. Poiss.*, p. 83.
(type locality : Ganges).
1868. *Coilia quadragesimalis* Gunther, *Cat. Fish. Brit. Mus.*, 7, p. 404.
1878. *Coilia quadragesimalis* Day, *Fish. India*, p. 631 (Ganges river).
1889. *Coilia quadragesimalis* Day, *Fauna Brit. India, Fish.*, 1, p. 397.
1926. *Coilia margaritifera* Jordan & Seale, *Bull. Harv. Mus. Comp. Zool.*, 67, p. 363 (type locality : Colombo, Ceylon).
1941. *Coilia quadragesimalis* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 713.
1949. *Coilia quadragesimalis* Misra, *Rec. Indian Mus.*, 45, p. 400.
1953. *Coilia quadragesimalis* Misra, *Rec. Indian Mus.*, 50, p. 384.
1955. *Coilia quadragesimalis* Munro, *Mar. Freshwater Fish. Ceylon*, p. 30.

B. 10; D. 1+13-14; P. vi+6; V 7; A. 35-42; C. 25; L. 1. 35.

Body elongate, compressed, tapering towards tail; abdomen keeled, serrated. Head 4·7, depth 4·3—4·7 in total length. Eyes 2·4 in head, 0·8 in snout. Upper jaw projecting. Cleft of mouth slightly oblique; maxil a nearly or just reaching gill opening. Teeth on jaws; vomer, palatines, pterygoids and tongue. Single dorsal inserted at the posterior end of the first third of body or midway between snout end and caudal base; base 2·5 in head. Pectorals low, 1·5 in total length, with 66 free upper rays produced and reaching beyond pelvics. Pelvics, small, 2·6 in head; origin slightly before dorsal. Anal moderate, confluent with caudal; origin an eye diameter behind last dorsal ray or a little before middle of total length. Caudal pointed, longer than head. No lateral line. Scales moderate. Abdominal scutes, preentral 5, postventral 8, none before pectorals. Lower gill rakers 23.

Silvery spot with gold and having nacreous reflections; 2 longitudinal rows of pearl-coloured spots below median line; a third irregular row of lesser number of spots on sides; fine yellowish.

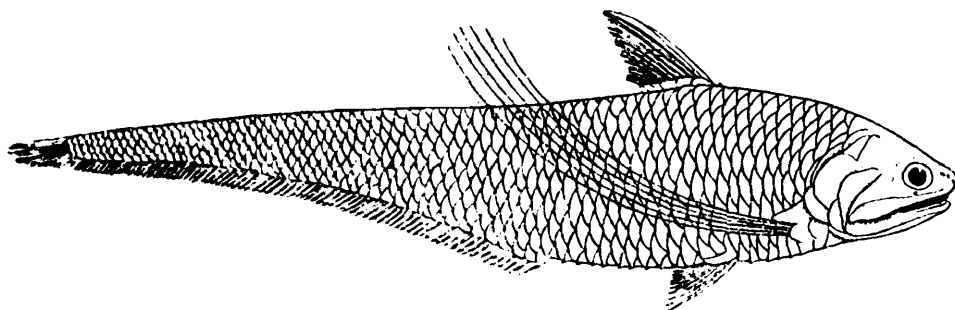
It attains 150 mm. in length; littoral, euryhaline.

Distribution.—India, Pakistan, Sri Lanka—in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 6°—21°N., 79°—89°E. in the Bay of Bengal.

169. *Coilia ramcarati* (Hamilton)

(Text-fig. 31)

1822. *Mystus ramcarati* Hamilton, *Fish. Ganges*, pp. 233, 282 (type locality : salt water estuaries of the Ganges; according to Günther the type in the British Museum).
 1830. *Engraulis (Coilia) hamiltonii* Gray, *Ill. Indian Zool. Hardwicke*, 1, pl. 10, fig. 3 (type locality : not given).
 1868. *Coilia ramcarati* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 402. (Ganges, Calcutta).
 1878. *Coilia ramcarati* Day, *Fish. India*, p. 631, pl. 159, fig. 2 (rivers and estuaries of Bengal).
 1889. *Coilia ramcarati* Day, *Fauna Brit. India*, Fish., 1, p. 396.
 1907. *Coilia ramcarati* Lloyd, *Rec. Indian Mus.*, 1, p. 221 (Akyab).
 1941. *Coilia ramcarati* Fowler, *Bull. U. S. nat. Mus.*, (100) 13, p. 718.
 1949. *Coilia ramcarati* Misra, *Rec. Indian Mus.*, 43, p. 401.
 1953. *Coilia ramcarati* Misra, *Rec. Indian Mus.*, 50, p. 384.



TEXT-FIG. 31.—Lateral view of *Coilia ramcarati* (Ham.) (After F. Day).

B. 11; D. 1+14; P. vi+6; V. 12; A. 95-110; L. 1. 70; L. tr. 9-10.

Body elongate, compressed, tapering towards tail; abdomen keeled, serrated. Head 6·0, depth 5·2-5—4 in total length. Eyes 4·3—5·0 in head, 0·7 in snout, 1·5 in interorbital. Upper jaw prominent. Cleft of mouth slightly oblique; maxilla reaching mandibular joint. Teeth on jaws, vomer, palatines, pterygoids and tongue. A single dorsal fin; origin in the posterior part of the first third of total length, about 1·6 times head length from snout end. Pectorals low, with 6 free upper rays produced and reaching beyond middle of total length. Pelvics moderate, 1·5 in head; origin before dorsal origin, much nearer to pectoral base than to anal origin. Anal long, base 1·9 in total length; origin nearly 3 eye diameters behind last dorsal ray. Caudal confluent with anal,

pointed, 2·1 in head. No lateral line. Scales small. Abdominal scutes, preventral 5, postventral 10—11. Lower gill rakers 28.

Golden with a darkish stain behind gill opening; last half of anal and whole of caudal blackish.

It attains about 457 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 20°—22°N., 88°—92°E. in the Bay of Bengal.

170. *Coilia reynaldi* Valenciennes

1848. *Coilia reynaldi* Valenciennes, *Hist. nat. Poiss.*, 21, p. 81 (type locality: Irrawadi river, Rangoon).

1866-72. *Coilia (Coilia) reynaldi* Bleeker, *Atl. Ich. Ind. Neerland.*, 6, 141, pl (8) 266, fig. 1 (Bengal).

1889. *Coilia reynaldi* Day, *Fauna Brit. India, Fish.*, 1, p. 396.

1938. *Coilia reynaldi* Fowler, *List Fish. Malaya*, p. 33 (Penang, Singapore).

1941. *Coilia reynaldi* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 718.

1949. *Coilia reynaldi* Misra, *Rec. Indian Mus.*, 45, p. 401.

1953. *Coilia reynaldi* Misra, *Rec. Indian Mus.*, 50, p. 384.

B. 9; D. 1+14; P. xii—xiii+5—6; V 6; A. 116; C. 10; L. 1 55; L. tr. 10—11.

Body elongate, compressed, tapering towards tail; abdomen keeled, serrated. Head 7·0, depth 6 in total length. Eyes 4 in head, 1·0 in snout, 1·5 in interorbital, very prominent. Cleft of mouth oblique; maxilla nearly reaching end of opercle. Teeth fine in both jaws, vomer, palatines, pterygoids and tongue. Single dorsal fin; origin in the first fourth of total length; Pectorals low, with 12 free, upper rays produced and reaching nearly to middle of body. Anal long; origin below or slightly behind last dorsal ray. Caudal united, anal pointed. No lateral line. Scales moderate. Abdominal scutes 12, sharp spines.

Silvery white with pinkish reflections.

It attains at least 100 mm. in length; littoral, euryhaline.

Distribution.—India, Burma.—Malaya, Singapore; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 1°—22°N., 88°—103°E. in the Indo-Pacific=(16°—22°N., 88°—100° E. in the Bay of Bengal +1°N.—103°E. in the Pacific Ocean).

71. Genus *Anchoviella* Fowler*

1789. *Menidia* Browne, *Nat. Hist. Jamaica*, ed. 2, p. 46 (type, *Menidia Corpare Pellucido, linea laterali latiori argentea*, inadmissible; Jordan & Evermann designated *Antherina browni* Gmelin as type in *Gen. Fish.*, pt. 1, p. 46, 1917).
1803. *Encrasicholus* (Commerson) Lacépède, *Hist. nat. Poiss.*, 5, pp. 382, 458 (type, "*Encrasicholus mandibula inferiore brevior*" etc., nonbinomial, inadmissible; Jordan & Evermann designated *Clupea vittargentea* Lac., as type in *Gen. Fish.*, pt. 1, p. 71, 1917).
1911. *Anchoviella* Fowler, *Proc. Acad. nat. Sci. Philad.*, p. 211 (type, *Engraulis perfasciatus* Poey, orthotypic).

Body elongate, scales moderate, deciduous. Maxilla almost reaching gill-opening. Snout overhanging large mouth. Abdomen somewhat keeled and serrated, with not more than 7 preventral scutes. Dorsal origin behind pelvic origin. Upper pectoral ray not produced. Anal single, short, behind dorsal fin. Adipose fin absent. Caudal forked. Branchiostegals 11—13. Gill rakers 17—50. Marked, silvery lateral band. Plankton and nekton feeders, living in large shoals.

Distribution.—Zanzibar, Red Sea, Arabia, S. Africa, Mauritius, India, Sri Lanka, Burma, Indonesia, Malaya, Thailand, Philippines, Formosa, China, Korea, Malanesia, Polynesia, Australia, and Hawaii.

Key to species of genus Anchoviella Fowler

1. Anal origin behind dorsal origin .. *A. heterolobus*
2. Anal origin below dorsal base .. 3
3. Abdominal scutes between pectorals and pelvics 6—8 *A. commersonii*
4. Abdominal scutes between pectorals and pelvics 4-5 . 5

*The generic name *Anchoviella* Fowler is erroneously used for these Indo-Pacific species of *Stolephorus* (vide Whitehead (1967, *Bull. Br. Mus. nat. Hist. (Zool.)*, Suppl. 2, p. 136). *ed.*

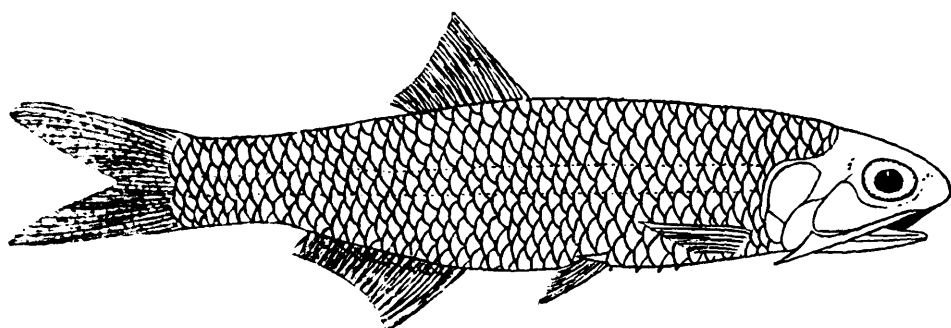
5. Maxillary reaching front border
of preopercle *A. indica*
6. Maxillary reaching gill-opening *A. tri*

171. *Anchoviella commersonii* (Lacépède)

(Pl. III, fig. 3; Text-fig. 32)

1803. *Stolephorus commersonii* Lacépède, *Hist. nat. Poiss.*, 5, pp. 381, 382, pl. 12, fig. 1 (type locality : not mentioned).
1808. *Engraulis commersonianus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 388 (Bengal).
1878. *Engraulis commersonianus* Day, *Fish. India*, p. 629, pl. 158, fig. 1 (seas of India to the Malay Archipelago).
1889. *Engraulis commersonianus* Day, *Fauna Brit. India*, Fish., 1, p. 394.
1912. *Engraulis commersonianus* Jenkins, *Rec. Indian Mus.*, 7, p. 60 (Puri).
1913. *Stolephorus commersonii* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 45, fig. 19 (Java, Madura, Bali, Sumatra, Bintang, Celebes, Ambon).
1915. *Stolephorus commersonii* Chaudhuri, *Mem. Indian Mus.*, 5, p. 426 (Chilka Lake).
1917. *Engraulis commersonianus* Hornell, *Madras Fish. Bull.*, 11, p. 93 (Tuticorin).
1922. *Stolephorus commersonii* Hora, *Mem. Indian Mus.*, 5, p. 764 (Chilka Lake).
1928. *Engraulis commersonii* Fowler, *J. Bombay nat. Hist. Soc.*, 32, p. 704 (Colombo).
1929. *Engraulis commersonianus* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 356 (Travancore).
1929. *Engraulis commersonianus* Wu, *Contr. Biol. Lab. Sci. Soc. China*, 5 (4), p. 21, fig. 16 (Amoy).
1938. *Anchoviella commersonii* Fowler, *List Fish. Malaya*, p. (Penang, Singapore).
1941. *Anchoviella commersonii* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 703.
1949. *Anchoviella commersonii* Misra, *Rec. Indian Mus.*, 45, p. 401.
1953. *Anchoviella commersonii* Misra, *Rec. Indian Mus.*, 50, p. 386.
1953. *Stolephorus commersoni* Herre, *Check List Philippine Fish.*, p. 78.
1953. *Anchoviella commersonii* Smith, *Sea Fish. South. Africa*, p. 94 (Durban).

1955. *Anchoviella commersonii* Munro, *Mar. Freshwater Fish. Ceylon*, p. 31.



TEXT-FIG. 32.—Lateral view of *Anchoviella commersonii* (Lac.) (After F. Day)

Vernacular names.—INDIA : *Kolla*, Kanarese; *Nethali netholi*, Malayalam; *Netholi. nethali*, Tamil; *Purasa*, Telegu; Standardised name : *Vella nethali*. SRI LANKA : *Halmassa*, Singhalese.

B. 11-13; D. 15-16; P. 14-15; V 7; A.20-21; C. 19; L. 1. 38-40; L. tr. 8-9;

Body elongate, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 5.0—5.2, depth 5.2—5.7 in total length. Eyes with adipose lid, 3.5 in head, 0.5 to 0.6 in snout, 1.0 in interorbital. Snout very prominent, overhanging mouth. Cleft of mouth slightly horizontal; maxilla extending to gill opening. Teeth fine in jaws, in narrow bands on vomer and palatines. A single dorsal fin; origin nearer to caudal base than to snout end and far behind pelvic origin. Pectorals low, 1.5 in head, not reaching pelvic base. Pelvics 2.2 in head; origin entirely before dorsal and nearer to anal origin than to pectoral base. Anal short; origin below middle of dorsal base, nearer to pelvic origin than to caudal base; base 1.1 in head, 5.8 in total length, Caudal deeply forked, equal to head. No lateral line. Scales moderate, deciduous. Abdominal scutes 6-8 between pectoral and pelvic bases, none before pectorals or behind pelvics. Lower gill rakers 19-26, 0.7 in eye, more than twice gill-filaments.

Silvery greenish or brownish above becoming lighter below; a silvery lateral band less than eye diameter in breadth from centre of gill opening to tail becoming wider behind; fine yellow with minute black dots.

It attains 203 mm. in length and is much esteemed for eating; littoral.

Distribution.—India, Sri Lanka.—Muscat, S. Africa, Indonesia, Thailand, Indo-China, Hongkong, Amoy, Philippines: in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 24°N.—29°S., 30°—123°E. in the Indo-Pacific=(24°N.—29°S. 30°—100°E. in the Indian Ocean+24°N.—7°S., 103°—123°E. in the Pacific Ocean).

172. *Anchoviella heterolobus* (Rüppell)*

1837. *Engraulis heterolobus* Rüppell, *Neue Wirbelth, Fische*, p. 79, pl. 21, fig. 4 (type locality : Red Sea).
1913. *Stolephorus heterolobus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 44 (Sumatra, Java, Ambon).
1924. *Stolephorus heterolobus* Hora, *Mem. As. Soc. Bengal*, 6, p. 14 (Singgora).
1929. *Anchoviella heteroloba* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 43 (Queensland).
1932. *Stolephorus heterolobus* Chevey, *Inst. Oceangr. Indo-Chine*, 19°note, p. 8 (Cochin-China, Annam).
1936. *Engraulis heterolobus* Herre, *Field Mus. Publ.*, 353, Zool. Ser. 21, p. 34 (Fiji, Solomons).
1939. *Stolephorus heterolobus* Herre, *Rec. Indian Mus.*, 41, p. 330 (Andamans).
1940. *Stolephorus heterolobus* Herre, *Rec. Indian Mus.*, 42, p. 1 (Ross Island).
1940. *Stolephorus heterolobus* Herre, *Rec. Indian Mus.*, 42, p. 10 (Mergui market).
1941. *Anchoviella heteroloba* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 698.
1941. *Stolephorus heterolobus* Herre, *Mem. Indian Mus.*, 13, p. 335.
1949. *Anchoviella heterolobus* Misra, *Rec. Indian Mus.*, 45, p. 402.
1953. *Anchoviella heterolobus* Misra, *Rec. Indian Mus.*, 50, p. 386.
1953. *Stolephorus heterolobus* Herre, *Check List Philippine Fish.*, p. 79 (Philippines).

Vernacular name.—INDIA : Standardised name : *Kasi Nethali*.

B. 12-13; D. 13-14; P. 13; V 7; A. 16-18; L.1. 35-36; L. tr. 8-9; Predorsal Scales 15.

*The genus *Anchoviella* Fowler is a junior synonym of *Stolephorus* Lacépède (vide Whitehead, 1973, *J. mar. biol. Ass. India*, 14(2), p. 118).

Body elongate, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 3.8-4.0, depth 5.0-6.0 in standard length. Eyes with adipose lid, 3.2-4.0 in head, greater than snout and interorbital. Snout very prominent, overhanging mouth. Cleft of mouth slightly horizontal; maxilla reaching hind border of preopercle. A single dorsal fin; origin nearer to caudal origin than to snout end, far behind pelvic origin. Pectorals low, as long as postorbit, not reaching pelvic base. Pelvics much longer than eye, 2.6-3.0 in head; origin midway between anal origin and pectoral base and much ahead of dorsal origin. Anal short; origin just behind last dorsal ray, 6.0 in total length. Caudal deeply forked, 5.0 in total length. No lateral line. Scales moderate, deciduous. Abdominal scutes 5 between pectorals and pelvics, none before pectorals or behind pelvics. Gill rakers 15+22, flattened, slender, 3.0 times gill filaments, a little shorter than eye.

Yellowish or pale brown with a silvery lateral band; sides of head bright silvery white; fins all pale.

It attains 90 mm. in length, littoral.

Distribution.—India, Burma.—Red Sea, Indonesia, Thailand, Indo-China, Philippines, Fiji, Solomon, Queensland; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 20°N.—17°S., 39°-180°E. in the Indo-Pacific=(20°N.—17°S., 39°—141°E. in the Indian Ocean+15°N.—7°S., 101°—180°E. in the Pacific Ocean).

173. *Anchoviella indica* (van Hasselt)

- 1823. *Engraulis indica* van Hasselt, *Algem. Konst. Letter-bode* 1 (23) p. 329 (type locality : Java).
- 1839. *Engraulis albus* Swainson, *Nat. Hist. Animal.*, 2, p. 293 (on *Nattoo* Russell, *Fish. Coromandel*, 2, p. 71, pl. 187, 1803, type locality : Vizagapatam).
- 1849. *Engraulis balinensis* Bleeker, *Verh. Bat. Gen.*, 22, p. 11 (type locality : Boleling, Bali).
- 1852. *Engraulis russellii* Bleeker, *Verh. Bat. Gen.*, 24, p. 38 (type locality : Batavia, Java).
- 1865. *Engraulis brownii* (nec. Gmelin) Day, *Fish. Malabar*, p. 237 (Malabar).
- 1878. *Engraulis indicus* Day, *Fish. India*, p. 629, pl. 158, fig. 3 (Seas of India to the Malay Archipelago).

1889. *Engraulis indica* Day, *Fauna Brit. India, Fish.*, 1, p. 394.
1913. *Stolephorus indicus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel*, 2, p. 46 (Java, Madura, Bali, Sumatra, Padang, Pedang, Singapore, Bintaug, Banka, Celebes, Ambon).
1915. *Stolephorus indicus* Chaudhuri, *Mem. Indian Mus.*, 5, p. 425 (Chilka Lake).
1916. *Engraulis indicus* Govindan, *Madras Fish. Bull.*, 11, p. 117.
1917. *Engraulis indicus* Hornell, *Madras Fish. Bull.*, 11, p. 93 (Tuticorin).
1922. *Stolephorus indicus* Hora, *Mem. Indian Mus.*, 5, p. 764 (Chilka Lake).
1926. *Stolephorus insularum* Jordan and Seale, *Bull. Harv. Mus. Comp. Zool.*, 67, p. 381 (Tahiti).
1929. *Engraulis indicus* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 356 (Travancore).
1931. *Anchovia indica* Chu, *Biol. Bull. St. John's Univ.*, p. 16 (Hong-kong).
1931. *Anchovia indica* Schmidt, *Trans. Pacific Comm. Acad. Sci.* 11, S. S. R., 2, p. (177 Kominato, Rin Kin.)
1932. *Stolephorus indicus* Chevey, *Inst. Oceanogr. Indo-Chine*, 19° note, p. 8 (Cambodia; Cochin China; Annam).
1933. *Stolephorus indicus nanus* Hardenberg, *Nat. Tijds. Ned. Ind.*, 93, p. 263 (type locality : not given).
1933. *Stolephorus indicus indicus* Hardenberg, *Nat. Tijds. Ned. Ind.* 93, p. 263.
1936. *Stolephorus indicus* Suvetti, *Index Fish. Siam*, p. 14 (Gulf of Siam).
1941. *Anchoviella indica* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 706.
1941. *Stolephorus indicus* Herre, *Mem. Indian Mus.*, 13, p. 335.
1949. *Anchoviella indica* Misra, *Rec. Indian Mus.*, 45, p. 402.
1953. *Anchoviella indica* Misra, *Rec. Indian Mus.*, 50, p. 386.
1953. *Stolephorus indicus* Herre, *Check List Philippine Fish.*, p. 80 (Philippines).
1953. *Anchoviella indica* Smith, *Sea Fish. South. Africa*, p. 94 (Natal).
1955. *Anchoviella indica* Munro, *Mar. Freshwater Fish. Ceylon*, p. 31 (coastal waters).

Vernacular names.—INDIA : Zoo-roo-cart-dah, Andamanese; Co-netholi, Malayalam; Netholi, Tamil; Nettellee, Natto. SRI LANKA : Hal-massa, Singhalese.

B. 11-13; D. 16; P. 14-16; V. 7; A. 19-21; C. 19; L. 1. 37-40; L. tr. 8-9; Predorsal scales 20-22.

Body elongate, compressed; abdomen keeled, serrated; dorsal and ventral profiles equally convex. Head 4.6-5.0, depth 6.0-6.5 in total length. Eyes with adipose lid, 3.5 in head, 0.6-0.7 in snout, 1.0 in interorbital. Snout very prominent, overhanging mouth. Cleft of mouth slightly horizontal; maxilla reaching opposite mandibular joint or hind preopercular edge. A single dorsal fin; origin nearer to caudal origin than to snout end and far behind pelvic origin. Pectorals low, not reaching pelvics, 1.5 in head. Pelvics 2.2 in head; origin nearer to anal origin than to pectoral base and much before dorsal origin. Anal short; origin below middle of dorsal base, nearer to pelvic origin than to caudal origin; its base 1.1 in head, 5.8 in total length. Caudal deeply forked, 1.2 in head. No lateral line. Scales moderate, deciduous. Abdominal scutes 4-5; between pelvics and pectorals, none before pectorals or behind pelvics. Gill rakers 20+21-22, slender, lanceolate, more or less equal to gill filaments.

Silvery dashed with green along back, and sometimes a few dark spots behind the occiput; a brilliant silvery lateral band from upper edges of eye to middle of caudal fin.

It attains 145 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Pakistan, Sri Lanka.—Zanzibar, S. Africa, Malaya, Indonesia, Thailand, Indo-China, Annam, Hongkong, Formosa, Japan, Pelew Is., Samoa, Tahiti, in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 2°N.—20°S., 30°E.—149°W. in the Indo-Pacific=(25°N.—29°S., 30°—100°E. in the Indian Ocean+26°N.—18°S., 101°E.—149°W. in the Pacific Ocean).

174. *Anchoviella tri* (Bleeker)

1852. *Engraulis tri* Bleeker, *Verh. Bat. Gen. (Haring)*, 24, p. 40 (type locality : Batavia).
 1878. *Engraulis tri* Day, *Fish. India*, p. 630, pl. 158, fig. 6.
 1889. *Engraulis tri* Day, *Fauna Brit. India*, Fish., 1, p. 395 (from Bombay through the seas and estuaries of India to the Malay Archipelago. This fish ascends the Hooghly as high as Calcutta).

1913. *Stolephorus tri* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 47.
1926. *Stolephorus rex* Jordan & Seale, *Bull. Harv. Mus. Comp. Zool.*, 67, p. 380 (type locality : Canara, India).
1927. *Engraulis tri* Fowler, *J. Bombay nat. Hist. Soc.*, 32, p. 254 (Bombay).
1931. *Stolephorus tri* Chu, *Biol. Bull. St. John's Univ.*, p. 16 (Amoy).
1932. *Stolephorus tri* Chevey, *Inst. Oceanogr. Indo-China*, 19° note, p. 9 (Cochin China; Combodia).
1935. *Stolephorus tri* Herre, *Mid. Pacific Mag.*, 10, (2), p. 163 (Pelew Is.).
1941. *Anchoviella tri* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 709.
1949. *Anchoviella tri* Misra, *Rec. Indian Mus.*, 45, p. 402.
1953. *Anchoviella tri* Misra, *Rec. Indian Mus.*, 50, p. 386.
1953. *Stolephorus tri* Herre, *Check List Philippine Fish.*, p. 81 (Philippines).

Vernacular name.— INDIA : Standardised name : *Tri nethali*.

B. 11; D. 1+14-15; P.12-13; V. 7; A. 20-23; C. 17; L. 1. 32-35; L. tr. 8-9; Predorsal scales 18-19.

Body oblong, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 5.0-5.5, depth 5.0-5.2 in total length. Eyes with adipose lid, 3.0-3.6 in head, 0.5-0.7 in snout, 1.0 in interorbital. Snout very prominent, overhanging mouth. Cleft of mouth slightly horizontal; maxilla just reaching gill opening. A single dorsal fin; origin nearer to caudal origin than to snout end, far behind pelvic origin. Pectorals low, 1.7 in head, not reaching pelvic origin. Pelvics small, 2.6 in head; origin nearer to pectoral base than to anal origin, much before dorsal origin. Anal short, equal to head, 5.5 in total length; origin under middle of dorsal base. Caudal deeply forked, 1.1 in head. No lateral line. Scales deciduous. Abdominal scutes 4-5 between pectorals and pelvics, none before pectorals or behind pelvics. Gill rakers 15 + 21-25, short, lanceolate, 2.0 times gill filaments, 1.0 in eye.

Silvery grey above becoming lighter and shot with purple on sides and below; a silvery lateral band from shoulder opposite eye to base of caudal; a dark spot behind occiput.

It attains 120 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Pakistan.—Malaya, Indonesia, Indo-China, Amoy, Philippines, Pelew Is., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 62°—135°E. in the Indo-Pacific = (20°N.—25°S., 62°—101°E., in the Indian Ocean + 24°N.—7°S., 103°—135°E. in the Pacific Ocean).

72. Genus *Thrissocles* Jordan and Evermann*

1817. *Thrissa* (nec Rafinesque, 1815), Cuvier, *Regne Animal*, 2, ed 1, p. 176 (type, *Clupea setirostris* Brouss., logotypic; inadmissible being preoccupied by *Thrissa* Rafinesque, a genus of Clupeidae).
1829. *Thryssa* Cuvier, *Regne Animal*, 2, ed. 2, p. 323 (type, *Clupea setirostris* Brouss.).
1838. *Thryssus* Swainson, *Nat. Hist. Animal*, 1, pp. 279, 280 (type, *Clupea setirostris* Brouss.).
1839. *Trichosoma* (nec Rudolphi, 1819), Swainson, *Nat. Hist. Animal*, 2, p. 292 (type, *Thrissa hamiltonii* Gray, monotypic).
1917. *Thrissocles* Jordan & Evermann, *Gen. Fish.*, p. 98 (type, *Clupea setirostris* Brouss., orthotypic).
1925. *Scutengraulis* Jordan & Seale, *Copeia*, No. 141, p. 30 (type, *Thrissa hamiltonii* Gray, orthotypic).
1925. *Thrissina* Jordan & Seale, *Copeia*, No. 141, p. 30 (type, *Clupea baelama* Forsk., orthotypic).

Body elongate, compressed, scales moderate, deciduous. Teeth in jaws minute, uniform. Maxilla moderate, produced or extended. Branchiostegals 11—13. Abdomen keeled and serrated. A tiny spine before dorsal. Pectorals reach pelvics; upper ray of pectoral not produced. Dorsal origin behind pelvic origin. Anal single, moderate, behind dorsal origin. Adipose fin absent. Caudal forked. A marked silvery band present or absent. Plankton feeders.

Distribution.—Red Sea, Arabia, Zanzibar, East and S. Africa, Madagascar, Mauritius, Seychelles, India, Pakistan, Sri Lanka, Burma, Singapore, Malaya, Thailand, Indonesia, Indo-China, China, Korea, Japan, New Guinea, Melanesia, Micronesia, Polynesia, Queensland, Philippines, Australia.

Key to the species of genus *Thrissocles* Jordan & Evermann

1. Keeled scutes on abdominal edge begin before pectoral base	3
2. Keeled scutes on abdominal edge begin behind pectoral base	<i>T. baelama</i>

*This genus is now considered a junior synonym of *Thryssa* Cuvier (vide Whitehead, 1973, *J. mar. biol. Ass. India*, 14 (1), p. 228).

3. Maxillary much produced, reaching pelvic base or beyond .. 5
4. Maxillary not much produced, not reaching pelvic base or beyond 7
5. Pelvic origin nearer to pectoral base than to anal origin ; anal base 4 in total length ; lower gill rakers 16-20 .. *T. dussumieri*
6. Pelvic origin midway between pectoral base and anal origin ; anal base 3·6 in total length ; lower gill rakers 12 *T. setirostris*
7. Maxillary reaching pectoral base or beyond 9
8. Maxillary not reaching pectoral base or beyond 15
9. Anal base 4·1—4·8 in total length ; dorsal origin nearer to caudal origin than to snout end 11
10. Anal base 3·0—3·3 in total length : dorsal origin nearer to snout end than to caudal origin 13
11. Maxillary reaching beyond pectoral base ; abdominal scutes 23 *T. valenciennesi*
12. Maxillary reaching pectoral base ; abdominal scutes 25-27 *T. mystax*
13. Lower gill rakers 16-17 ; predorsal scales 20—22 ; dorsal profile convex *T. purava*
14. Lower gill rakers 11 ; predorsal scales 25 ; dorsal profile nearly straight *T. annandalei*
15. Abdominal scutes 22-23 17
16. Abdominal scutes 26—29 21
17. Anal base 3·0 in total length *T. rambhae*
18. Anal base 3·5—3·8 in total length 19
19. Lower gill rakers 27 ; pelvic origin midway between pectoral base and anal origin ; scales in lateral series 35—38 *T. kammalensis*
20. Lower gill rakers 10 ; pelvic origin nearer to pectoral base than to anal origin ; scales in lateral series 45 *T. kempfi*

21. Pelvic origin midway between pectoral base and anal origin ; scales in lateral series 39-40 ; lower gill rakers 21—25 *T. malabaricus*
22. Pelvic origin nearer to pectoral base than to anal origin ; scales in lateral series 44—47 ; lower gill rakers 12—16 *T. hamiltonii*

175. ***Thrissocles annandalei* (Chaudhuri)***
(Pl. II)

1915. *Engraulis annandalei* Chaudhuri, *Mem. Indian Mus.*, 5, p. 419, fig. 3 (type locality: dredged in shallow water off Nalbano Island, Chilka Lake: type is in the Zoological Survey of India).

1949. *Thrissocles annandalei* Misra, *Rec. Indian Mus.*, 45, p. 403

1953. *Thrissocles annandalei* Misra, *Rec. Indian Mus.*, 50, p. 386.

D. 1+12; P. 14; V. 8; C. 19; A. 45; L. 1. 50; L. tr. 13;
Predorsal scales 25.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile convex, dorsal profile almost straight. Head 5·8, depth 4·3 in total length (4·8 and 3·6 in standard length). Eyes 5·0 in head, 0·5 in snout. Snout prominent. Cleft of mouth oblique; maxilla extending to pectoral base. A single dorsal fin; origin nearer to snout end than to caudal origin, and far behind pelvic origin. Pectorals low, not reaching pelvic base, 1·1 in head. Pelvics small, 2·5 in head; origin nearer to pectoral base than to anal origin, and much before dorsal. Anal long; origin slightly behind middle of dorsal base, nearer to pelvic base than to caudal origin; its base 3·0 in total length, 2·6 in standard length. Caudal deeply forked, nearly equal to head. No lateral line. Scales thin but not so deciduous. Abdominal scutes, preventral 15, postventral 10.

Silvery grey above becoming lighter on sides and below; fins hyaline.

It attains 140 mm. in length and ascends estuaries; littoral, euryhaline.

Distribution.—India, in the mean annual isotherm of 20°C. in lat. 19°N., long. 85°E. in the Bay of Bengal.

*Now considered, with a query, conspecific with *Thryssa purava* (Hamilton) (*vide* Whitehead, 1973, *J. biol. mar. Ass. India*, 14(1), p. 231).

176. *Thrissocles baelama* (Forskål)^o*

1775. *Clupea baelama* Forskål, *Descript. Animal.*, p. 72 (type locality: Djedda, Red Sea).
1852. *Engraulis encrasicholoides* Bleeker, *Verh. Bat. Gen. (Haring.)*, 24, p. 37 (type locality: Batavia Java).
1870. *Engraulis baelama* Day, *Proc. zool. Soc. Lond.*, p. 700 (Andamans).
1878. *Engraulis baelama* Day, *Fish. India*, p. 626, pl. 158, fig. 7 (the example figured, life-size, was from Port Blair, Andaman Islands).
1882. *Engraulis encrasicholoides* Macleay, *Proc. Linn. Soc. New South Wales*, 7, p. 593 (New Guinea).
1889. *Engraulis baelama* Day, *Fauna Brit. India*, Fish., 1, p. 391 (From the Red Sea and Coast of Zanzibar, through the seas of India to the Andamans, also recorded by Gunther from Mysol and Manado).
1906. *Anchovia evermanni* Jordan and Seale, *Bull. Bur. Fishr.*, 25, p. 188, fig. 4 (type locality: Apia, Samoa).
1913. *Engraulis baelama* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 33 (Java, Sumatra, Madura, Bali, Celebes, Timor, Ambon, Ceram, Banda, Aru Is., Misol, New Guinea).
1933. *Anchoviella baelama* Deraniyagala, *Ceylon J. Sci. (C)*, 5, p. 81 (Ceylon).
1940. *Thrissina baelama* Herre, *Rec. Indian Mus.*, 42, p. 1 (Andamans).
1941. *Thrissocles baelama* Fowler, *Bull. U.S. Nat. Mus.*, (100) 13, p. 683.
1941. *Thrissina baelama* Herre, *Mem. Indian Mus.*, 13, p. 335.
1944. *Thrissocles baelama* Misra, *Rec. Indian Mus.*, 45, p. 403.
1953. *Thrissocles baelama* Misra, *Rec. Indian Mus.*, 50, p. 403.
1953. *Thrissocles baelama* Misra, *Rec. Indian Mus.*, 50, p. 387.
1953. *Thrissina baelama* Munro, *Mar. Freshwater Fish. Ceylon*, p. 31 (coastal waters).

Vernacular names.—SRI LANKA : *Bilee lagga*, *Hal massa*, Singhalese, *Netholi*, Tamil.

B. 11-13; D. 1+14-15; P. 13-16; V.7; A. 27-31; C. 20; L.1. 38-41; L. tr. 8-9; Predorsal scales 16-20.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more or less straight, dorsal slightly convex. Head 4.5-4.6, depth 5.0-5.2 in total length. Eyes with adipose lid, 4.0 in head, 0.8-1.0 in snout, 1.0 in interorbital.

*Now treated under the genus *Thrissina* Jordan & Seale (*vide* Whitehead, 1973, *J. mar. biol. Ass. India*, 14 (1), p. 227).

Snout prominent overhanging mouth. Cleft of mouth slightly oblique; maxilla extending a little beyond mandibular joint. Teeth minute on vomer, palatines and pterygoids. A single dorsal fin; origin nearer to snout end than to caudal origin and an eye diameter behind pelvic origin. Pectorals low, 1.8 in head, hardly reaching pelvic origin. Pelvics 2.1 in head, nearer to pectoral base than to anal origin and an eye diameter before dorsal. Anal moderate, base nearly equal to twice dorsal base; nearer to pelvic origin than to caudal origin and about an eye diameter behind last dorsal ray. Caudal deeply forked, slightly less than head. No lateral line. Scales regularly arranged, not easily deciduous. Abdominal scutes beginning behind pectoral base, preventral 4-6, postventral 8-10. Gill rakers 15-20+19-22.

Bluish above, silvery on sides and below; head glossed with gold; fins hyaline; caudal dark edged.

It attains 140 mm. in length; littoral.

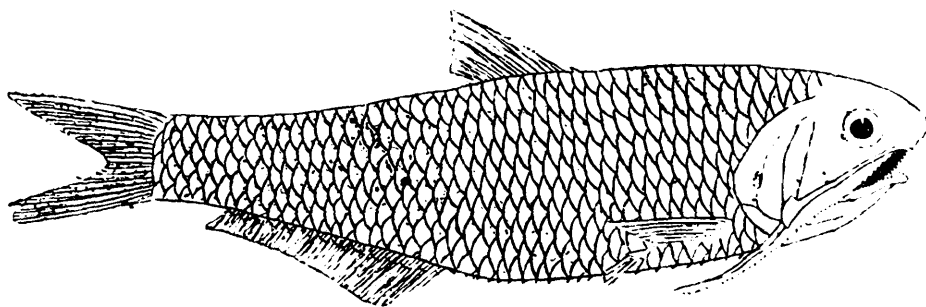
Distribution—India, Pakistan, Sri Lanka.—Red Sea, Zanzibar, Mauritius, Seychelles, Malaya, Indonesia, Thailand, Indo-China, Guam, Samoa, Polynesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.-20°S., 39°E.-170°W. in the Indo-Pacific=(25°N.-20°S., 39°-100°E. in the Indian Ocean+15°N.-12° S., 101°E.-170°W in the Pacific Ocean).

177. *Thrissocles dussumieri* (Valenciennes)

(Pl. III, fig. 1; Text-fig. 33)

- 1848. *Engraulis dussumieri* Valenciennes, *Hist. nat. Poiss.*, 21, p. 69 (type locality: not given).
- 1865. *Engraulis auratus* Day, *Proc. zool. Soc. Lond.*, p. 312 (type locality: Cochin, Malabar).
- 1865. *Engraulis auratus* Day, *Fish. Malabar*, p. 238, pl. 19, fig. 2 (Malabar).
- 1878. *Engraulis dussumieri* Day, *Fish. India*, p. 627, pl. 158, fig. 4 (the example figured, life-size, was from Madras).
- 1879. *Trichosoma adela* Rutter, *Proc. Acad. nat. Sci. Philadelphia*, p. 65 (type locality: Swatow, China).
- 1889. *Engraulis dussumieri* Day, *Fauna Brit. India*, Fish., 1, p. 391 (seas of India to the Malay Archipelago).
- 1913. *Engraulis dussumieri* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 41 (Java, Borneo, Singapore).
- 1914. *Engraulis dussumieri* Seale, *Philippine J. Sci.*, 9, p. 59 (Philippines).

1917. *Engraulis dussumieri* Hornell, *Madras Fish. Bull.*, **11**, p. 91 (Tuticorin).
 1924. *Engraulis dussumieri* Fowler, *J. Bombay nat. Hist. Soc.*, **30**, p. 40 (Calicut).
 1927. *Engraulis dussumieri* Fowler, *J. Bombay nat. Hist. Soc.*, **32**, p. 253 (Bombay).
 1929. *Engraulis dussumieri* Pillay, *J. Bombay nat. Hist. Soc.*, **33**, p. 356 (Travancore).
 1932. *Engraulis dussumieri* Chevey, *Inst. Oceanogr. Indo-China*, 19° note, p. 9 (Indo-China).
 1936. *Engraulis dussumieri* Suvatti, *Index Fish. Siam*, p. 14 (Gulf of Siam).
 1938. *Thrissocles dussumieri* Fowler., *List Fish. Malaya*, p. 34 (Singapore).
 1939. *Engraulis dussumieri* Hora & Mukerji, *Rec. Indian Mus.*, **38**, p. 18 (Maungmagan, Burma).
 1941. *Thrissocles dussumieri* Fowler, *Bull. U.S. nat. Mus.*, (100) **13**, p. 681 (Calicut; Bombay).
 1949. *Thrissocles dussumieri* Misra, *Rec. Indian. Mus.*, **45**, p. 403.
 1953. *Thrissocles dussumieri* Misra, *Rec. Indian Mus.*, **50**, p. 387.
 1953. *Thrissocles dussumieri* Herre, *Check List Philippine Fish*, p. 74 (Philippines).
 1955. *Thrissocles dussumieri* Munro, *Mar. Freshwater Fish. Ceylon*, p. 33 (coastal waters).



TEXT-FIG. 33.—Lateral view of *Thrissocles dussumieri* (V.) (After F. Day)

Vernacular names.—INDIA : *Neela manangu*, Kanarese; *Nadu manangu*, Malayalam; *Kela*, Tamil. Standardised name : *Neela managu*.

B. 12-13; D.1+13-15; P.11-12; V.7; A.34-38; C. 17; L.1. 40-42; L. tr. 9-10; Predorsal scales 16-17.

Body oblong, compressed; abdomen keeled, serrated. Ventral and dorsal profiles more or less equally convex.

Head 4.4—4.6, depth 4.2—4.5 in total length. Eyes 3.7—4.5 in head, 0.6 in snout, 1.0–1.2 in interorbital. Snout very prominent, over-hanging mouth. Cleft of mouth oblique; maxilla extending up to pelvic origin. Small teeth on jaws, vomer, palatines, pterygoids and tongue. A single dorsal fin; origin nearer to snout end than to caudal origin, and about 1.5 eye diameters behind pelvic origin. Pectorals low, 1.3 in head, reaching a little beyond pelvic origin. Pelvics small, 3.8 in head; origin much nearer to pectoral base than to anal origin, and 1.5 eye diameters before dorsal. Anal moderate, base 4 in total length, 1.1 times head length, nearer to pelvic origin than to caudal origin, and about 1/3 eye diameter, behind last dorsal ray. Caudal deeply forked, 1.1 in head, the lower lobe slightly longer. No lateral line. Scales thin, deciduous. Abdominal scutes, preventral 15–16, postventral 7–8. Gill rakers 16—17+16—20, equal to gill filaments, a little shorter than eye.

Coppery above becoming silvery below; a large black humeral spot; fine hyaline; caudal dark edged.

It attains 140 mm. in length; littoral.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Malaya, Indonesia, Thailand, Indo-China, Hongkong, Philippines; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—7°S., 62°—123°E. in the Indo-Pacific=(5°—25°N., 62°—100°E. in the Indian Ocean +24°N.—7°S., 101°—123°E. in the Pacific Ocean).

178. *Thrissocles hamiltonii* (Gray)

1833. *Thrissa hamiltonii* Gray, *Ill. Ind. Zool. Hardwicke*, 2, pl. 92, fig. 3 (type locality : India).
 1839. *Thryssa subspinosa* Swainson, *Nat. Hist. Animal.*, 2, p. 293 (on *Poorawah* Russell, 1803, *Fish. Coromandel*, 2, p. 72, p. 189; type locality: Vizagapatam).
 1848. *Engraulis hamiltonii*, Valenciennes, *Hist. nat. Poiss.*, 21, p. 66 (Pondicherry).
 1865. *Engraulis hamiltonii* Day, *Fish. Malabar*, p. 239 (Malabar).
 1878. *Engraulis hamiltonii* Day, *Fish. India*, p. 625, pl. 157, fig. 4 (Sind through the seas of India to the Malay Archipelago).
 1889. *Engraulis hamiltonii* Day, *Fauna Brit. India, Fish.*, 1, p. 389.

1890. *Engraulis hamiltonii* Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova*, (2) 9, p. 350 (Rangoon).
1913. *Trichosoma hamiltoni* Jordan and Metz, *Mem. Carnegie Mus.*, 6, No. 1, p. 8 (Fusan).
1913. *Engraulis grayi* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 37 (Java, Sumatra, Singapore, Borneo, Celebes, Ceram).
1926. *Scutengraulis hamiltoni* Jordan & Seale, *Bull. Harv. Mus. Comp. Zool.*, 67, p. 371 (Calcutta; Penang; Colombo).
1928. *Engraulis hamiltonii* Fowler, *J. Bombay nat. Hist. Soc.*, 33, p. 104 (Bombay).
1929. *Scutengraulis hamiltoni* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 43 (N. Australia, Queensland).
1932. *Engraulis grayi* Chevey, *Inst. Oceanogr. Indo-China*, 19° note, p. 9 (Cochin-China).
1933. *Anchoviella hamiltoni* Deraniyagala, *Ceylon. J. Sci. (C)*, 5, p. 81.
1936. *Engraulis grayi* Suvatti, *Index Fish. Siam*, p. 15 (Siam).
1941. *Thrissocles hamiltonii* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 673 (Bombay).
1949. *Thrissocles hamiltonii* Misra, *Rec. Indian Mus.*, 45, p. 403.
1953. *Thrissocles hamiltonii* Misra, *Rec. Indian Mus.*, 50, p. 387.
1953. *Scutengraulis hamiltoni* Herre, *Check List Philippine Fish.*, p. 76 (Philippines).
1955. *Engraulis hamiltonii* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 16 (Coasts of Sind & Makran).
1955. *Thrissocles hamiltonii* Munro, *Mar. Freshwater Fish. Ceylon*, p. 32 (coastal waters).

Vernacular names.—INDIA: *Badarkati*, Marathi, *Poorawah*, Telegu. PAKISTAN : *Koor*.

B. 12-13; D. 1+14-15; P. 12-13; V.7; A. 36-41; C. 19; L.I. 44-47; L. tr. 11-13; Predorsal scales 18-22.

Body oblong, compressed; abdomen keeled, serrated. Dorsal profile convex, ventral more or less horizontal up to anal. Head 5.2-5.5, depth 4.2 in total length. Eyes with adipose lid, 3.5-4.2 in head, 0.7 in snout, 1.0 in interorbital. Upper jaw prominent. Cleft of mouth oblique; maxilla extending beyond gill opening. Teeth small, uniserial in jaws, smaller and in narrow band on palatines, none on vomer. A single dorsal fin; origin nearer to snout end than to caudal origin and 2 eye diameters

behind pelvic origin, or equidistant between them. Pectorals low, equal to head, or slightly shorter, reaching beyond pelvic origin. Pelvics small, 3.0 in head; origin nearer to pectoral base than to anal origin, 2 eye diameters before dorsal origin. Anal moderate, base 3.8 in total length, nearer to pelvic origin than to caudal origin; origin below or an eye diameter behind last dorsal ray. Caudal deeply forked, equal to head. No lateral line. Scales moderate, deciduous. Abdominal scutes, preventral 16-18, post-ventral 10-11. Gill rakers 9—11+12—16, 1.3 in eye.

Bronze along the back, silvery on sides and below; black venules on shoulder behind upper half of opercle fins yellow, dorsal edged black.

It attains 225 mm. in length and ascends tidal rivers; littoral, euryhaline.

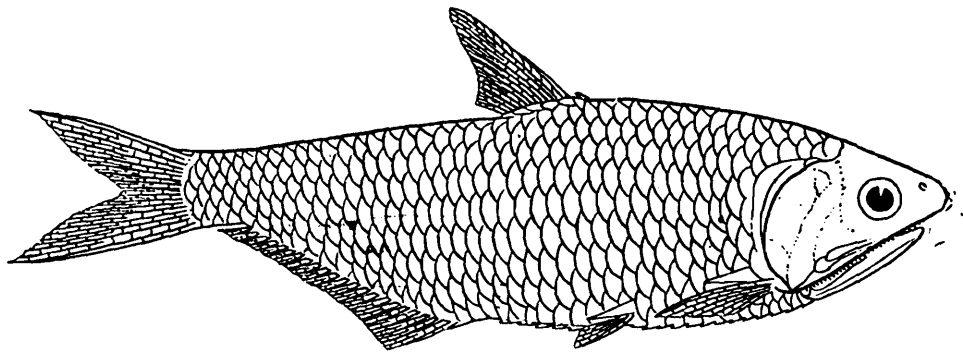
Distribution.—India, Pakistan, Burma, Sri Lanka.—Malaya Singapore, Indonesia, Thailand, Indo-China, Korea, Philippines, Queensland; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35°—18°S., 62°—140°E., in the Indo-Pacific=(25°N.-18°S., 62°—140°E. in the Indian Ocean+35°N.—7°S., 101°—127°E. in the Pacific Ocean).

179. *Thrissocles kammalensis* (Bleeker.)

(Text-fig. 34)

- 1849. *Engraulis kammalensis* Bleeker, *Verh. Nat. Gen. (Madura)*, 22, p. 18 (type locality : Madura Straits near Kammal and Surabaja).
- 1852. *Engraulis rhinorhynchus* Bleeker, *Verh. Bat. Gen. (Haring.)*, 24, p. 40 (type locality: Batavia).
- 1869. *Engraulis rhinorhynchus* Day, *Proc. zool. Soc. Lond.*, p. 384 (Chandipore).
- 1878. *Engraulis kammalensis* Day, *Fish. India*, p. 626, pl. 157, fig. 1 (the example figured, life size, was from Orissa).
- 1889. *Engraulis kammalensis* Day, *Fauna Brit. India, Fish.*, 1, p. 390 (Ceylon, Bay of Bengal to the Malay Archipelago).
- 1913. *Engraulis kammalensis* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 35 (Java, Madura, Bali, Banka, Sumatra, Singapore, Borneo, Celebes).
- 1929. *Engraulis kammalensis* Wu, *Contr. Biol. Lab. Sci. Soc. China*, 5, No. 4, p. 20, fig. 15 (Amoy).

1936. *Engraulis kammalensis* Suvatti, *Index, Fish. Siam*, p. 15 (Gulf of Siam).
 1937. *Scutengraulis kammalensis* Herre & Meyers, *Raffles Mus. Bull.*, 13, p. 13 (Johore).
 1941. *Thrissocles kammalensis* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 672.
 1949. *Thrissocles kammalensis* Misra, *Rec. Indian Mus.*, 45, p. 404.
 1953. *Thrissocles kammalensis* Misra, *Rec. Indian Mus.*, 50, p. 387.
 1955. *Thrissocles kammalensis* Munro, *Mar. Freshwater Fish. Ceylon*, p. 32 (coastal waters).



TEXT-FIG. 34.—Lateral view of *Thrissocles kammalensis* (Blkr.)
 (After F. Day)

Vernacular name.—SRI LANKA : *Pothu lagga*, Sinhalese.

B. 10-11; D. 1+13-14; P. 11-12; V 7; A. 32-35; L. I. 35-38; L. tr. 9-10.

Body oblong, compressed; abdomen keeled, serrated. Ventral profile more convex than dorsal. Head with a median keel, 4.5-5.0, depth 4.0-4.4 in total length (3.7-4.0 and 3.2--3.7 in standard length). Eyes 3.0-3.5, equal to snout and interorbital. Upper jaw very prominent. Cleft of mouth oblique; maxilla extending to gill opening. Teeth on jaws, palatines, pterygoids, vomer and tongue. A single dorsal fin; origin about midway between snout and caudal origin and behind pelvic origin. Pectorals low, as long as or a little longer than postorbital part of head, reaching to pelvic base. Pelvics small, less than half of head; origin midway between anal origin and subopercular edge. Anal moderate, base 3.8 in total length; origin at a short distance behind last dorsal ray. Caudal deeply forked. No lateral line. Scales moderate, deciduous. Abdominal scutes, preventral 14-15, postventral 8. Lower gill rakers 27, spinulose, equal to eye.

Greyish above, silvery on sides and below; a black spot scores nape reaching downwards to scapula; fins hyaline; dorsal and caudal tipped black.

It attains 112 mm. in length and ascends tidal rivers; littoral, euryhaline.

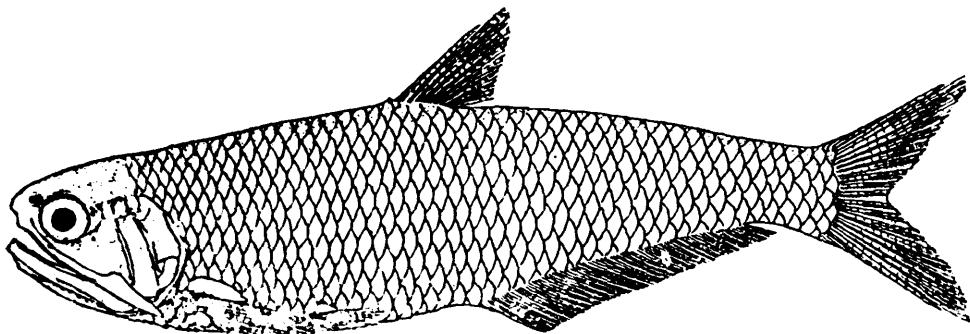
Distribution.—India, Pakistan, Sri Lanka, Malaya, Singapore, Indonesia, Indo-China, Amoy; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 24°N.—7°S., 85°—120°E. in the Indo-Pacific= (5°-21°N., 85°—100° E. in the Indian Ocean +24°N.—7°S., 103°-120°E. in the Pacific Ocean).

180. *Thrissocles kempi* (Chaudhuri)*
(Text-fig. 35)

1915. *Engraulis kempi* Chaudhuri, *Mem. Indian Mus.*, 5, p. 421, fig. 4 (type locality : off Barkul in the main area of the Chilka Lake; the type is in the Zoological Survey of India).

1949. *Thrissocles kempi* Misra, *Rec. Indian Mus.*, 45, p. 404.

1953. *Thrissocles kempi* Misra, *Rec. Indian Mus.*, 50, p. 387.



TEXT-FIG. 35.—Lateral view of *Thrissocles kempi* (Chaudhuri)
(After B. L. Chaudhuri)

D. 1+12; P.14; V. 8; A. 40; L.I. 45; L. tr. 12; Predorsal scales 18.

Body oblong, compressed; abdomen keeled, serrated. Dorsal profile almost straight up to dorsal fin, ventral profile convex up to anal fin. Head 5.4, depth 4.2 in total length. Eyes 3.8 in head, 0.6 in snout and in interorbital. Upper jaw slightly prominent. Cleft of mouth oblique, maxilla reaching beyond gill opening. A single dorsal fin; origin nearer to snout end than to caudal origin and 2 eye diameters behind pelvic origin. Pectorals low, 1.1 in head, reaching beyond pelvic base. Pelvics small, 2.5 in head; origin nearer to pectoral base than to anal origin and 2 eye diameters before dorsal origin. Anal moderate, base 3.5 in total length; origin nearer to pelvic origin than to caudal origin and just below last dorsal ray. Caudal deeply forked,

*Doubtfully considered a junior synonym of *Thryssa malabarica* (Bloch) (*vide*. Whitehead, 1973, *J. mar. biol. Ass. India*, 14 (1), p. 235).

equal to head. No lateral line. Scales deciduous. Abdominal scutes, preventral 15, postventral 8. Lower gillrakers 10.

Dark above, sides and anterior part of abdomen silvery; the rest of body pale yellow; fins hyaline.

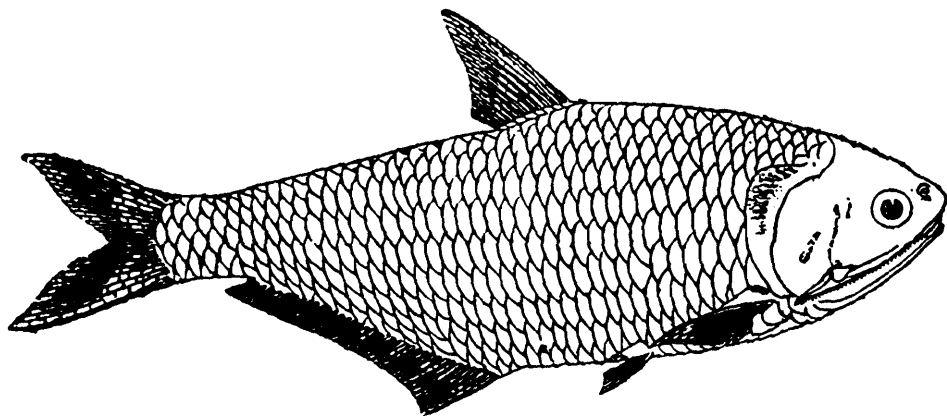
It attains 64 mm. in length; littoral, euryhaline.

Distribution.—India; in the mean annual isotherm of 20°C. with lat. 19°N. long. 85°E. Bay of Bengal.

181. **Thrissocles malabaricus** (Bloch)

(Pl. VII, fig. 2; Text-fig. 36)

- 1795. *Clupea malabaricus* Bloch, *Nat. Ausl. Fische*, 9, p. 115, pl. 432, (type locality: Tranquebar).
- 1803. *Clupea malabarica* Lacépède, *Hist. nat. Poiss.*, 5, p. 425 (Malabar).
- 1839. *Thryssa cuvieri* Swainson, *Nat. Hist. Animal.* 2, p. 293 (on Poorwa Russell, 1803, *Fish, Coromandel*, 2, p. 75, 293, pl. 194) (type locality: Vizagapatam).
- 1848. *Engraulis malabaricus* Valenciennes, *Hist. nat. Poiss.*, 21, p. 63, pl. 194, (Bombay).
- 1865. *Engraulis malabaricus* Day, *Fish. Malabar*, p. 239 (Malabar).
- 1868. *Engraulis malabaricus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 395 (coast of Malabar).
- 1878. *Engraulis malabaricus* Day, *Fish. India*, p. 625, pl. 157, fig. 5 (coast of Sind and through the seas of India).
- 1889. *Engraulis malabaricus* Day, *Fauna Brit. India*, Fish., 1, p. 389.
- 1910. *Engraulis malabaricus* Jenkins, *Rec. Indian Mus.*, 5, (Chilka Lake).
- 1913. *Engraulis malabaricus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 36.
- 1929. *Engraulis malabaricus* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 356 (Travancore).
- 1941. *Thrissocles malabarica* Fowler, *Bull. U.S. nat. Mus.*, (100), 13, p. 671.
- 1949. *Thrissocles malabaricus* Misra, *Rec. Indian Mus.*, 45, p. 404.
- 1953. *Thrissocles malabaricus* Misra, *Rec. Indian Mus.*, 50, p. 387.
- 1953. *Thrissocles malabaricus* Smith, *Sea Fish South. Africa*, p. 95 (Port Alfred).
- 1955. *Engraulis malabaricus* Anonymous, *Mar. Fish. Karachi, Sind & Makran.*, p. 16.
- 1955. *Thrissocles malabarica* Munro, *Mar. Freshwater Fish. Ceylon.*, p. 32 (coastal waters).



TEXT-FIG. 36.—Lateral view of *Thrissocles malabaricus* (Bl.)
(After F. Day)

Vernacular names.—INDIA: *Poor-relan*, *Monangoo* Malayalam; *Poor-relan*, Tamil, *Poorwa*, Telegu.

B. 12; D. 1+14—15; P. 14; A. 40-43; C. 20; L.1. 39-40;
L. tr. 11-12.

Body oblong, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 5.0-5.1, depth 3.7 in total length. Eyes with adipose lid, 4.0-4.5 in head, 0.7 in snout, 1.5 in interorbital. Upper jaw prominent. Cleft of mouth oblique; maxilla extending beyond gill opening. Teeth fine in jaws and on palate. A single dorsal fin; origin nearer to snout end than to caudal origin, about an eye diameter behind pelvic origin. Pectorals low, 1.2 in head, just reaching pelvic base. Pelvics small, 2.5 in head, origin midway between pectoral base and anal origin, and an eye diameter before dorsal origin. Anal moderate, base 3.5 in total length; origin nearer to pelvic origin than to caudal origin and just behind last ray of dorsal. Caudal deeply forked, equal to head. No lateral line. Scales regularly arranged, deciduous. Abdominal scutes, preventral 17, postventral 9-10. Lower gill rakers 21-25, half eye diameter.

Silvery shot with gold and purple; black ∇ venules on shoulders; pectorals often deep black; other fins yellow; dorsal and caudal edged black.

It attains 150 mm. in length, littoral.

Distribution.—India, Pakistan; Sri Lanka.—South Africa, N. Celebes; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°N.—33°S., 27°—120°E. in the Indo-Pacific=(25°N.—33°S., 27°—83°E. in the Indian Ocean+20°S.—20°E. in the Pacific Ocean).

182. *Thrissocles mystax* (Schneider)

- 1801. *Clupea mystax* Schneider, *Syst. Ichth. Bloch.*, p. 426, pl. 83 (type locality: Malabar.).
- 1846. *Thryssa mystax* Richardson, *Ichth. China Japan*, p. 309 (seas of India and China).
- 1848. *Engraulis mystax* Valenciennes, *Hist. nat. Poiss.*, 20, p. 67 (India).
- 1852. *Engraulis mystacoides* Bleeker, *Verh. Bat. Gen. (Haring)*, 24, p. 42 (type locality: Batavia).
- 1868. *Engraulis mystax* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 397 (Bombay; Madras; Java).
- 1878. *Engraulis mystax* Day, *Fish. India*, p. 625, pl. 157, fig. 3 (seas and estuaries of India to the Malay Archipelago and China).
- 1889. *Engraulis mystax* Day, *Fauna Brit. India, Fish.*, 1, p. 390.
- 1910. *Engraulis mystax* Jenkins, *Rec. Indian Mus.*, 5, p. 135, (Chilka Lake).
- 1913. *Engraulis mystax* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 38 (Java, Madura, Sumatra, Singapore, Banka, Borneo, N. Celebes).
- 1917. *Engraulis mystax* Hornell, *Madras Fish. Bull.*, 11, p. 93, (Tuticorin).
- 1929. *Scutengraulis mystax* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 43 (Queensland).
- 1931. *Engraulis mystax* Chu, *Biol. Bull. St. John's Univ.*, p. 17 (seas of China; Amoy).
- 1931. *Anchovia mystax* Schmidt, *Trans. Pacific Comm. Acad. Sci. U.S.S.R.*, 2, p. 20 (Fusan).
- 1932. *Engraulis mystax* Chevey, *Inst. Oceanogr. Indo-China*, 19°note, p. 9 (Annam).
- 1933. *Anchoviella mystax* Deraniyagala, *Ceylon J. Sci. (C)*, 5, p. 82 (Ceylon).
- 1936. *Engraulis mystax* Suvatti, *Index Fish. Siam*, p. 15 (Siam).
- 1940. *Scutengraulis mystax* Herre, *Rec. Indian Mus.*, 42, p. 9 (Mergui market).
- 1941. *Thrissocles mystax* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 675.
- 1949. *Thrissocles mystax* Misra, *Rec. Indian Mus.*, 45, p. 405.

1953. *Thrissocles mystax* Misra, *Rec. Indian Mus.*, **50**, p. 386.
1953. *Scutengraulis mystax* Herre, *Check List Philippine Fish.*, p. 77 (Philippines).
1955. *Thrissocles mystax* Munro, *Mar. Freshwater Fish. Ceylon*, p. 32 (coastal waters).

Vernacular names.—INDIA: *Phasa*, Bengali; *Kati*, Bombay; *Manangu*, Malayalam; *Kati*, *Tolkati*, Marathi; *Phasa*, Oriya; Standardised name: *Kati manangu*. BANGLADESH: *Phasa*. SRI LANKA: *Ata lagga*, *Hal massa*, Singhalese.

B. 12-14; D. 1+13-15; P. 12-13; V 7; A. 35-38; C. 19; L.I. 45; L. tr. 12/20-22.

Body oblong, compressed; abdomen keeled, serrated., Dorsal and ventral profiles equally convex. Head 4.8-5.0, depth 4.5-4.7 in total length. Eyes with adipose lid 4.0-4.5 in head, 0.7-1.0 in snout, 1.2 in interorbita. Upper jaw prominent. Cleft of mouth oblique; maxilla reaching pectoral base. Teeth fine, irregularly biserial in jaws. A single dorsal fin; origin nearer to caudal origin than to snout end, about 2.2 eye diameters behind pelvic origin. Pectorals low, 1.3 in head, reaching beyond pelvic origin. Pelvics small, 2.6 in head; origin nearer to pectoral base than to anal origin, about 2.2 diameters before dorsal origin. Anal moderate, base 4.1 in total length; origin nearer to pelvic base, than to caudal origin, just behind last dorsal ray. Caudal deeply forked, equal to head. No lateral line. Scales regularly arranged, deciduous. Abdominal scutes, preventral 16-17, postventral 9-10. Gill rakers 9—11 + 16—17, equal to eye.

Neutral gray above becoming silvery white on sides and below; black venules over the scapular region; dorsal and caudal pale brownish; other fins yellowish.

It attains 228 mm. in length; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Malaya, Singapore, Indonesia, Thailand, Annam, China, Philippines, Queensland, Fusan; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 35°N.—18°S., 62°—140°E. in the Indo-Pacific=(25°N.—18°S. 62°—140°E. in the Indian Ocean+35°N.—7°S., 101°—129°E. in the Pacific Ocean).

183. *Thrissocles purava* (Hamilton)

1822. *Clupea purava* Hamilton, *Fish. Ganges*, pp. 238, 382 (type locality; the estuaries of the Ganges).
1839. *Thryssa megastoma* Swainson, *Nat. Hist. Animal.*, **2**, p. 293. (on *Peddah Poorawah* Russell, 1803, *Fish. Coromandel*, p. 73, pl. 190; type locality: Vizagapatam).
1848. *Engraulis purava* Valenciennes, *Hist. nat. Poiss.*, **21**, p. 65 (Coromandel).
1868. *Engraulis purava* Günther, *Cat. Fish. Brit. Mus.*, **7**, 397 (Kurra-
chee; Cochin; Calcutta).
1878. *Engraulis purava* Day, *Fish. India*, p. 628, pl. 157, fig. 2 (seas
and estuaries of Sind, both sides of India to the Malay
archipelago).
1889. *Engraulis purava* Day, *Fauna Brit. India*, Fish. **1**, p. 393.
1913. *Engraulis purava* Weber & de Beaufort, *Fish. Indo-Austral.*
Archipel., **2**, p. 39 (Pinang, Rangoon).
1915. *Engraulis purava* Chaudhuri, *Mem. Indian Mus.*, **5**, p. 424
(Chilka Lake).
1916. *Engraulis purava* Raj, *Rec. Indian Mus.*, **12**, p. 251 (Madras).
1917. *Engraulis purava* Hornell, *Madras Fish. Bull.*, **11**, p. 92, (Tuti-
corin).
1922. *Engraulis purava* Hora, *Mem. Indian Mus.*, **15**, p. 764 (Chilka
Lake).
1924. *Engraulis purava* Fowler, *J. Bombay. nat. Hist. Soc.*, **30**, p. 40
(Calicut).
1924. *Engraulis hornelli* Fowler, *J. Bombay nat. Hist. Soc.*, **30**, p. 41
(type locality: Calicut; according to Fowler the type is in
the United States National Museum, Washington).
1929. *Engraulis purava* Pillay, *J. Bombay nat. Hist. Soc.*, **33**, p. 356
(Travancore).
1941. *Thrissocles purava* Fowler, *Bull. U.S. nat. Mus.*, (100) **13**, p.
677 (Calicut).
1949. *Thrissocles purava* Misra, *Rec. Indian Mus.*, **45**, p. 405.
1953. *Thrissocles purava* Misra, *Rec. Indian Mus.*, **50**, p. 386.
1955. *Engraulis purava* Anonymous, *Mar. Fish. Karachi, Sind &*
Makrans, p. 17.

Vernacular names.—INDIA: *Kutthavoo*, Malayalam; *Pussai*, Oriya;
Peddah-poorawah, Telegu. BURMA: *Nga buh*, *Showk-a-thin*, Arakan.

B. 12; D. 1+13; P. 15; V 6-7; A. 45-47; L. 1. 46; L. tr.
12; Predorsal scales 20-22.

Body oblong, compressed; abdomen keeled, serrated.
Dorsal and ventral profiles more or less equally convex.
Head 5.4-6.0, depth 4.2-4.5 in total length. Eyes with
adipose lid, 4.2-5.0 in head, 0.7 in snout, 1.0 in interor-
bital. Upper jaw prominent. Cleft of mouth oblique;

maxilla reaching to pectoral base. Teeth small, uniserial in jaws. A single dorsal fin; origin nearer to snout end than to caudal origin and nearly 3 eye diameters behind pelvic origin. Pectorals low, 1.1 in head, reaching beyond pelvic origin. Pelvics small, 2.2 in head; origin nearer to pectoral base than to anal origin and about 3 eye diameters before dorsal origin. Anal moderate, base 3.3 in total length; origin below middle of dorsal base or beneath the posterior dorsal rays, and nearer to pelvic origin than to caudal origin. Caudal deeply forked, 1.1 times head. No lateral line. Scales regularly arranged. Abdominal scutes, preventral 15-16, postventral 10-11. Gill rakers 16+17, twice gill filaments.

Steel blue along back and with a golden tinge about the head; silvery on sides and below; dorsal and caudal yellowish, other fins uncoloured.

It attains 305 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Pakistan, Burma.—Penang, Borneo Is., Micronesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 1°-25°N., 62°-142°E. in the Indo-Pacific=(5°-25°N., 62°-96°E. in the Indian Ocean+12°N., 142°E. in the Pacific Ocean).

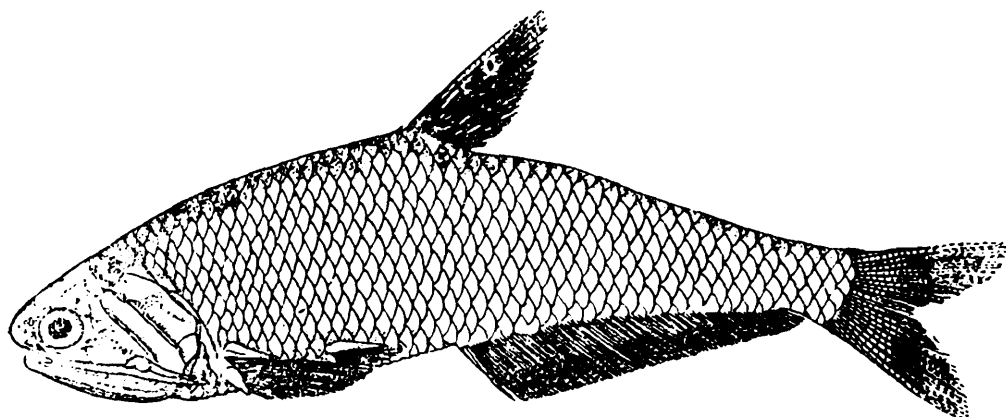
184. *Thrissocles rambhae* (Chaudhuri)*
(Text-fig. 37)

1916. *Engraulis rambhae* Chaudhuri, *Mem. Indian Mus.*, 5, p. 423 (type locality: Rambha Bay, Chilka Lake; type is in the Zoological Survey of India).

1949. *Thrissocles rambhae* Misra, *Rec. Indian Mus.*, 45, p. 406.

1953. *Thrissocles rambhae* Misra, *Rec. Indian Mus.*, 50, p. 387.

*Now treated with a query, a junior synonym of *Thryssa malabarica* (Bloch) (*vide* Whitehead, 1973, *J. mar. biol. Ass. India*, 14 (1), p. 235).



TEXT-FIG. 37.—Lateral view of *Thrissocles rambhae* (Chaudhuri)
(After B.L. Chaudhuri)

D. 1+11; P. 13; V 7; A. 40; L.1. 46; L. tr. 12;
Predorsal scales 22.

Body oblong, compressed; abdomen keeled, serrated. Dorsal profile highly convex, ventral profile nearly straight. Head 4.8, depth 4.2 in total length. Eyes 4.0 in head, 0.5 in snout. Upper jaw prominent. Cleft of mouth slightly oblique; maxilla extending a little beyond gill opening, not reaching pectoral base. A single dorsal fin; origin nearer to snout end than to caudal origin and about one and half eye diameters behind pelvic origin. Pectorals low, 1.3 in head, much beyond pelvic origin. Pelvics small, 2.4 in head; origin midway between pectoral base and anal origin, and about one and half diameters before dorsal origin. Anal moderate, 3.1 in total length; origin nearer to pelvic base than to caudal origin and below 1 or 2 last dorsal rays. Caudal deeply forked, 1.2 in head. No lateral line. Scales regularly arranged, deciduous. Abdominal scutes, preventral 15, postventral 7. Lower gill rakers 17.

Silvery with upper part yellowish brown; lower half of the posterior part brown; fins hyaline; dorsal edged black.

It attains 95 mm. in length, ascends tidal waters; littoral, euryhaline.

Distribution.—India; in the mean annual isotherm of 20°C. in lat. 19°N. long. 85°E. in a Bay of Bengal.

185. *Thrissocles setirostris* (Broussonet)

1782. *Clupea setirostris* Broussonet, *Ichth.*, 1, pl. 11 (type locality: Tanna, New Hebrides).

1848. *Engraulis setirostris* Valenciennes, *Hist. nat. Poiss.*, 21, p. 69 (India).

1849. *Thryssa macrognathos* Bleeker, *Verh. Bat. Gen. (Madura)*, 22, p. 13 (type locality: Madura near Bangcallang).

1878. *Engraulis setirostris* Day, *Fish. India*, p. 626 (from the Red Sea through the seas of India to the Malay Archipelago).
1889. *Engraulis setirostris* Day, *Fauna Brit. India*, Fish., 1, p. 391.
1913. *Engraulis setirostris* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 40 (Madura, Sumatra, Padang, Banka, Celebes, Ambon, Tanna, China).
1917. *Engraulis setirostris* Hornell, *Madras Fish. Bull.*, 11, p. 91 (Tuticorin).
1931. *Engraulis setirostris* Chu, *Biol. Bull. St. John's Univ.*, p. 17 (China).
1936. *Engraulis setirostris* Suvatti, *Index Fish. Siam*, p. 15 (Siam).
1940. *Thrissocles setirostris* Herre, *Rec. Indian Mus.*, 42, p. 10 (Mergui market).
1941. *Thrissocles setirostris* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 679.
1949. *Thrissocles setirostris* Misra, *Rec. Indian Mus.*, 45, p. 406.
1953. *Thrissocles setirostris* Misra, *Rec. Indian Mus.*, 50, p. 387.
1953. *Thrissocles setirostris* Smith, *Sea Fish. South. Africa*, p. 95 (Port St. Johns).
1955. *Thrissocles setirostris* Munro, *Mar. Freshwater Fish. Ceylon*, p. 32 (coastal waters)

Vernacular names.—INDIA : *Yeka-poorawah*, Telegu; Standardised name: *Dadi manantgu*. SRI LANKA: *Raval lagga*, Singhalese.

B. 10-11; D. 1+14-16; D. 12-14; V. 6; A. 34-38; C. 17; L. I. 40-44, L. tr. 10-11; Predorsal scales 18-19.

Body elongate, compressed; abdomen keeled, serrated. Dorsal and ventral profiles equally convex. Head 5.5, depth 4.4 in total length. Eyes with adipose lid, 3.5-4.0 in head, 0.5 in snout, 1.0 in interorbital. Upper jaw not very prominent, snout bluntly rounded. Cleft of mouth oblique; maxilla produced into a long filament often reaching beyond pelvics. Teeth small, uniserial in jaws, on vomer, palatines, pterygoids and tongue. A single dorsal fin; origin nearer to snout end than to caudal origin and about an eye diameter behind pelvic origin. Pectorals low, 1.0-2.2 in head, reaching pelvic base. Pelvics small, 1.7-2.0 in head; origin midway between pectoral base and anal origin and an eye diameter before dorsal origin. Anal moderate, base 3.6 in total length; origin much nearer to pelvic origin than to caudal origin, and just behind last dorsal ray. Caudal deeply forked, equal to head. No lateral line. Scales regularly arranged, deciduous. Abdominal scutes, preventral 17-18, postventral 8-10. Gill

rakers 5+12, slender, lanceolate, 1.0 in gill-filaments, 1.5 in eye.

Greenish grey above, silvery on sides and below; black venules on shoulder; fins hyaline.

It attains 170 mm. in length and is found in sea and brackish waters; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Red Sea, S. Africa, Malaya, Indonesia, Thailand, Indo-China, China, Queensland, Melanesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25°—29°S., 30°—140°E. in the Indo-Pacific.

186. *Thrissocles valenciennesi* (Bleeker)*

1866. *Stolephorus (Thryssa) valenciennesi* Bleeker, *Ned. Tijds. Dierk.*, 3, p. 306 (type locality: Java, Sumatra, Singapore, Borneo).

1927. *Engraulis valenciennesi* Fowler, *J. Bombay nat. Hist. Soc.*, 33, p. 254 (Bombay).

1936. *Thrissocles valenciennesi* Fowler, *List Fish. Malaya*, p. 36 (Singapore, Penang).

1941. *Thrissocles valenciennesi* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 682 (Bombay).

1949. *Thrissocles valenciennesi* Misra, *Rec. Indian Mus.*, 45, p. 406.

1953. *Thrissocles valenciennesi* Misra, *Rec. Indian Mus.*, 50, p. 387.

B. 12-13; D. 1+13-14; P. 12-13; V 7; A. 38-42; L.I. 40. L. tr. 12; Predorsal scales 19-20.

Body oblong compressed; abdomen keeled, serrated. Dorsal profile convex, ventral profile almost straight. Head 5.0-5.2, depth 4.3-4.6 in total length (4.0-4.2 and 3.3-3.6 in standard length). Eyes 3.5-3.6 in head, 0.7 in snout, 1.0 in interorbital. Upper jaw prominent, snout rounded. Cleft of mouth oblique; maxilla extending slightly beyond pectoral base. Teeth on jaws, vomer, palatines, pterygoids and tongue. A single dorsal fin; origin nearer to caudal base than to snout end, and behind pelvic origin. Pectorals low, equal to postorbital part of head, reaching pelvic base. Pelvics 2.5-2.6 in head, midway between anal and subopercle. Anal moderate, base 2.8-3.0 in

*Now considered a junior synonym of *Thryssa mystax* (Schneider) (vide Whitehead, et al, 1966, *Zool. Verhandl.*, 84, p. 125).

standard length; origin a little before end of dorsal. Caudal deeply forked, 3·8 in standard length. No lateral line. Scales thin, deciduous, with 6-7 fine, vertical lines interrupted at median axis. Abdominal scutes, preventral 15, postventral 8. Gill rakers 10-12+14-17, lanceolate slender, 0·7 in eye.

Silvery grey above becoming lighter on sides and below: scapular region with black venules; fins hyaline; caudal with darker margin.

It attains 177 mm. in length; littoral.

Distribution.—India.—Malaya, Singapore, Indonesia, Philippines; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 18°N.—7°S., 72°—123°E. in the Indo-Pacific=(5°—18°N., 72°—100°E. in the Indian Ocean+14°N.—7°S., 103°—123°E. in the Pacific Ocean).

73. Genus *Xenengraulis* Jordan & Seale

1925. *Xenengraulis* Jordan & Seale, *Copeia*, No. 141. p. 29 (type, *X. spinidens* Jordan & Seale, orthotypic).

Body elongate, compressed, scales small, deciduous. Head small. Teeth in jaws partly canine-like. Maxilla reaching gill opening. Gill rakers few. Abdomen keeled and serrated. Dorsal with a spine in front. Dorsal origin behind pelvic origin. Pectorals reach middle of pelvics. Anal single, moderate, behind dorsal origin. Adipose fin absent. Caudal forked. Enlarged scale at caudal base.

Distribution.—India, Burma, Siam.

187. *Xenengraulis spinidens* Jordan & Seale

1925. *Xenengraulis spinidens* Jordan & Seale, *Copeia*, No. 141, p. 29 (type locality: India, Siam, Calcutta, Rangoon).
 1941. *Xenengraulis spinidens* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 668 (India, Burma, Siam).
 1949. *Xenengraulis spinidens* Misra, *Rec. Indian Mus.*, 45, p. 406.
 1953. *Xenengraulis spinidens* Misra, *Rec. Indian Mus.*, 50, p. 388.
 D.1/13; V. 7; A. 46; L. 1. 42; L. tr. 12.

Body oblong, compressed; abdomen keeled, serrated. Head 5·0, depth 3·2 in standard length. Eyes 4·6 in head. cleft of mouth oblique; maxilla reaching beyond gill opening, but not to pectoral base. Teeth in jaws large, canine-like, smaller in mandibles; small teeth on vomer, palatines, pterygoids. A single dorsal fin; origin midway between hind edge of eye and caudal base, far behind pelvic

origin. Pectorals low, equal to postorbital part of head, extending to middle of pelvics. Pelvics small; origin much before dorsal origin. Anal moderate, base 2.8 in standard length; origin below last dorsal ray. Caudal forked, slightly longer than head, lower lobe longer. No lateral line. Scales with striae incomplete, very little net work of lines evident. Abdominal scutes, preventral 16, postventral 11, beginning before pectorals. Lower gill rakers 14, thin, curved, the largest 1.2 in eye.

Brownish above, silvery on sides and below; no dark venules on shoulder.

It attains 208 mm. in length and ascends tidal rivers; littoral, euryhaline.

Distribution.—India, Burma.—Thailand; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 11°—22°N., 85°—101°E. in the Indo-Pacific=(16°—22°N., 85°—96°E. in Bay of Bengal+11°N.—101°E. in the Pacific Ocean).

IV. Superfamily ALEPOCEPHALOIDAE

Anterior portion of head produced into a long tube terminating in a narrow mouth, or not produced into a long tube. No gular plate. Photophores present or absent, when present never arranged in double rows close to ventral profile. Air bladder, present or absent. Shoulder organ present or absent. Pelvics present or absent. No postcleithrum. No supra-branchial organ. A lateral line. Scales distinct or indistinct on either side. Deep sea fishes.

The superfamily ALEPOCEPHALOIDAE is represented by 3 families in the Indian region.

Key to families of superfamily ALEPOCEPHALOIDAE

1. Anterior portion of head produced into a long tube terminating in a narrow mouth ; gill-openings narrow, not surpassing level of pectorals	DOLICHOPTERYGIDAE
2. Anterior portion of head not produced into a long tube ; gill openings wide, surpassing level of pectorals	3
3. Shoulder organ present	SEARSIDAE
4. Shoulder organ absent	ALEPOCEPHALIDAE

XXIV Family ALEPOCEPHALIDAE

Body elongate, compressed; abdomen non-keeled, non-serrated. Head with or without scales. Photophores present or absent, when present not in serial double rows close to ventral profile. Cleft of mouth horizontal or oblique. Eyes prominent or small. Teeth uniserial or pluriserial. Premaxilla and maxilla toothed. Branchiostegals 6-7. Pseudobranchiae. Shoulder organ absent. Opercle complete, but large or small, present or often rudimentary or absent. Pelvics present. Anal long or short. Anus behind middle of body. A single dorsal fin. Pectorals small or well developed. Adipose fin. Lateral line distinct or indistinct on either side. Scales cycloid, moderate, small or rudimentary. Deep sea fishes.

The family ALEPOCEPHALIDAE is represented by 6 genera in the Indian region.

Key to genera of family ALEPOCEPHALIDAE

1. Trunk scaly ..	3	
2. Trunk naked	7	
3. Branchiostegals 6 ; teeth in jaws uniserial ; no teeth on maxilla		Alepocephalus
4. Branchiostegals 7 ; teeth in jaws uniserial or pluriserial ; teeth on maxilla	5	
5. A single series of teeth in premaxilla and maxilla		Bathytroctes
6. Several series of teeth in premaxilla and maxilla		Narcetes
7. Dorsal and anal fins short ; body moderately elongate		Xenodermichthys
8. Dorsal and anal fins very long ; body exceedingly elongate		Leptoderma

74. Genus *Alepocephalus* Risso

1820. *Alepocephalus* Risso, *Mem. de L' Acad. Sci. Torlino*, 25, p. 270 (type, *A. rostratus* Risso).
1896. *Mitchillina* Jordan & Evermann, *Bull. U.S. nat. Mus.*, No. 47, pt. 1, p. 453 (type, *Alepocephalus bairdii* G. & B., orthotypic).
1934. *Halisauriceps* Fowler, *Proc. Acad. nat. Sci. Philad.*, 85, p. 247 (type, *Alepocephalus longiceps* Lloyd, orthotypic).

1951. *Torictus* Parr, *Amer. Mus. Novitat.*, No. 1531, p. 10 (type, *Alepocephalus edentulus* Alc., orthotypic).
1952. *Lloydiella* Parr, *Bull. Harv. Mus. Comp. Zool.*, 107, No. 4, p. 256 (type, *Alepocephalus bicolor* Alc., orthotypic).

Body elongate, compressed, scales moderate, cycloid, deciduous. Eyes prominent. Snout short, blunt or long, pointed. One or two supermaxillaries. Premaxillary, palatine and sometimes vomer toothed. Maxillary toothless. 6 branchiostegals. Close set long, numerous gill rakers. Gill openings wide, surpassing level of pectorals, covered by free over lapping gill membrane and by skin of head. Pseudobranchiae. Dorsal and anal fins short ; their origins nearly opposite to each other. Pelvic origin in advance of dorsal origin. Adipose fin absent. Caudal forked.

Distribution.—Gulf of Aden, 1061—1080 m., Gulf of Oman, 1260—1280 m., Arabian Sea, 658—1650 m., Bay of Bengal, 438—1267 m., West coast of Sumatra, 750 m., Flores Sea, 521—694 m.

Key to species of genus Alepocephalus Risso

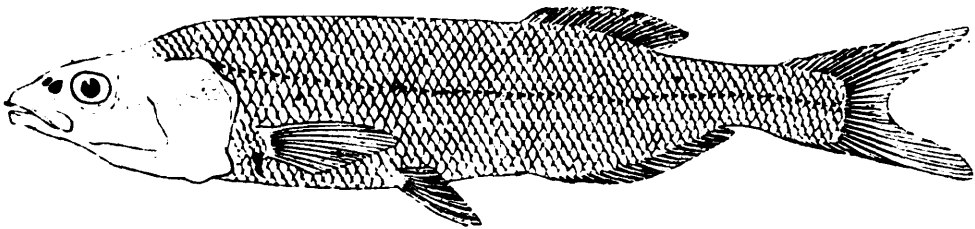
1. Anal origin well behind middle of body (measured with caudal) ; 2 supermaxillaries	3	
2. Anal origin exactly in middle of body (measured with caudal) ; 1 supermaxillaries		<i>A. edentulus</i>
3. Maxilla long, extending beyond anterior border of orbit	5	
4. Maxilla short, not extending beyond anterior border of orbit	9	
5. Dorsal origin before anal origin		<i>A. bicolor</i>
6. Dorsal origin opposite to or a little behind anal origin	7	
7. Head long, $2\frac{1}{2}$ times in standard length ; anal long in opposite dorsal origin		<i>A. macrops</i>
8. Head short, 3 times in standard length; anal origin a little behind dorsal origin		<i>A. blanfordii</i>
9. Dorsal and anal equal, with their origins opposite		<i>A. longiceps</i>

10. Dorsal shorter than anal, with
its origin behind anal origin *A. microlepis*

188. *Alepocephalus bicolor* Alcock

(Pl. IV, fig. 1; Text-fig. 38)

1891. *Alepocephalus bicolor* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 33 (type locality : Bay of Bengal, off Ganjam coast, 15°56' 50" N., 81° 30'30" E., 240-276 fms., 11-1 C.; type is in the Zoological Survey of India).
 1892. *Alepocephalus bicolor* Alcock, *Ill. Zool. Invest., Fish.*, pl. 4, fig. 2.
 1899. *Alepocephalus bicolor* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 169 (Bay of Bengal, off Ganjam Coast, 240-276 fms., Arabian Sea, off Malabar Coast, 360 fms.).
 1906. *Alepocephalus bicolor* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 19, 369.
 1913. *Alepocephalus bicolor* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 99 (W. of Sumatra, 750 m.; Flores sea, 521-538 m.)
 1939. *Alepocephalus bicolor* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 15 (Gulf of Aden).
 1949. *Alepocephalus bicolor* Misra, *Rec. Indian Mus.*, 45, p. 406.
 1952. *Lloydia bicolor* Parr, *Bull. Harv. Mus. Comp. Zool.*, 107, pp. 256, 259.
 1953. *Alepocophalus bicolor* Misra, *Rec. Indian Mus.*, 50, p. 390.



TEXT-FIG. 38.—Lateral view of *Alepocephalus bicolor* Alc.
(After A. Alcock)

B. 6; D. 20-21; P. 10-11; V 8; A. 26-28; L. 1. 62-63; Ltr. 18.

Body elongate, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles gradiently equal, convex. Head 4.3, depth 5.8 in total length (3.3—3.8 and 4.7—4.9 in standard length). Eyes moderate, without adipose lid, converging anteriorly, 5.0—6.0 in head, 1.1 in snout and more than an eye diameter apart. Nostrils close together, immediately before eye. Snout obtusely pointed, depressed, 3.5 in head. Cleft of mouth slightly oblique; maxilla reaching just behind anterior border of eye. A row of small teeth on both jaws and on palatines. Gill openings very wide, gill membranes entirely separate,

over lapping broadly. Pseudobranchiae small. A single dorsal fin; origin just in advance of the posterior third of standard length, opposite vent, and much behind pelvic origin. Pectorals low, broad, inserted just behind head, reaching pelvic origin, a little longer than postorbital part of head. Pelvics moderate; more than twice eye, reaching more than half way to anal origin; origin midway between pectoral base and anal origin, nearer to pelvic origin than to caudal origin, and behind middle of total length; anal base about 1.4 times longer than dorsal base. Caudal deeply forked, 1.1 in head with numerous rudimentary rays at its base. Scales deciduous, every where except on lateral line. Scales cycloid. Gill rakers long, lamellar. Pyloric caeca in a pectinate arrangement.

Head including sclerotic and eye black; body uniform dull slate blue.

It attains 300 mm. in length. Adult males smaller than females; at a depth of 438—1080 metres; bathypelagic.

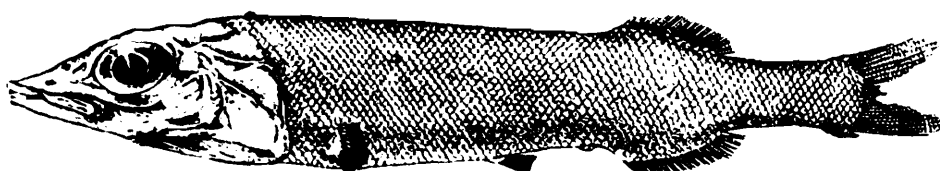
Distribution.—India : off Ganjam coast, Bay of Bengal; 15°56' 50" N., 81°31' 30" E., 438—504 m., 11.1°C., surface temperature 26.2°C.; off Malabar coast, Arabian Sea, 9°29' 34" N., 75° 38" E., 658 m., 9.2°C. surface temperature 27.8°C.; Gulf of Aden, 1061—1080 m., 10.85°C. at 1000 m., surface temperature 27.8°C., Gulf of Aden, 1061—1080 m., 10.85°C. at 1000 m., surface temperature 23.69°C., W. of Sumatra, 750 m., Flores Sea, 521—538 m., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 13°N.—8° S., 46°—121° E. in the Indo-Pacific=(15° N.—0° 36' S., 46°—98°E. in the Indian Ocean+8° S., 121°E. in the Pacific Ocean).

189. *Alepocephalus blanfordi* Alcock

(Pl. IV, fig. 2; Text-fig. 39)

1892. *Alepocephalus blanfordi* Alcock, *Ann. Mag. nat. Hist.*, (6) 10., p. 357 (type locality : S. of Cape Comorin, 6° 58' N., 77° 26' 50" E., 902 fms., 5°C. ; type is in the Zoological Survey of India).
1894. *Alepocephalus blanfordi* Alcock, *Ill. Zool. Investig. Fish.*, pl. 9, fig. 1.
1899. *Alepocephalus blanfordi* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 171 (Arabian Sea, off Cape Comorin, 902 fms.).
1906. *Alepocephalus blanfordi* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 369.

1913. *Alepocephalus blanfordi*, Weber & de Beaufort, *Fish. Indo-Austral, Archipel.*, 2, p. 100 (Flores Sea, 694 m.).
1949. *Alepocephalus blanfordii* Misra, *Rec. Indian Mus.*, 45, p. 407.
1952. *Alepocephalus blanfordi* Parr, *Bull. Harv. Mus. Comp. Zool.*, 107, p. 258.
1953. *Alepocephalus blanfordii* Misra, *Rec. Indian Mus.*, 50, p. 390.
1955. *Alepocephalus blanfordi* Munro, *Mar. Freshwater Fish. Ceylon*, p. 33 (Gulf of Manaar, 902 fms.).



TEXT-FIG. 39.—Lateral view of *Alepocephalus blanfordi* Alc.,
(After A. Alcock)

B. 6; D. 16; P. 11; V 6-7; A. 17; L. 1. ca 70.

Body elongate, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles gradiently convex. Head 3.2, depth 6.2 in total length (3.0 and 5.8 in standard length). Eyes large, with adipose lid, 3.5 in head, 1.0 in snout hardly half diameter apart, with large nostrils closely placed together in front of their angle. Snout depressed, obtusely pointed, equal to eye, 3.5 in head. Cleft of mouth almost horizontal; maxilla reaching just beyond anterior border of eye. Upper jaw reaching just beyond and rests upon the anterior border of orbit completely enclosing the mandible on all sides. A row of fine teeth in both jaws and on each prominent palatine. Gill openings very wide. Gill membranes entirely separate and only slightly overlapping. Pseudobranchiae large. A single dorsal fin; origin in the posterior third of the standard length, just behind vent and far behind pelvic origin. Pectorals low, inserted nearly half eye diameter away from head, not reaching pelvic origin. Pelvics small, less than eye; origin almost in the middle of total length, nearer to anal origin than to pectoral base and much before dorsal origin. Anal origin slightly behind dorsal origin and nearer to pelvic origin than to caudal origin, and well behind middle of total length. Anal base equal to dorsal base. Caudal deeply forked, about 2.2 in head with many rudimentary rays at its base. Lateral line present. Scales thick, deciduous, cycloid. Gill rakers numerous, close-set,

broadly lanceolate, acute. A row of 14 large, long, pyloric caeca.

Body lavender grey, head and fins black.

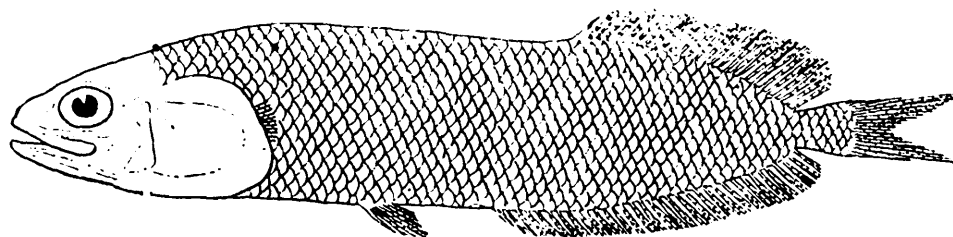
It attains 359 mm. in length; at a depth 694—1,650 m., bathypelagic.

Distribution.—India : south of Cape Comorin, Arabian Sea, $6^{\circ} 58' \text{ N.}$, $77^{\circ} 26' 50'' \text{ E.}$, 1650 m., 5° C. —Flores Sea 694 m.; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 6° N. — 8° S. , 77° — 121° E. in the Indo-Pacific=(6° N. , 77° E. in the Indian Ocean+ 8° S. , 121° E. in the Pacific Ocean).

190. *Alepocephalus edentulus* Alcock

(Pl. IV, fig. 3; Text-fig. 40)

1892. *Alepocephalus edentulus* Alcock, *Ann. Mag. nat. Hist.*, (6) 10, p. 358, pl. 18, fig. 2 (type locality : Bay of Bengal, $12^{\circ} 50' \text{ N.}$, $81^{\circ} 30' \text{ E.}$ 475 fms, 7.5° C. ; type is in the Zoological Survey of India).
1899. *Alepocephalus edentulus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 172 (Bay of Bengal, off Madras Coast, 475 fms.).
1900. *Alepocephalus edentulus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 32, fig. 4.
1906. *Alepocephalus edentulus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 369.
1949. *Alepocephalus edentulus* Misra, *Rec. Indian Mus.*, 45, p. 407.
1951. *Torictus edentulus* Parr, *Amer. Mus. Novitat.*, No. 1531, p. 10.
1953. *Alepocephalus edentulus* Misra, *Rec. Indian Mus.*, 50, p. 389.



TEXT-FIG. 40.—Lateral view of *Alepocephalus edentulus* Alc.,
(After A. Alcock)

B.6 : D. 29; P. 9; V 6; A. 35; L. 1. ca 50; L. tr. 15.

Body oblong, much compressed, abdomen non-keeled, non-serrated. Dorsal and ventral profiles equally convex. Head, 3.6, depth, 5.4 in total length (3.2 and 4.8 in standard

length). Eyes moderate, without adipose lid, 4.5 in head. Snout blunt, barely equal in length either to interorbital or eye. Cleft of mouth almost horizontal; maxilla reaching considerably behind midorbit. Minute teeth in a row in the premaxilla and mandibles and a few inconspicuous, deciduous teeth in the prominent edges of the palatines only. Gill openings very wide, gill membrane united with isthmus only anteriorly. Pseudobranchiae small. A single, moderate, dorsal fin; origin in the posterior third of standard length, far behind pelvic and opposite 6th or 7th anal ray, much nearer to caudal origin than to pectoral base; its base 1.3 in anal base. Pectorals not low, short, inserted close behind head, far away from pelvic base. Pelvics moderate, 1.2 times eye, reaching halfway to anal origin; origin midway between pectoral base and anal origin and much before dorsal origin. Anal long; origin about one and quarter eye diameters before dorsal origin, and an eye diameter behind middle of standard length; or exactly in the middle of total length and nearer to pelvic origin than to caudal origin; base 1.3 times dorsal base. Caudal completely divided down to its base into 2 long, feathery lobes 2.3 in head. Lateral line present. Scales cycloid, deciduous. Gill rakers long, setaceous, about 12 in the middle of first branchial arch. A row of 4 stout pyloric caeca.

Head and eyes jet black ; body and fins grayish black.

It attains 177 mm. in length and has been obtained at a depth of 868 m., bathypelagic, endemic.

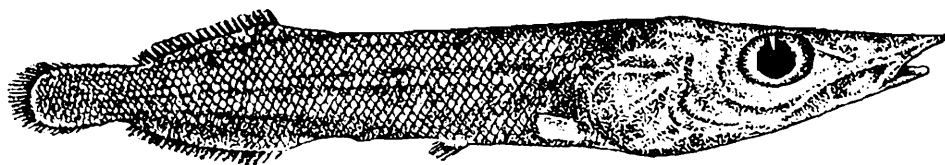
Distribution.—India : off Madras coast, Bay of Bengal, 12°50' N., 81°30' E., 868 m., 7.5°C., in the mean annual isotherm of 20° C.

191. *Alepocephalus longiceps* Lloyd

(Pl. IV, fig. 4; Text-fig. 41)

1909. *Alepocephalus longiceps* Lloyd, *Mem. Indian Mus.*, 2, p. 147 (type locality : Andaman Sea, Bay of Bengal, 12° 49' 30" N., 96° 24' 30" E. 693 fms.; type is in the Zoological Survey of India).
1909. *Alepocephalus longiceps* Lloyd, *Ill. Zool. Investing. Fish.*, pl. 44, fig. 2.
1949. *Alepocephalus longiceps* Misra, *Rec. Indian Mus.*, 45, p. 407.
1952. *Halisauriceps longiceps* Parr, *Bull. Harv. Mus. Comp. Zool.*, 107, pp. 256, 260.

1953. *Alepocephalus longiceps* Misra, *Rec. Indian Mus.*, 50, p. 390.



TEXT-FIG. 41.—Lateral view of *Alepocephalus longiceps* Lloyd
(After R. E. Lloyd)

B. 6; D. 20; P. 10; V 6; A. 23; L. 1. 52; L. tr 5/1/6.

Body elongate, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles equally horizontal. Head 3.8, depth 7.6 in total length (3.2 and 6.5 in standard length). Eyes without adipose lid, 4.5—5.0 in head, 1.5 in snout. Snout long, pointed, equal to postorbital part of head. Upper jaw prominent, considerably projecting over lower jaw as much as a distance equal to half diameter of eye. Cleft of mouth nearly horizontal, wide; maxilla reaching anterior border of eye. Minute teeth on premaxillary, dentary, palatines and vomer. Opercle voluminous, gill openings very wide, gill membranes partially overlapping. Pseudobranchiae small. A single, moderate, dorsal fin; origin slightly behind posterior third of total length, far behind pelvics and much nearer to caudal origin than to pectoral and pelvic bases and opposite anal origin. Pectorals low, small, inserted close behind head, not reaching pelvic origin. Pelvics small, about an eye diameter, not reaching anal origin; origin nearer to pectoral base than to anal origin and much before dorsal origin. Anal moderate, base equal to dorsal base; origin opposite dorsal origin, nearer to pelvic origin than to caudal origin and well behind middle of total length. Caudal rounded, less than eye. Lateral line present. Scales deciduous, cycloid. Gill rakers numerous, long, lanceolate, acute. 7 rudimentary pyloric caeca.

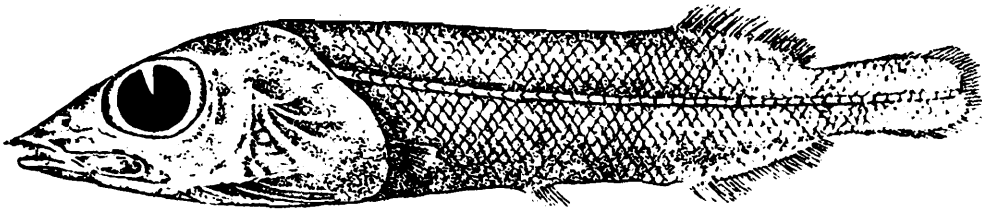
It attains 90 mm. in length and has been found at a depth 766 m., bathypelagic, endemic.

Distribution.—India : Andaman Sea, Bay of Bengal, 12° 49' 30" N., 96° 24' 30" E., 1267 m., in the mean annual isotherm of 20° C.

192. *Alepocephalus macrops* Lloyd

(Pl. IV, fig. 6; Text-fig. 42)

1909. *Alepocephalus macrops* Lloyd, *Mem. Indian Mus.*, 2, p. 148
(type locality : Bay of Bengal, off Arakan coast, 419 fms.,
12.4° C.; type is in the Zoological Survey of India).
1909. *Alepocephalus macrops* Lloyd, *Ill. Zool. Investig. Fish.*, pl. 44,
fig. 3.
1949. *Alepocephalus macrops* Misra, *Rec. Indian Mus.*, 45, p. 407.
1952. *Alepocephalus macrops* Parr, *Bull. Harv. Mus. Comp. Zool.*,
107, p. 257.
1953. *Alepocephalus macrops* Misra, *Rec. Indian Mus.*, 50, p. 390.



TEXT-FIG. 42.—Lateral view of *Alepocephalus macrops* Lloyd
(After E. Lloyd)

B. 6; D. 17; P. 8; A. 20; L. 1 50; L. tr. 6/1/9.

Body oblong, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile almost straight. Head 2.6, depth 5.6 in total length (2.5 and 5.5 in standard length). Eyes prominent, without adipose lid, 3.2 in head, 0.8 in snout, greater than interorbital. Upper jaw slightly overlaps. Snout 3.7 in head. Cleft of mouth nearly horizontal; maxilla reaching nearly to midorbit. Teeth conspicuous, on premaxillaries, dentaries, palatines and vomer. Opercle very large, covered with black, soft skin. Gill openings very wide. A single dorsal fin; origin in posterior third of total length, far behind pelvic origin, much nearer to caudal origin than to pectoral base; dorsal base equal to anal base. Pectorals low, short, inserted behind head, half of eye, not reaching pelvic base. Pelvics small, half of eye, not reaching anal origin; nearer to pectoral base than to anal origin and much before dorsal origin. Anal moderate; origin opposite to dorsal origin, base equal to dorsal base, nearer to pelvic origin than to caudal origin and far behind middle of total length. Caudal nearly truncate, less than half eye. Lateral line present. Scales cycloid, rather large, their length and breadth equal. Gill rakers numerous, long, lanceolate, acute. 17 pyloric caeca of moderate length.

Head jet black, body brownish black, fins black with a bluish tinge.

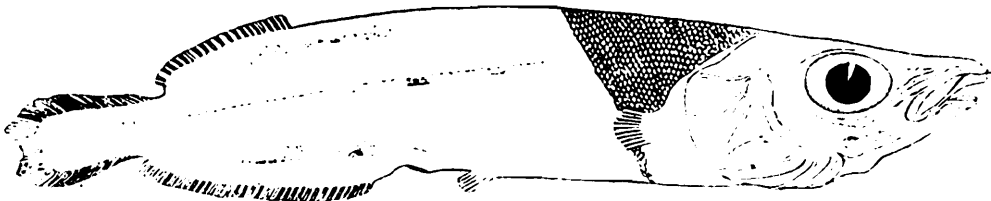
It attains 110 mm. in length and is found at a depth of 766 m. ; bathypelagic, endemic.

Distribution.—Burma : off Arakan coast, Bay of Bengal, 17°7' 30"N., 94° 5' 30" E. 766 m., 12·4° C., in the mean annual isotherm of 20° C.

193. *Alepocephalus microlepis* Lloyd

(Pl. IV, fig. 5; Text-fig. 43)

1909. *Alepocephalus microlepis* Lloyd, *Mem. Indian Mus.*, 2, p. 146 (type locality : Laccadive Sea, 12° 47' N., 73° 44' 45" E., 823-870 fms., S. of Cape Comorin, 603 fms., Gulf of Oman, 689-700 fms., 6·7°C.; type is in the Zoological Survey of India).
1909. *Alepocephalus microlepis* Lloyd, *Ill. Zool. Investig. Fish.*, pl. 44, fig. 4.
1949. *Alepocephalus microlepis* Misra, *Rec. Indian Mus.*, 45, p. 407.
1953. *Alepocephalus microlepis* Misra, *Rec. Indian Mus.*, 50, p. 390.



TEXT-FIG. 43.—Lateral view of *Alepocephalus microlepis* Lloyd
(After R.E. Lloyd)

B. 6; D. 20-22; P. 10; V. 5-6; A. 30-33; L. 1. 125; L. tr. 30-35

Body oblong, compressed; abdomen non-keeled, non-serrated; dorsal profile gradually convex, ventral profile nearly straight. Head 3·2, depth 5·6—6·0 in total length (3·1 and 5·5 in standard length). Eyes prominent, without adipose lid, 3·3 in head, 1·0 in snout. Upper jaw projecting over lower jaw. Cleft of mouth oblique; maxilla just reaching anterior border of eye. Teeth well developed on premaxillaries, dentaries, very small ones on palatines; 3 or 4 minute teeth on vomer. Opercle covered with brownish, black, soft skin like cranium and snout. Gill openings

large, very side. Pseudobranchiae small. A single dorsal fin; origin a little behind the posterior third of total length, far behind pelvic origin and much nearer to caudal origin than to pectoral base; base 1.8 in anal base. Pectorals not low, short, inserted about $1/4$ eye diameter behind head. Pelvics small, half eye, not reaching anal origin; origin nearer to anal origin than to pectoral base and much before dorsal origin. Anal moderate; origin about an eye diameter before dorsal origin. Anal base 1.8 times dorsal base nearer to pelvic origin than to caudal origin, and far behind middle of total length. Caudal nearly lunate, small, less than half eye diameter. Lateral line present. Scales small, nearly circular. Gill rakers numerous, long, lanceolate, acute. Eight pyloric caeca.

It attains 200 mm. in length and has been obtained at a depth of 1102—1591 m., bathypelagic.

Distribution.—India : Laccadive Sea, $12^{\circ}47'$ N., $73^{\circ}44'45''$ E., 1505—1591 m., South of Cape Comorin, $7^{\circ}37'15''$ N., $76^{\circ}41'$ E., 1102 m., Gulf of Oman, 1260—1280 m., 63° C., in the mean annual isotherm of 20°C . with the latitudinal and longitudinal range of 7° — 23° N., 57° — 76° E. in the Indian Ocean.

75. Genus *Bathytroctes* Günther

1878. *Bathytroctes* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 249 (type, *B. microlepis* Gthr., orthotypic).
1951. *Lepogenys* Parr, *Amer. Mus. Novitat.*, No. 1531, p. 5 (type, *Bathytroctes squamosus* Alc., orthotypic).
1952. *Grimatroctes* Parr, *Bull. Harv. Mus. Comp. Zool.*, 107, No. 4, pp. 263, 265 (type, *Bathytroctes grimaldi*, Zugmayer, orthotypic).

Body elongate, compressed, scales cycloid, moderate, deciduous, present or absent on head. Eyes prominent. Snout moderate, not produced into a long tube. A single series of teeth on premaxilla and maxilla. Gill openings wide, surpassing level of pectorals. Branchiostegals 7. Dorsal and anal fins short; dorsal origin in advance of anal origin. Pelvic origin in advance of dorsal origin. Adipose fin absent. Caudal forked.

Distribution.—Atlantic Ocean : Gulf of Mexico, 767 m., Pernambuco, Brazil, 1234 m., Cape Verde Is., 1442—3655 m., Azores Is., 1442—3655 m., Morocco coast, 1113 m.,

South east of Cape St. Vincent, Portugal, 1992 m., north coast of Africa, 1500—2000 m.; Indian Ocean : between Zanzibar and Seychelles, 1500—2000 m., Gulf of Aden, 1469 m., Laccadive Sea, 1353 m., Andaman Sea, 1500—2000 m., north of Celebes 393 m.; Pacific Ocean : coast of Oregon, North America, 1604 m., Galapagos Is., 2485—3278 m., coast of Ecuador, South America, 1355 m., Gulf of Panama, 2068—2689 m.

Key to species of genus Bathytroctes Günther

1. Maxilla extending to level of midorbit only	<i>B. macrolepis</i>
2. Maxilla extending beyond level of midorbit	3
3. Lateral line scales 50 ; maxilla reaching just behind postorbit	<i>B. squamosus</i>
4. Lateral line scales 70-100; maxilla reaching postorbital level or beyond midorbit	5
5. Lateral line scales 98-100 ; maxilla reaching postorbital level	<i>B. rostratus</i>
6. Lateral line scales 70 ; maxilla not reaching postorbital level	.. <i>B. microlepis</i>

194. *Bathytroctes macrolepis* Günther

1887. *Bathytroctes macrolepis* Günther, "Challenger" Rep., Deep Sea Fish., 22, p. 225, pl. 57 (type locality : North of Celebes, 2150 fms., 3·7° C.; type is in the British Museum).
1899. *Bathytroctes macrolepis* Alcock, Cat. Ind. Deep Sea Fish., p. 174 (Andaman Sea).
1913. *Bathytroctes macrolepis* Weber & de Beaufort, Fish. Indo-Austral. Archipel., 2, p. 103.
1949. *Bathytroctes macrolepis* Misra, Rec. Indian Mus., 45, p. 408.
1952. *Bathytroctes macrolepis* Parr, Bull. Harv. Mus. Comp. Zool., 107, p. 267.
1953. *Bathytroctes macrolepis* Misra, Rec. Indian Mus., 50, p. 390.

B. 7; D. 15; V 8; A. 11; L. 1. 42.

Body elongate, compressed; abdomen non-keeled, non-serrated. Head naked, low, elongate, tapering towards front, less than 3.0, depth 5.5 in standard length. Eye 3.2 in head, longer than snout and double of interorbital.

Jaws subequal. Cleft of mouth oblique; maxilla extending to posterior third of eye. Tooth small, weak, pointed, of equal size, uniserial; intermaxillary and anterior part of maxillary toothless; vomerine teeth in 2 groups, each with 3 teeth; 9 teeth on each palatine. Pseudobranchiae present. Gills very narrow. A single dorsal fin; origin slightly before vent, with its last ray opposite the 4th ray of anal; the anterior rays high, the longest being equal to depth of body below it. Pectorals small. Pelvics reaching beyond vent but not to anal origin; origin nearer to anal origin than to pectoral base and before dorsal. Vent midway between gill opening and caudal base. Anal origin smaller than dorsal; origin behind dorsal origin with the 4th ray opposite the last dorsal ray, and nearer to pelvic origin than to caudal origin; anterior rays high the longest being equal to depth of body above it. Lateral line straight with white mucous apertures. Scales simple, cycloid. Gill rakers long, lanceolate, widely-set, 22 on the outer branchial arch.

Uniform black.

It attains more than 225 mm. in length at a depth of 3,931 m.; abyssal.

Distribution.—India : Andaman Sea, Bay of Bengal.—North of Celebes 3931 m., in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 12° N.—2° S., 92°—120° E. in the Indo-Pacific (12° N. 92° E. in the Bay of Bengal + 2° S., 120° E. in the Pacific Ocean).

195. *Bathytroctes microlepis* Günther

- 1878. *Bathytroctes microlepis* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 249 (type locality : South east of Cape St. Vincent, 1090 fms.; 3·1° C.
- 1889. *Bathytroctes microlepis* Alcock, *Ann. Mag. nat. Hist.*, (6) 4, p. 452 (Andaman Sea, 8 miles south east of Cinque Island, 500 fms.).
- 1899. *Bathytroctes microlepis* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 174 (Andaman Sea).
- 1941. *Bathytroctes microlepis* Herre, *Mem. Indian Mus.*, 13, p. 335.
- 1949. *Bathytroctes microlepis* Misra, *Rec. Indian Mus.*, 45, p. 408.
- 1952. *Grimatiroctes microlepis* Parr, *Bull. Harv. Mus. Comp. Zool.*, 107, p. 266.

1953. *Bathytroctes microlepis* Misra, *Rec. Indian Mus.*, **50**, p. 391.

B. 7; D. 16; V 8; A. 17; L. 1. *ca* 70.

Body elongate, compressed; abdomen non-keeled, non-serrated. Eyes very large. Cleft of mouth wide; maxilla extending below posterior third of eye. Intermaxillary, maxillary and mandible with a series of minute teeth; similar teeth on vomer and palatines, but none on tongue. Gills very narrow. Pseudobranchiae present. A single dorsal fin; origin behind pelvics and before anal origin, Pectorals small. Pelvics small; origin before dorsal origin, nearer to anal origin than to pectoral base. Anal nearly equal to dorsal, origin nearer to pelvic origin than to caudal origin. Scales small, cycloid. Lateral line present. Gill rakers long, lanceolate.

It attains 200 mm. in length and has been obtained at a depth of 1993 m.; bathypelagic.

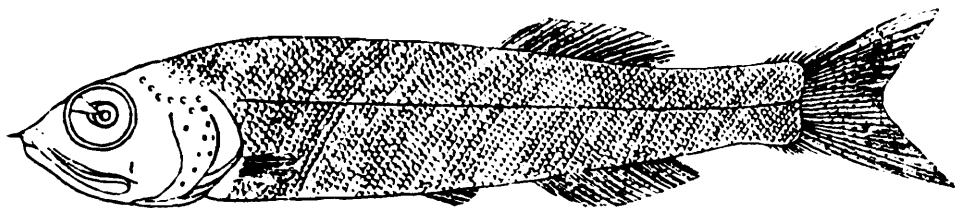
Distribution.—India : Andaman Sea, 8 miles south east of Cinque I., 914 m.—South east of St. Vincent, Portugal, 1993 m., 3.1° C., in the mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of $12^{\circ} 49' 30''$ N., $92^{\circ} 24' 30''$ E. in Bay of Bengal and 36° N., 7° W. in the Atlantic Ocean.

196. *Bathytroctes rostratus* Günther

(Text-fig. 44)

1878. *Bathytroctes rostratus* Günther, *Ann. Mag. nat. Hist.*, (5) **2**, p. 250 (type locality : Pernambuco, $8^{\circ} 37'$ S., $34^{\circ} 28'$ W. 675 fms., 4° C.).
1906. *Bathytroctes rostratus* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 17, 370, pl. 14. figs. 2, 3 (Bay of Bengal, $7^{\circ} 1' 2''$ N., $85^{\circ} 56' 5''$ E., 1500-2000 m., 3.5° - 5.7° C. between Zanzibar & Seychelles, Gulf of Aden, Diego Garcia).
1933. *Bathytroctes rostratus* Beebe, *Zoologica*, **16**, No. 2, p. 36 ($32^{\circ} 12'$ N., $64^{\circ} 36'$ W., Western Atlantic).
1949. *Bathytroctes rostratus* Misra, *Rec. Indian Mus.*, **45**, p. 408.

1953. *Bathytroctes rostratus* Misra, *Rec. Indian Mus.*, 50, p. 390.



TEXT-FIG. 44.—Lateral view of *Bathytroctes rostratus* Gthr. (After Brauer)

B. 7; D. 17-20; P. 16-17; V 9; A. 16-17; L. 1. 98-100; L. tr. 22.

Body elongate, compressed; abdomen non-keeled, non serrated; dorsal profile a little more arched than ventral profile. Head 4.2, depth 5.8 in total length (3.5 and 4.8 in standard length). Eyes prominent, without adipose lid, 3 in head, 0.7 in snout, 1.5 in interorbital. Cleft of mouth wide, oblique; maxilla reaching to hind border of eye. Anterior pair of premaxillary teeth projecting, trunk-like. Maxillaries and mandibles with a series of minute teeth, similar teeth on vomer and palatines, but none on tongue, Pseudobranchiae present. Gills very narrow. A fleshy, black, supraclavicular process immediately behind. A single dorsal fin; origin behind opercle in the middle of total length, nearer to caudal origin than to pectoral base, and eye diameter before anal origin. Pectorals low, small, equal to eye. Pelvics small, 0.7 in eye; not reaching anal origin, nearer to anal origin than to pectoral base and about an eye diameter before dorsal origin. Anal base more or less equal to dorsal; origin nearer to pelvic origin and caudal origin and below 5th ray of dorsal. Caudal forked, 1.1 in head with rudimentary rays at base. Lateral line straight. Scales small, cycloid. Gill rakers long, lanceolate.

Greyish brown to violet black, head sometimes lighter; eye bluish.

It attains 164 mm. in length and has been obtained at a depth 1113—2000 m., bathypelagic.

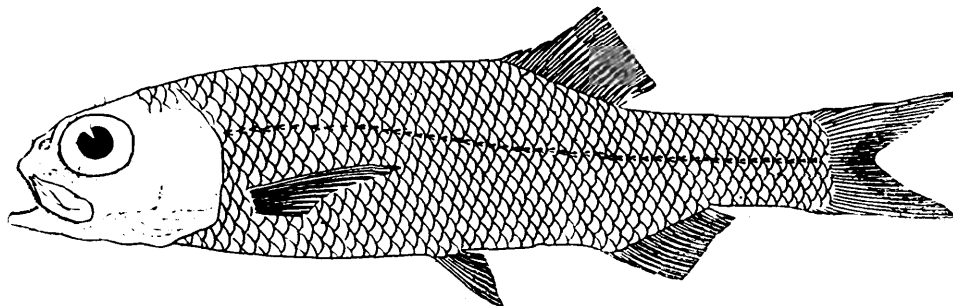
Distribution.—India : Bay of Bengal, 7°1' 2" N., 85° 56' 5" E., 1500—2000 m., 3.5° to 5.7°C.—Pernambuco, Brazil, 1234 m., 4° C., Morocco coast, 1113 m., 8° C., Gulf of Gascony, North east Coast of Africa 9°6'1" N., 53° 41'2" E., 1500—2000 m., 3.5° to 5.7° C., between Zanzibar and

Seychelles 4°5' S., 48°58' 6" E., 1500—2000 m., 3.5 to 5.7° C.; Diego Garcia, 6° 19' 3" S., 73° 18' 9" E., 1900 m., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 9°N.—6° S., 48°—85°E. in the Indian Ocean and 44° N.—8°S., 2°—34° W. in the Atlantic Ocean.

197. ***Bathytroctes squamosus* Alcock**

(Pl. IV; fig. 7; Text-fig. 45)

1890. *Bathytroctes squamosus* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 303 (type locality : Arabian Sea, 15° 2' N., 72° 34' E., 740 fms., 6.7°C.; type is in the Zoological Survey of India).
1892. *Bathytroctes squamosus* Alcock, *Ill. Zool. Investig. Fish.*, pl.5, fig. 1.
1899. *Bathytroctes squamosus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 173 (Arabian Sea, off the Laccadives, 740 fms).
1913. *Bathytroctes squamosus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 101 (Bali sea, 1018 m.).
1949. *Bathytroctes squamosus* Misra, *Rec. Indian Mus.*, 45, p. 408.
1951. *Lepogenys squamosus* Parr, *Amer. Mus. Novitat.*, No. 1531, p.5.
1953. *Bathytroctes squamosus* Misra, *Rec. Indian Mus.*, 50, p. 390.



TEXT-FIG. 45.—Lateral view of *Bathytroctes squamosus* Alc.
(After A. Alcock)

B. 7; D. 17; P. 10; V. 9; A. 17; C. ca 35; L. l. ca 50; L. tr. 15.

Body oblong, compressed; abdomen non-keeled. Dorsal profile more arched than ventral profile. Head 4.4, depth 4.8 in total length (3.8 and 4.2 in standard length). Eyes without adipose lid, very prominent, 3.6 in head, 0.5 in snout. Cleft of mouth oblique, maxilla extending just behind midorbit. Teeth small, even, acute, uniserial, recurved in premaxilla, mandible, palatines and vomer, procurvent or procurved in maxillary. Tongue large, A row of pores along limb of mandibles. Pseudobranchiae large, coarse. Gill opening very wide, gill membranes entirely separate; 4th gill cleft occluded. A single dorsal fin; origin behind middle of total length, nearer to caudal origin than to pectoral base, about an eye diameter behind pelvic origin, and much before anal origin.

Pectorals low, long, narrow, just reaching pelvic base, 1.2 in head. Pelvics moderate, broad, 1.1 times eye, reaching slightly beyond vent but not anal origin; origin nearer to anal origin than to pectoral base and about an eye diameter before dorsal. Anal base slightly less than dorsal base; origin just below last 3rd dorsal ray, nearer to cauda origin than to pelvic origin. Caudal symmetrically forked 1.3 in head. Lateral line nearly straight. Scales cycloid, moderate; deciduous, except on lateral line where adherent and perforated; scales on cheeks and opercle. Gill rakers long, close-set on first three arches, longest on the first. 5—6 large pyloric caeca.

Head uniform, deep black, body pinkish brown, fins transparent grey; buccal membrane and entire peritoneum black.

It attains 257 mm. (10 inches) in length and is found at a depth 1018—1353 m.; bathypelagic.

Distribution.—India : off the Laccadives, Arabian Sea, 15° 2' N., 72° 34' E. 1353 m., 6.7°C.—Bali Sea, 1018 m., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 15°N., 72°E. in the Arabian Sea and 8°S., 115°E. in the Pacific Ocean.

76. Genus *Narcetes* Alcock

1890. *Narcetes* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 305 (type, *N. erimelas* Alc., orthotypic).

Body elongate, compressed, scales moderate. Eye rather small. Snout moderate, not produced into a long tube. Premaxilla, maxilla, mandible, palatine and vomer toothed; tooth on premaxilla and mandible pluriserial. Gill openings wide, surpassing level of pectorals. Gills 4. Opercle complete. Gill rakers long. Branchostegals 7. Dorsal fin in posterior half of body; dorsal origin in advance of anal origin. Pelvic origin opposite to or before dorsal origin. Anal entirely behind dorsal. Adipose fin absent. Caudal forked. Pyloric caeca in moderate number.

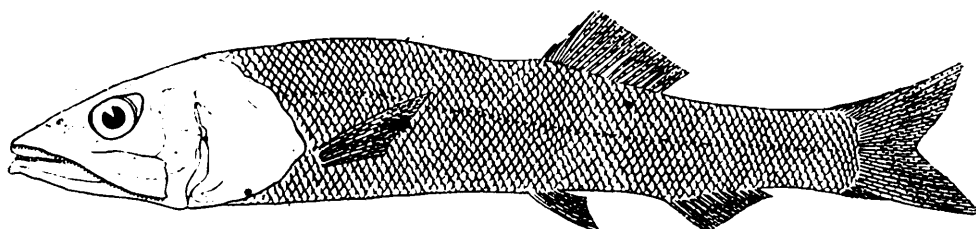
Distribution.—Gulf of Oman, 1837 m., Arabian Sea, 1353 m., West of Gulf of Panama, 1547 m.

13—1341 ZSI/71

198. *Narcetes erimelas* Alcock

(Pl. V, fig. 1; Text-fig. 46)

1890. *Narcetes erimelas* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 305
(type locality : Arabian Sea, 15° 2' N., 72° 34' E. 740 fms.,
6.7° C.; type is in the Zoological Survey of India).
1892. *Narcetes erimelas* Alcock, *Ill. Zool. Investig. Fish.*, pl. 4, fig. 1.
1899. *Narcetes erimelas* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 175
(Arabian Sea, near Laccadive Is., 740 fms.).
1949. *Narcetes erimelas* Misra, *Rec. Indian Mus.*, 45, p. 408.
1953. *Narcetes erimelas* Misra, *Rec. Indian Mus.*, 50, p. 391.



TEXT-FIG. 46.— Lateral view of *Narcetes erimelas* Alc. (After A. Alcock)

B. 7; D. 15-16; P. 10-11; V 9; A. 12; C. ca 35; L. 1. 68-83.

Body elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile more arched than ventral profile. Head broad, pyramidal, naked, 3.2, depth 6.0 in total length (2.8 and 5.2 in standard length). Head bones sculptured, the opercle and preopercle with their border augmented by a semimembranous, striated fringe, Eyes small, 5.4 in head, interorbital deeply crenate, slightly less than eye. Snout nearly as broad as long, depressed, rounded from side to side with its dorsal and ventral profiles meeting at an acute angle, 3.5 in head, 1.5 times eye. Nostrils very large, close to eye. Cleft of mouth wide, oblique; maxilla reaching posterior border of orbit. Teeth small, even, uniform, acute; those in jaws standing uncoveredly by lips outside the mouth; those in premaxilla and mandibles recurved, quadriserial anteriorly and triserial laterally in the premaxilla, biserial in the mandibles; those in the maxilla uniserial, procurved or procured; those in palatines uniserial, incurved; those on vomer recurved in a group of 2 or 3 on each side; tongue toothless. A row of 6 pores along limb of mandibles. Pseudobranchiae large. Gill openings very wide, gill membranes entirely separate. Opercles large, complete. 4th gill cleft wide. A single dorsal fin; origin to snout length behind middle of

total length and opposite to pelvic origin, nearer to caudal origin than to eye. Pectorals low, moderate, broad, 1.9 in head. Pelvics broad, 3.1 in head; origin opposite to dorsal origin, nearer to anal origin than to pectoral base. Anal base 1.2 in dorsal base; origin about an eye diameter or 2 rows of scales behind last dorsal ray and nearer to pelvic origin than to caudal origin. Caudal forked, with rudimentary rays at base, 2.1 in head. Lateral line almost straight. Scales moderate, deciduous. Gill rakers on the 1st arch close-set, finely pointed, as long as eye, gill laminae very narrow, delicate. 10 very large pyloric caeca.

Head, iris, body, fins, inside of mouth and gill chambers and entire peritoneum deep black.

It attains 343 mm. in length and has been obtained at a depth of 1353 m., bathypelagic, endemic.

Distribution.—India : North-west of Laccadive Is., Arabian Sea, 15° 2' N., 72° 34' E. 1353 m., 6.7°C., in the mean annual isotherm of 20° C.

77. Genus *Xenodermichthys* Günther

1878. *Xenodermichthys* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 250 (type *X. nodulosus* Gthr., orthotypic).

1884. *Aleposomus* Gill, *Amer. nat.*, 18, p. 433 (type, *A. copei* Gill).

Body low, moderately elongate, compressed, scaleless or with minute rudimentary scales. Tubercular luminous organs at least on trunk. Snout moderate, not produced into a long tube. Premaxilla, maxilla and mandible toothed : palate toothless. Skin thick on head and abdomen. Gill openings wide, surpassing level of pectorals. Branchiostegals 6 or 7. Dorsal and anal fins in posterior half of body ; their origins opposite to each other. Pelvic origin far in advance of dorsal origin and almost in the same horizontal line with the pectoral origin. Adipose fin absent. Caudal forked.

Distribution.—Atlantic Ocean : East coast of North America, 5317 m., coast of Morocco, 717—1350 m.; Indian Ocean : Gulf of Aden, 457—1080 m., Zanzibar, 640—658 m., Arabian Sea, 786—1240 m., Bay of Bengal, 786—

1240 m., Andaman Sea, 676—767 m., west coast of Sumatra, 750—1143 m.

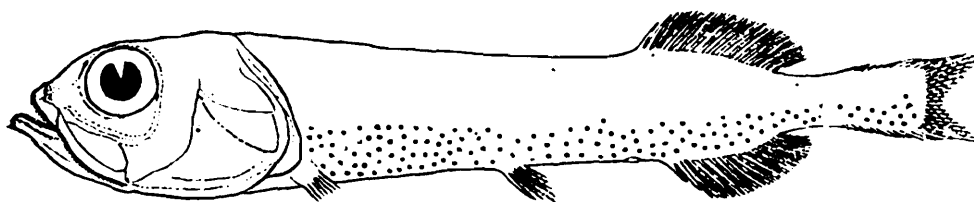
Key to species of genus Xenodermichthys Günther

1. Lateral line inconspicuous, without scales *X. guentheri*
2. Lateral line conspicuous, with underlying scales *X. squamilaterus*

199. *Xenodermichthys guentheri* Alcock

(Pl. V, fig. 2; Text-fig. 47)

1892. *Xenodermichthys guentheri* Alcock, *Ann. Mag. nat. Hist.*, (6) 10, p. 359, pl. 18, fig. 3 (type locality : Bay of Bengal, 15° 43' 30" N., 91° 8' 30" E., 678 fms., 5·6° C.; type is in the Zoological Survey of India).
1899. *Xenodermichthys guentheri* Alcock, *Cat. Ind. Deep Sea Fish.* p. 180 (Bay of Bengal, off Madras Coast, 678 fms.; Arabian Sea, off Travancore coast, 7° 17' 30" N., 70° 54' 30" E., 430 fms., 8·3° C., surface temperature 27·8° C.).
1900. *Xenodermichthys guentheri* Alcock, *Ill. Zool. Investig Fish.*, pl. 32, fig. 2.
1939. *Rouleina guentheri* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 15 (Gulf of Aden, 13° 3'-13° 6' 42" N., 46° 21' 30"-46° 21' 42" E., AT, 1022-1080 m.).
1949. *Xenodermichthys guentheri* Misra, *Rec. Indian Mus.*, 45, p. 409.
1953. *Xenodermichthys guentheri* Misra, *Rec. Indian Mus.*, 50, p. 391.



TEXT-FIG. 47.—Lateral view of *Xenodermichthys guentheri* Alc.
(After A. Alcock)

B. 6; D. 15; P. 5; V. 6; A. 14.

Body elongate, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles symmetrically similar. Head 3.2, depth 7.0 in total length (3.1 and 6.6

in standard length). Eyes prominent, encroaching upon dorsal profile, 3.5 in head, $\frac{2}{3}$ diameter apart, 0.6 in snout. Snout obtuse, surmounted by an acutely pointed tubercle projecting from the prominent symphysis of lower jaw. Cleft of mouth oblique, jaws even in front but for the symphy-sical tubercle over mandible; maxilla extending to postor-bit; premaxilla forming on each side nearly half the extent of the margin of upper jaw. Teeth uniserial, minute close-set on premaxilla and maxilla; broad and boat-shaped on mandible; no teeth on palatines and vomer. Gill openings extremely wide, extending forwards almost to the mandibular symphysis and upwards almost to the post-temporal region. Opercle together with branchiostegal rays enveloped in a thick membraneous skin. Pseudobranchiae present. A single dorsal fin in the posterior third of body; origin opposite to vent, slightly before anal origin and 2 eye diameters behind pelvic origin; its base 1.1 times anal base. Pectorals small, half in eye, almost in the same horizontal line with the pelvics on the ventral profile. Pelvics equal to eye; origin just behind the middle of total length, nearer to anal origin than to pectoral base nearly two eye diameters before dorsal origin. Anal origin close behind vent, slightly behind dorsal origin, 1.1 in dorsal base and midway between caudal and pelvic origins. Vent nearer to anal origin than to pelvic origin. Caudal forked, 2.1 in head to pelvic origin; with rudimentary rays at its base, approaching anal by an eye diameter. No lateral line distinguished in life. Scaleless, with longitudinally wrinkled black skin embedded with scattered granular, yellowish colour nodules. Gill-rakers numerous, long, close-set on the first arch. 7 or 8 pyloric caeca, the posterior six relatively enormous.

Uniform jet black.

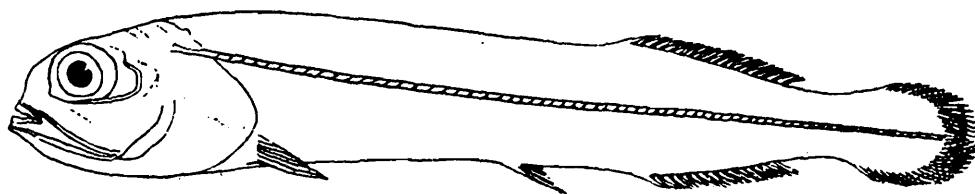
It attains 152 mm. in length and has been obtained at a depth of 1022—1240 m., bathypelagic.

Distribution.—India : off Travancore coast, Arabian Sea $7^{\circ} 17' 30''$ N. $76^{\circ} 54' 30''$ N., 786 m., 8.3° C. off Madras Coast, Bay of Bengal $15^{\circ} 43' 50''$ N., $91^{\circ} 8' 30''$ E. 1240 m., 5.6° C.—Gulf of Aden 1022—1080 m; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 7° — 15° N., 46° — 91° E. in the Indian Ocean.

200. *Xenodermichthys squamilaterus* Alcock

(Pl. V, fig. 3; Text-fig. 48)

1898. *Xenodermichthys squamilaterus* Alcock, *Ann. Mag. nat. Hist.*, (7) 2, p. 148 (type locality : off the Andamans, 14° 13' N., 93° 40' E., 370-419 fms. 8.3° C.; type is in the Zoological Survey of India).
1899. *Xenodermichthys squamilaterus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 181 (Andaman Sea, 370-419 fms.).
1900. *Xenodermichthys squamilaterus* Alcock, *Ill. zool. Invest. Fish*, pl. 25, fig. 4.
1941. *Xenodermichthys squamilaterus* Herre, *Mem. Indian Mus.*, 45, p. 409.
1953. *Xenodermichthys squamilaterus* Misra, *Rec. Indian Mus.*, 50, p. 391.



TEXT-FIG. 48.—Lateral view of *Xenodermichthys squamilaterus* Alc.
(After A. Alcock)

B. 6; D. 20; P. 6; V. 6; A. 18.

Body elongate, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles more or less alike. Head 3.8, depth 6.1 in total length (3.7 and 5.9 in standard length). Eyes moderately prominent, 4.0 in head, 0.6 in snout. Snout blunt. Cleft of mouth oblique; maxilla extending to postorbit. Teeth uniserial, minute, close-set, on premaxilla, maxilla and mandible, none on palatines and vomer. Gill openings very wide. Pseudobranchiae present. A single dorsal fin in the posterior third of body; origin before anal, about one and a quarter eye diameters behind pelvic origin; its base 1.1 times the anal base. Pectorals low, 1.2 times eye. Pelvics almost equal to eye; origin just behind the middle of total length, nearer to anal origin than to pectoral base and one and a quarter eye diameters before dorsal origin. Anal origin close behind dorsal base, 1.1 in dorsal base, nearer to pelvic base than to caudal origin. Caudal rounded, 2.1 in head, with rudimentary rays at its base, approaching anal rays by an eye diameter. Lateral line distinct as a tube running down the middle of body and stiffened by their subcutaneous equidistant scales with a pore between every two scales.

Jet uniform black.

It attains 152 mm. in length and has been obtained at a depth 676—766 m., bathypelagic, endemic.

Distribution.—India : Andaman Sea, Bay of Bengal, 14° 13'N., 93° 40'E., 676—766 m., 8.3° C., in the mean annual isotherm of 20° C.

78. Genus *Leptoderma* Vaillant

1886. *Leptoderma* Vaillant, *Comptes Rendus, Ac. Sci. Paris*, 103, p. 1239 (type, *L. macrops* Vaillant, orthotypic).

Body low, exceedingly elongate, tail tapering almost to a filament, without scales. Head moderate. Eyes large. Snout moderate, not produced into a long tube. A series of small teeth in both jaws; none on palate. Gill openings wide but not surpassing level of pectorals. Pseudobranchiae. Lanceolate, close-set gill rakers. Dorsal and anal very long, ending near caudal, anal the longer. Dorsal origin behind anal origin. Pectorals high. Pelvic origin in advance of dorsal origin. Adipose fin absent. Caudal small, forked.

Distribution.—Morocco coast, 1139—2330 m., Sudan, 1139—2330 m., Bay of Bengal, 1375 m.

201. *Leptoderma affinis* Alcock

(Pl. V, fig. 4 ; Text-fig. 49)

1892. *Leptoderma macrops* (nec Vaillant) Alcock, *Ann. Mag. nat. Hist.*, (6) 10, p. 361 (type locality : Off Kistna Delta, Bay of Bengal, 753 fms., 5.1° C.; type is in the Zoological Survey of India).

1899. *Leptoderma affinis* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 182 (type locality : Bay of Bengal, off Kistna Delta, 753 fms.).

1900. *Leptoderma affinis* Alcock, *Ill. Zool. Investig. Fish.*, pl. 32, fig. 3.

1949. *Leptoderma affinis* Misra, *Rec. Indian Mus.*, 45, p. 410.

1953. *Leptoderma affinis* Misra, *Rec. Indian Mus.*, 50, p. 392.



TEXT-FIG. 49.—Lateral view of *Leptoderma affinis* Alc. (After A. Alcock)

D. ca 66; V. 5; A. ca 85.

Body elongate, low, tapering to tail; abdomen non-keeled, non-serrated; dorsal profile gradually convex, ventral horizontal. Head 4.2, depth 9.0 in total length (3.9 and 8.3 in standard length). Eyes very prominent, 3.0 in head, 0.7 in snout. Snout squarish. Mouth terminal, maxilla being vertical when mouth opened; maxilla very broad, of 3 pieces. Rami of mandible very broad posteriorly, narrow anteriorly, with a series of small teeth. A series of small teeth on premaxilla; none on maxilla or palate. Gill openings wide, but not surpassing level of pectorals; upper arc of gill arches truncated. Pseudobranchiae small. A single long, dorsal fin; origin behind middle of total length, and behind anal origin by a distance equal to postorbital portion of head; dorsal base reaching caudal origin, 1.2 in anal base. Pectorals small, high, in level with middle of eye, 3.0 in head or equal to eye. Pelvics small, a little less than eye; origin before middle of total length, nearer to anal origin than to pectoral base, at a distance equal to the length of head without snout from the gill opening. Anal very long; origin behind middle of total length and before dorsal origin by a distance equal to postorbital portion of head; its base 1.2 times dorsal base, reaching caudal fin. Vent nearer to pelvic origin. Caudal deeply forked, a little less than eye. Lateral line of a row of pores extending from occiput to caudal. Gill rakers numerous, close-set, lanceolate.

Skin naked, in life uniformly covered with thick velvety, opalescent epidermis probably luminous in function. Purple, the contracted opalescent epidermis forming a sort of bloom (in spirit).

It attains 223 mm. in length and has been obtained at a depth 1377 m., bathypelagic, endemic.

Distribution.—India : off Krishna delta, 16°N. 62°E., Bay of Bengal, 1377 m., 5.1°C., in the mean annual isotherm of 20° C.

XXV Family SEARSIDAE

Body elongate, compressed or deep with a conspicuous dorsal comb and a ventral keel or devoid of a conspicuous dorsal comb and ventral keel; abdomen non-keeled, non-serrated. Head naked or scaly. Cleft of mouth oblique.

Photophores present or absent. Eyes very prominent. Teeth uniserial. Branchiostegals 4—7. Pseudobranchiae. Shoulder organ present. Opercle complete, large. Pelvics present or absent. Anal moderate, opposite dorsal. A single dorsal fin. No adipose fin. Single or two supermaxillaries. Lateral line distinct. Scales small, cycloid. Deep-sea fishes.

The family SEARSIDAE is represented by a single subfamily *PLATYTROCTINAE* in the Indian region.

ix. Subfamily *PLATYTROCTINAE*

Body deep, compressed with a conspicuous dorsal comb and a ventral keel. Head naked. Cleft of mouth oblique. No regular photophores, but a median dorsal and ventral row of scales with black pigmentation present or absent; supra and infracaudal luminous scales always present. Ventral present or absent. Two supermaxillaries.

The subfamily *PLATYTROCTINAE* is represented by two genera in the Indian region.

Key to the genera of subfamily PLATYTROCTINAE

1. Pelvics present	Platytröctegen
2. Pelvics absent	Platytröctes

79. Genus **Platytröctes** Günther

1878. *Platytröctes* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 249 (type, *P. apus* Gthr., orthotypic).

Body oblong, elevated, compressed, scales small. A median dorsal and ventral row of scales with black pigmentation; supra and infra caudal luminous scales. Eyes large. Snout wide, not produced into a long tube. Premaxilla, maxilla, mandible and vomer uniserially toothed. Gill openings wide, surpassing level of pectorals. Branchiostegals 5—6. Dorsal and anal fins in posterior half of body; their origins opposite to each other. Pelvics absent. Adipose fin absent. Caudal forked.

Distribution.—Mid-Atlantic Ocean, 2742 m., Cape Verde 1., 2500 m., Arabian Sea, 1353 m.

202. *Platyroctes apus* Günther

1878. *Platyroctes apus* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 249
(type locality : mid-Atlantic, 1° 22' N. 26° 36' W. 1500 fms., 3·7° C.
1890. *Platyroctes apus* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 307
(Arabian Sea, 15° 2' N., 72° 34' E., 740 fms., 3·7° C., surface temperature, 28. 3° C.).
1899. *Platyroctes apus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 177
(Arabian Sea, in the neighbourhood of the Laccadive banks, 740 fms.).
1900. *Platyroctes apus* Brauer, "*Valdivia*" *Tiefsee Fische*, p. 370
(Mid-Atlantic, Arabian Sea).
1949. *Platyroctes apus* Misra, *Rec. Indian Mus.*, 45, p. 409.
1953. *Platyroctes apus* Misra, *Rec. Indian Mus.*, 50, p. 391.
1960. *Platyroctes apus* Parr, *Dana Report*, No. 51, p. 34, figs. 22-26
(Mid-Atlantic 21° 57' N., 22° 58' W., 5000 m., wire, 1 specimen 153·5 mm. in length; the Pacific off the coast of Panama 6°-7° N., 78°-80°W., 3500-4500 m. wire, 9 specimens 36.5-152 mm. in length; off the Philippines, 4° 3' N., 123° 26' E., 500 m., wire, 1 specimen 123·5 mm. in length; Java sea, 4° 20' S., 116° 46' E., 5000 m. wire, 1 specimen 60 mm. in length).

B. 5—6; D. 17—21; P. 19—22; A. 15—19; L. 1. *ca* 100

Body oblong, much compressed; abdomen non-keeled, non-serrated. Head 3.5, depth more than one third of standard length (More than half the depth of body contributed by simple dorsal and ventral folds of skin into which neither muscles nor viscera enter). Eyes prominent, longer than snout. Nostrils large, superior, nearer to snout end than to eye. Snout 3.0 or a little more in head, almost entering dorsal profile. The narrow triangular interorbital and the occiput sharply concave and bordered on each side by mucuous canal with large pores; a similar canal with pores along preorbital and another one along the free edge of preopercle. Mouth rather short, but broad. Lower jaw projecting when open. Maxilla broad, petal-shaped reaching to or a little beyond front boarder of eye. Limbs of mandible as a curious boat-shaped bone. Teeth uniserial, small, even in premaxilla, maxilla and in front

half of mandible; a small tooth on either side of the head of vomer; no teeth on palatines. Pseudobranchiae present. Gills very narrow; gill laminae very short. A single dorsal; origin opposite to anal. Dorsal and anal fins opposite to each other, on tail. Pectorals short, about half as long as eye; its base nearly horizontal. Clavicles project freely at their symphysis as a pair of spikes separated only at tip. Pelvics absent. Vent much nearer to caudal origin than to gill opening, with dorsal origin immediately above it and anal origin immediately behind it. Caudal forked. Lateral line present. Scales small, cycloid; those near the dorsal and ventral profiles and many of the others with keel-like scales of many snakes. Gill rakers on first branchial arch long, extremely numerous, 9—10+35—37 and close-set. Pyloric appendages rudimentary.

Brown; head, pectoral region, vent and edges of caudal peduncle black (in spirit).

It attains 252 mm. in length and has been obtained at a depth of 1353—2743 m.; abyssal.

Distribution.—India : in the neighbourhood of the Laccadive banks, Arabian Sea, 15° 2' N., 72° 34' E., 1353 m., 3.7°C.—Mid-Atlantic, 2743 m., 2.8°C., Pacific, off the coast of Panama, 6°—7° N., 78°—80° W., 3500—4500 m. wire; off the Philippines, 4°3' N., 123° 26' E., 500 m. wire; Java Sea, 4°20' S., 116° 46' E., 5000 m. wire; Mid-Atlantic, 21° 57' N., 22° 58' W., 5000 m. wire; in the mean annual isotherm of 20° C. in 15° N.—7° S., 72° E.—80° W. in the Indo-Pacific=(15° 2' N., 72° 34' E. in the Arabian Sea +7° N.—4° S., 116° E.—80° W. in Pacific Ocean and 1°—20° N., 21°—26° W. in the Atlantic).

80. Genus *Platytroctegen* Lloyd

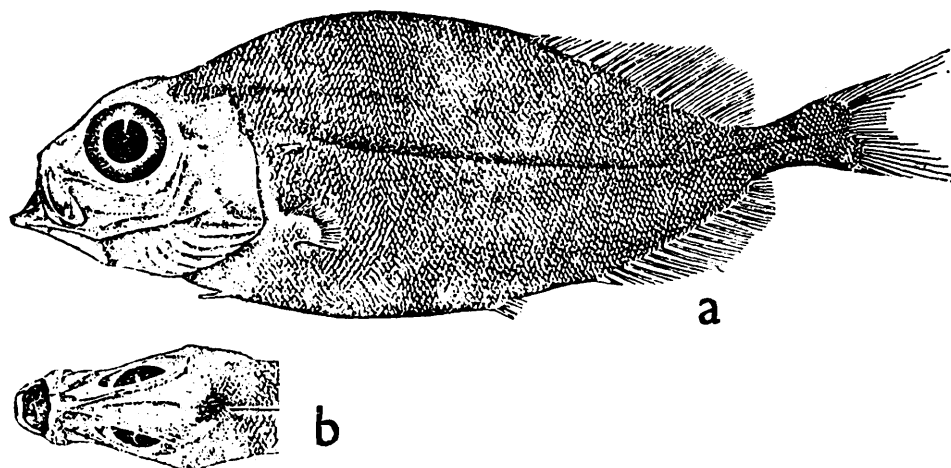
1909. *Platytroctegen* Lloyd, *Mem. Indian Mus.*, 2, p. 145 (type, *P. mirus* Lloyd, orthotypic).

Resembling the previous genus *Platytroctes* Gthr., but differing from it mainly in the possession of a small, well developed pelvic fins and non-keeled scales.

Distribution.—India : Laccadive Sea, 914 m.

203. *Platytroctegen mirus* Lloyd
(Text-fig. 50)

1909. *Platytroctegen mirus* Lloyd, *Mem. Indian Mus.*, 2, p. 145 (type locality : Laccadive Sea, 12° 18' 46'' N., 74° 5' 29'' E., 500 fms; bottom temperature 7.6° C., surface temperature 25.3° C.: nature of soil green mud, globigerina ooze; by Agassiz trawl).
1960. *Platytroctegen mirus* Parr, *Dana Report*, No. 51, p. 38, figs. 27 & 28.



TEXT-FIG. 50.—(a) Lateral view of *Platytroctegen mirus* Lloyd
(b) Dorsal view of head (After R.E.Lloyd)

B. 6; D. 24(23½); P. 26—28; V 5; A. 24(23½); L.1. ca 105.

Body oblong, compressed; abdomen non-keeled, non-serrated. Head slightly more than a quarter, depth one third of standard length. Empty dorsal and ventral folds of skin. Eye less than one-third head. Snout equal to half eye diameter, forming the body contour. Upper surface of head triangular, nearly flat, bounded on either side by straight, supraorbital ridges converging in front. The supraorbital ridge, infraorbital and the preopercle, each supporting a muciferous canal opening at intervals. A small, tubular papilla with an apical pore on skin at a short distance behind opercle on a level with the centre of eye. Minute, uniserial teeth on premaxilla, maxilla and dentary; a few small teeth on vomer; palatines toothless. Left opercle overlapping the right one at its lower edge, with an extra or 7th small branchiostegal ray not represented on right side. Dorsal and anal fins opposite to each other, on tail. Pectorals short; clavicles projecting at their symphysis as a pair of spikes not separated at tip. Pelvics present. Caudal forked. Lateral line present.

Scales small, cycloid, non-keeled. Gill rakers of the front arch longer than others; gill filaments and rakers nearly a third of eye diameter.

Uniform black.

It attains 130 mm. in length and has been found at a depth of 914 m.; bathypelagic, endemic.

Distribution.—India : Laccadive Sea, 12° 18' 46'' N., 74° 5' 29'' E. 914 m., 7.6° C., surface temperature 25.3° C., in the mean annual isotherm of 20° C.

XXVI. Family DOLICHOPTERYGIDAE

Body elongate, compressed abdomen non-keeled, non-serrated. Head naked. Eyes large or moderate, lateral or telescopic. Snout produced into a long tube ending in a narrow mouth. Margin of upper jaw formed equally by premaxilla and maxilla. Uniserial teeth in jaws only. Opercle complete. Gill openings wide below, restricted above, not surpassing level of pectorals. Pseudobranchiae rudimentary. Branchiostegals 5. A single short dorsal fin in the posterior part of body. Pectorals and pelvics well developed. Anal much longer than or equal to or shorter than dorsal. No adipose fin. Caudal forked. Distinct lateral line. Scales minute, cycloid.

The family DOLICHOPTERYGIDAE is represented by a single genus in the Indian region.

81. Genus *Aulastomatomorpha* Alcock

1890. *Aulastomatomorpha*, Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 307 (type, *A. phosphorops* Alc., orthotypic).

Body elongate, scales minute. Head scaleless. Eyes large, non-telescopic. Snout produced into a long tube ending in a small mouth. Uniserial teeth in jaws only. No shoulder organ. Gill openings wide below, contracted above, where it does not surpass level of pectoral fins. Branchiostegals 5. Gills 4. Pseudobranchiae rudimentary. Opercle complete. Dorsal fin short, in the posterior part of body. Dorsal origin behind anal origin. Pelvic origin in front of anal and dorsal origins. Anal very long. Adipose fin absent. Caudal forked. A few small pyloric caeca.

Distribution.—Arabian Sea, 1828 m.

204. *Aulastomatomorpha phospherops* Alcock
(Pl. v, fig. 5; Text-fig. 51)

1890. *Aulastomatomorpha phospherops* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 307 (type locality : Laccadive Sea, 11° 12' 47" N., 74° 25' 30" E., 100° fms.; 3·7° C., surface temperature 28·3° C., type is in the Zoological Survey of India).
1892. *Aulastomatomorpha phospherops* Alcock, *Ill. Zool. Investig. Fish.*, pl. 5, fig. 2.
1899. *Aulastomatomorpha phospherops* Alcock, *Cat. Ind. Deep Sea Fish.* p. 178 (Arabian Sea, near the Laccadives, 1000 fms.).
1949. *Aulastomatomorpha phospherops* Misra, *Rec. Indian Mus.*, 45, p. 410.
1953. *Aulastomatomorpha phospherops* Misra, *Rec. Indian Mus.*, 50, p. 393.



TEXT-FIG. 51.—Lateral view of *Aulastomatomorpha phospherops* Alc.
(After A. Alcock)

B. 5; D. 21; P. 7; V 6; A. 41.

Body elongate, compressed, with a narrow, continuous, thick, succulent fold of integument from the mid-dorsal line behind the nape to midventral line behind the vent; abdomen non-serrated, non-keeled; dorsal and ventral profiles equally convex. Head rather low, depressed, 3.5, depth 6.4 in total length (3.1 and 5.8 in standard length); completely covered with thick, spongy, dazzling white, probably luminous skin. Eyes very large, prominent; 5 in head, 2.2 in snout; interorbital less than half eye. Snout produced into a long tube, about 2.2 in head, ending in a terminal mouth. Jaws apparently with limited motion, upper jaw projecting slightly over lower and formed in the anterior half by the premaxilla and the posterior half by maxilla. Teeth minute, acute, recurved and uniserial on the premaxilla and mandible; maxilla toothless. Gill openings very wide below, restricted above, not surpassing the level of pectorals. Opercles complete with their bones including the branchiostegal rays, though well calcified, extremely thin, fragile and completely concealed within

a continuous fold of skin and mucous membrane. Gills with narrow laminae and coarse lamellae; 4th gill cleft wide. Pseudobranchiae rudimentary, of 4 or 5 delicate, short lamellae on each side. A single short dorsal fin; origin slightly in advance of the posterior fourth of the body minus the caudal, nearly three eye diameters behind anal origin and far behind pelvic origin; its base shorter than snout, 2.6 in anal base. Pectorals narrow, 2.8 in head. Pelvics short, 1.1 times eye, reaching just behind vent; origin close behind middle of standard length, much nearer to anal origin than to pectoral base and about a caudal length before dorsal origin. Anal long; base 2.6 times the dorsal base; origin about an eye diameter behind pelvics. Caudal symmetrically forked with numerous rudimentary rays at its base, 1.7 in head. Lateral line along the middle of body. Scales minute, hardly imbricate, cycloid. Well developed gill rakers on all arches, moderately long in the first, short on the 4th and 5th. 4 small pyloric caeca arranged in a ring.

Head snow-white, iris black, body chocolate, and fins blackish grey; mouth, gill chamber and entire peritoneum jet black.

It attains 280 mm. in length and has been obtained at a depth of 1828 m., bathypelagic, endemic.

Distribution.—India : Laccadive Sea, 11° 12' 47" N., 74° 25' 30" E., 1828 m., 3.7 C., surface temperature 28.3° C., in the mean annual isotherm of 20° C.

v. Suborder *CHIROCENTROIDEI*

No gular plate. No photophores. Air bladder large, cellular, connected with ear. Head small, scaleless. No adipose fin. Pectoral radials in two rows, proximal with 4 radials and distal with 3 radials. No suprabranchial organ. Upper jaw formed by the premaxillaries and maxillaries. Two supramaxillaries. Supraoccipital in contact with frontals. Opercles complete. Postcleithrum attached to scapula. Branchiostegals 8. No pseudobranchiae. Gill membrane separate, free. No pyloric caeca.

Cretaceous to Lower Eocene.

The suborder *CHIROCENTROIDEI* is represented by a single family in the Indian region.

XXVII. Family CHIROCENTRIDAE

Body elongate, compressed, with thin, deciduous scales; abdomen keeled, with hair-like rays, non-serrated. Head scaleless. Auxillary scales above and below pectorals. Pelvics large. Cleft of mouth oblique, wide, superior; maxilla extending to midorbit or beyond. Eyes small, subcutaneous. Canine teeth in jaws; teeth in narrow bands on palatines, pterygoids and tongue. No pyloric caeca. A short dorsal fin behind middle of standard length and far behind pelvics. Lateral line obsolete.

The family CHIROCENTRIDAE is represented by a single genus in the Indian region.

82. Genus *Chirocentrus* Cuvier

1816. *Chirocentrus* Cuvier, *Rigne Animal.*, 2, ed. 1, p. 178 (type, *Clupea dorab* Forsk., monotypic).

1873. *Neosudis* Castelnau, *Proc. zool. acclin. Soc. Victoria*, 2, p. 119 (type, *N. vorax* Castelnau, monotypic).

Body low, elongate, scales small, deciduous; without photophores. Cleft of mouth wide, superior. Teeth in narrow bands on palatine, pterygoid and tongue. Abdominal edge keeled; with hair-like rays; non-serrated. Dorsal fin short, in the caudal region of body, opposite to anal. Pelvic origin in front of dorsal origin, nearly between pectoral and anal origins. Anal longer than dorsal. Adipose fin absent. Caudal deeply forked.

Distribution.—Red Sea, Zanzibar, Mozambique, Natal, Mauritius, India, Pakistan, Sri Lanka, Burma, Thailand, Malaya, Indonesia, Siam, China, Formosa, Philippines, Melanesia, Australia.

Key to species of genus Chirocentrus Cuvier

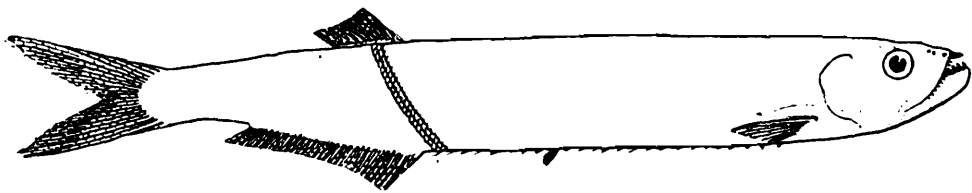
1. Maxilla extending beyond mid orbit ; gill rakers 7+16-18; gill rakers twice gill filaments	<i>C. nudus</i>
2. Maxilla not extending beyond midorbit ; gill rakers 3+11—14; gill rakers shorter than gill filaments	<i>C. dorab</i>

205. **Chirocentrus dorab** (Forsk.)

(Pl. VIII, fig. 3; Text-fig. 52)

1775. *Clupea dorab* Forsk., *Descript. Animal.*, pp. xiii, 72 (type locality : Djedda, Red Sea).
1801. *Clupea dentex* Schneider, *Syst. Ichth. Bloch*, p. 428 (type locality : Red Sea).
1846. *Chirocentrus dorab* Valenciennes, *Hist. nat. Poiss.*, 19, p. 160, pl. 565 (Coromandal, Malabar).
1865. *Chirocentrus dorab* (part) Day, *Fish. Malabar*, p. 233 (Malabar).
1868. *Chirocentrus dorab* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 275 (Bengal).
1873. *Neosudis vorax* Castelnau, *Proc. zool. Acclimat. Soc. Victoria*, 2, p. 118 (Noumea, New Caledonia).
1878. *Chirocentrus dorab* (part) Day, *Fish. India*, p. 652, pl. 166, fig. 3 (Red Sea, through the seas of India to the Malay Archipelago and beyond).
1889. *Chirocentrus dorab* (part) Day, *Fauna Brit. India, Fish.*, 1, p. 368, fig. 114.
1907. *Chirocentrus dorab* Lloyd, *Rec. Indian Mus.*, 1, p. 222 (Akyab).
1912. *Chirocentrus dorab* Jenkins, *Rec. Indian Mus.*, 7, p. 57 (Akyab).
1913. *Chirocentrus dorab* (part) Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 18, fig. 11 (Java, Madura, Sumatra, Panang, Singapore, Celebes, Ambon).
1929. *Chirocentrus dorab* McCulloch, *Mem. Austral. Mus.*, 5, p. 36 (N. Australia, Queensland).
1931. *Chirocentrus dorab* Chu, *Biol. Bull. St. John's Univ.*, No. 1, p. 13 (Seas of China).
1931. *Chirocentrus dorab* Tanaka, *J. Facul. Sci., Sec. 4, Zool.*, 3, pt. 1, p. 16 (S. Japan).
1933. *Chirocentrus dorab* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
1936. *Chirocentrus dorab* Suvatti, *Index Fish. Siam*, p. 9 (Gulf of Siam).
1940. *Chirocentrus dorab* Herre, *Rec. Indian Mus.*, 42, p. 9 (Mergui Archipelago).
1941. *Chirocentrus dorab* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 724 (Fiji, Japan, Cochin China).
1949. *Chirocentrus dorab* Misra, *Rec. Indian Mus.*, 45, p. 410.
1952. *Chirocentrus dorab* Mori, *Mem. Hyogo Univ. Agric.*, 1, No. 3, p. 34 (Fussan).

1953. *Chirocentrus dorab* Misra, *Rec. Indian Mus.*, **50**, p. 393.
 1953. *Chirocentrus dorab* Herre, *Check List Philippine Fish.*, p. 59 (Philippines)
 1953. *Chirocentrus dorab* Smith, *Sea Fish. South. Africa*, p. 87 (Delagoa Bay).
 1955. *Chirocentrus dorab* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 13, (coasts of Sind and Makran).
 1955. *Chirocentrus dorab* Munro, *Mar. Freshwater Fish. Ceylon*, p. 33 (Ceylon).



TEXT-FIG. 52.—Lateral view of *Chirocentrus dorab* (Forsk)

B. 8; D. 17—18; P. 14—15; V. 7; A. 35; C. 19.

Vernacular names.—INDIA : *Thuppo-vahlay*, Malayalam; *Kunda*, Oriya; *Mooloo-alley*, *Kiru-vahlah*, Tamil; Standardised name : *Vala*. PAKISTAN : *Pussant*, Baluchistan; *Kerli*, Karachi, Sind and Makaran. SRI LANKA : *Podi*, *katuvalla*, *Pann katuvalla*; *Pat katuvalla*, Singhalese; *Kollaku vallai*, *Tuppu vallai*, *Mullu vallai*, *Kuru vallai*, Tamil.

Body very elongate, much compressed; abdomen keeled, with hair-like rays non-serrated. Dorsal profile of head more or less horizontal like the body profile; ventral profile of head rather convex becoming straight up to anal. Head small, 6.5, depth 8.4 in total length (5.2—5.5 and 7.2—7.3 in standard length). Eyes small, subcutaneous, 4.0—4.6 in head, 1.0—1.3 in snout, greater than interorbital. Interorbital 5.5—6.5 in head. Cleft of mouth oblique, wide, superior; maxilla extending to $\frac{1}{4}$ — $\frac{1}{2}$ in eye. Mandibular rami greatly elevated inside mouth. Teeth in upper jaw small except 2 moderate front canines; 2 sharp, small teeth at mandibular symphysis, 6 elongate teeth on each of mandible, gradually longer posteriorly. Teeth in narrow bands on palatines, pterygoids and tongue. Gill opening wide, gill membrane separate, free. No pseudobranchiae. A single, short dorsal fin behind middle of standard length, nearly a head-length behind pelvics and less than eye diameter behind anal or opposite to it; its base 2.5 in anal base. Pectorals low, with broad, osseous, outer and inner auxillary scales, 1.5—2.0 in head. Pelvics very small, about an eye diameter; origin in the middle of standard

length, about a head length nearer to anal origin than to pectoral base. Anal base 2.5 times dorsal base; origin nearer to pelvic origin than to caudal origin. Caudal deeply forked, 1.1 times head. Lateral line obsolete. Scales small, deciduous, cycloid. Gill rakers 3+11—14, long, compressed, well spaced, shorter than gill filaments.

Bluish black above becoming silvery on sides and abdomen; fins hyaline; dorsal and pectorals dark; caudal brownish.

It attains 3,648 mm. in length. When captured it bites at every thing near it; found from surface to 109 metres; edible but bony; littoral.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Red Sea, Natal, S. Africa, Muscat, Malaya, Penang, Singapore, Indonesia, Thailand, Annam, Hongkong, China, Formosa, Japan, Philippines, Queensland, Melanesia, Fiji; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35°N.—29°S., 30°—180° E., in the Indo-Pacific=(25°N.—29°S., 30°—140° E. in the Indian Ocean +35°N.—16°S., 101°—180° E. in the Pacific Ocean).

206. *Chirocentrus nudus* Swainson

1839. *Chirocentrus nudus* Swainson, *Nat. Hist. Animal., Fish.*, 2, p. 294 (on *Wahlah* Russell, 1803, *Fish. Coromandel*, 2, p. 78, pl. 199, (type locality : Vizagapatam).
1852. *Chirocentrus hypselosoma* Bleeker, *Nat. Tijds. Ned. Ind.*, 3, p. (54) 71 (type locality : Singapore, Samarang).
- 1866-72. *Chirocentrus hypselosoma* Bleeker, *Atl. Ichth. Ind. Neerland.*, 6, p. 93, pl. (11) 269, fig. 3 (Java, Penang, Singapore, Banka, Borneo, Celebes).
1913. *Chirocentrus dorab* (*nec* Forskål), Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 18 (part), *nec* fig. 18.
1941. *Chirocentrus nudus* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 727.
1953. *Chirocentrus nudus* Smith, *Sea Fish. South. Africa*, p. 87 (Durban).
1955. *Chirocentrus nudus* Munro, *Mar. Freshwater Fish. Ceylon*, p. 34.

Vernacular name.—INDIA : *Wahlah*, Telegu.

B. 8; **D.** 17—19; **P.** 15; **V.** 7; **A.** 31—33; **C.** 19.

Body very elongate, much compressed; abdomen keeled, with hair-like rays, non serrated. Dorsal profile of head horizontal like the body profile; ventral profile of head convex becoming straight upto anal. Head small, 6.1, depth 8.0 in total length (5.1 and 6.8 in standard length). Eyes small, subcutaneous, 4.0—4.5 in head, 0.8 in snout. Interorbital 5.0—5.2 in head. Cleft of mouth oblique, wide, superior; maxilla extending beyond midorbit. Teeth as in the previous species. Gill openings wide, gill membrane separate, free. No pseudobranchiae. A single short dorsal fin; origin behind middle of standard length, more or less opposite to anal origin and about a head length behind pelvic origin; its base about 2.0 in anal base. Pectorals low, 1.1 in head, with broad, osseous, outer and inner auxillary scaly flaps. Pelvics small, about an eye diameter; origin an eye diameter before middle of standard length, nearer to anal origin than to pectoral base. Anal base 2.0 times dorsal base; origin nearly opposite dorsal origin, nearer to pelvic origin than to caudal origin. Caudal very deeply forked, 1.1 times head. No lateral line. Scales cycloid, thin, small, deciduous. Gill rakers 7+16—18, finely lanceolate, more than twice gill—filaments.

Brown above pale to light below; neutral brown, diffused streak from above gill opening to middle of caudal base; fins all pale.

It attains 426 mm. in length., littoral.

Distribution.—India, Sri Lanka.—S. Africa, Malaya, Singapore, Indonesia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 17° N.—29° S., 30°—120° E. in the Indo-Pacific=(17° N. 29° S., 30°—100° E. in the Indian Ocean+1° N.—7° S., 103°—120° E. in the Pacific Ocean).

vi. Suborder *CHANOIDEI*

Gular plate absent. Photophores absent. Air bladder present. No adipose fin. Suprabranchial organ present. Upper jaw bordered by premaxillaries only. Supramaxillaries absent. Pelvics with 10—12 rays. No orbitosphenoid and basisphenoid. Toothless.

Lower Cretaceous to recent.

The suborder *CHANOIDEI* is represented by a single family in the Indian region.

XXVIII. Family CHANIDAE

Body oblong, compressed. Head scaleless. Cleft of mouth small, terminal, transverse. Upper jaw slightly projecting over lower jaw; lower jaw with small symphyseal tubercles. Maxillaries short, wide. No supramaxillaries. No gular plate. Toothless. Gill membranes completely united, free from isthmus. Pseudobranchiae moderate. A suprabranchial organ. A single dorsal fin with origin before pelvics. Pectorals low. Pelvics well developed, 10—12 rays. Anal smaller than dorsal. Caudal deeply forked. Scales cycloid, small, firm. Lateral line complete.

Lower Cretaceous to recent.

The family CHANIDAE is represented by a single genus in the Indian region.

83. Genus *Chanos* Lacépède

- 1805. *Chanos* Lacépède, *Hist. nat. Poiss.*, 5, p. 395 (type, *C. arabicus* Lac., monotypic).
- 1823. *Lutodeira* v. Hasselt, *Alg. Konst. Letterbode*, p. 333 (type *L. indica* v. Hass., monotypic).
- 1828. *Scoliotomus* Rüppell, *Atl. Reise Nordl. Afrika, Fische*, p. 17 (type, *Lutodeira indica* v. Hass.).
- 1842. *Ptycholepis* (nec Agassiz, 1832) Gray, in *Dieffenbach, Travels in New Zealand*, 2, p. 218 (type, *Mugil salmoneus* Schn.).
- 1846. *Lutodira* Agassiz., *Zool. Index Univ.*, p. 217 (type, *Lutodeira indica* v. Hass.).

Body moderately elongate, compressed, scale small; without photophores. Eyes with broad adipose lid. Mouth small, terminal. Teeth absent. Gill membranes entirely united below, isthmus free. Abdominal edge rounded, non-serrated. Dorsal fin longer than anal. Dorsal origin opposite to pelvic origin. Anal short. Adipose fin absent. Caudal deeply forked.

Distribution.—Red Sea, Arabia, East coast of Africa Mauritius, Seychelles, Chagos Archipelago, Maldives,

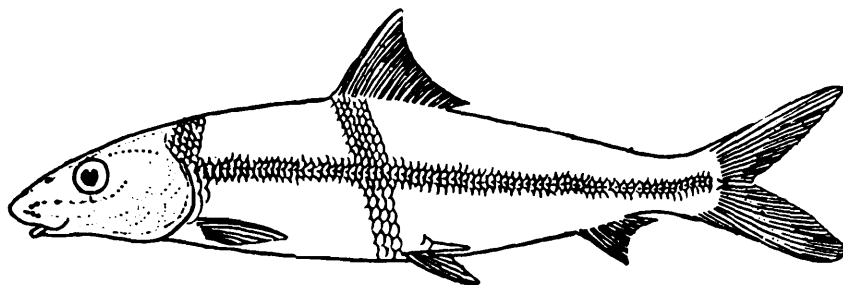
Laccadives, India, Sri Lanka, Malay Peninsula, Indonesia, Philippines, Thailand, Indo-China, Formosa, China, Japan, Australia, New Zealand, Melanesia, Polynesia, Hawaii.

207. *Chanos chanos* (Forskål)

(Pl. VIII, fig. 1; Text-fig. 53)

- 1775. *Mugil chanos* Forskål, *Descript. Animal.*, pp. xiv, 74 (type locality : Djedda, Red Sea).
- 1801. *Mugil solmoneus* (Forster) Schneider, *Syst. Ichth. Bloch*, p. 421 (type locality : Pacific Ocean).
- 1803. *Chanos arabicus* Lacepède, *Hist. nat. Poiss.*, 5, pp. 395, (type locality : Arabia).
- 1823. *Lutodeira indica* van Hasselt, *Algem. Konst. Letterbode*, p. 338 (type locality : Java).
- 1829. *Cyprinus pala* Cuvier, *Règne Animal.*, 2, ed. 2, p. 276 (on *Palah Bontah* Russell, 1803, *Fish. Coromandel*, 2, p. 84, pl. 207; type locality : Vizagapatam).
- 1829. *Cyprinus tolo* Cuvier, *Regne Animal.*, 2, ed. 2, p. 276 (on *Tooleloo* Russell, *Fish. Coromandel*, 2, p. 85, pl. 208, 1803, type locality : Vizagapatam).
- 1832. *Leuciscus zeylonicus* Bennett, *Proc. zool. Soc. Lond.*, p. 184 (Ceylon).
- 1841. *Chanos cyprinella* Eydoux & Souleyet, *Voy. "Bonite" Zool.*, 1, p. 196 (type locality : Hawaiian Is.).
- 1846. *Chanos mento* Valenciennes, *Hist. nat. Poiss.*, 19, p. 194 (type locality : Mauritius).
- 1846. *Chanos chloropterus* Valenciennes, *Hist. nat. Poiss.*, 19, p. 195 (type locality : India).
- 1846. *Chanos nuchalis* Valenciennes, *Hist. nat. Poiss.*, 19, p. 196 (on *Palah Bontah* Russell).
- 1846. *Chanos lubina* Valenciennes, *Hist. nat. Poiss.*, 19, p. 199 (type locality : Buru, Seychelles, Mauritius).
- 1849. *Buterinus madraspatensis* Jerdon, *Mad. J. Lit. Sci.*, 15, p. 344 (type locality : Madras).
- 1852. *Chanos mossambicus* Peters, *Monatsb. Akad. Wiss. Berlin*, p. 684 (type locality : Mozambique).
- 1856. *Chanos pala* Day, *Fish. Malabar*, p. 224 (Malabar).
- 1868. *Chanos salmoneus* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 473 (Ceylon).
- 1878. *Chanos salmoneus* Day, *Fish. India*, p. 651, pl. 166, fig. 2, (Red Sea, seas of India to the Malay Archipelago and beyond).
- 1886-87. *Chanos salmoneus* Vaillant, *Bull. Soc. Philom. Paris*, (7) 11, p. 53 (Tahiti).

1889. *Chanos salmoneus* Day, *Fauna Brit. India, Fish.*, 1, p. 403, fig. 127.
1901. *Chanos chanos* Jordon & Snyder, *Annot. Zool. Japan*, 3, p. 52 (Riu Kiu).
1903. *Chanos gardineri* Regan, *Fauna Geogr. Maldive & Laccadive Archipel. Gardner*, 1, p. 280 (type locality : North Pool of Hulule I.).
1913. *Chanos chanos* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 15, fig. 8 (Java; Madura, Pinang; Borneo; Celebes; Buru; New Guinea).
1915. *Chanos chanos* Chaudhuri, *Mem. Indian Mus.*, 5, p. 417 (Chilka Lake).
1922. *Chanos chanos* Hora, *Mem. Indian Mus.*, 5, p. 764 (Chilka Lake).
1929. *Chanos salmoneus* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 356 (Travancore).
1929. *Chanos chanos* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 42 (Queensland).
1931. *Chanos chanos* Chu, *Biol. Bull. St. John's Univ.*, No. 1, p. 13 (S. China).
1933. *Chanos chanos* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 82 (Ceylon).
1936. *Chanos chanos* Suvatti, *Index Fish. Siam*, p. 8 (Siam).
1941. *Chanos chanos* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 537 (Hawaiian Is. Honolulu, Fiji).
1949. *Chanos chanos* Misra, *Rec. Indian Mus.*, 45, p. 411.
1953. *Chanos chanos* Misra, *Rec. Indian Mus.*, 50, p. 393.
1953. *Chanos chanos* Herre, *Check List Philippine Fish.*, p. 581 (Philippines).
1953. *Chanos chanos* Smith, *Sea Fish. South. Africa*, p. 88, fig. 105 (Durban).
1955. *Chanos chanos* Munro, *Mar. Freshwater Fish. Ceylon*, p. 34 (Ceylon).



TEXT-FIG. 53.—Lateral view of *Chanos chanos* (Forsk.)

Vernacular names.—INDIA : *Hu-meen*, Kanarese; *Poomeen*, Malayalam; *Tulu candul*, *Palmeen*, Tamil; *Pu-meen*, *Polah bontah*, Telegu; Standardised name : *Palmeen*. SRI LANKA : *Tulu*, *Vaikka*, Singhalese

B. 4; D. 13-16; P. 15-16; V 10-12; A. 9-11; L. 1. 75-90 ;L. tr. 12-15; Predorsal scales 30-46.

Body oblong, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles equally convex. Head 5.2—5.5, depth 4.6—5.2 in the total length (4.2 and 3.8 in standard length). Eyes with large adipose lid, 3.5—5.7 in head, 0.7—1.0 in snout and 1.2—1.4 in interorbital. Mouth small, terminal, transverse; maxilla short, wide, excluded from gape of mouth, without supplemental bone, not reaching eye. Upper jaw slightly projecting over lower jaw. Toothless. Gill openings wide, gill membrane totally united, free from isthmus. Pseudobranchiae. Accessory branchial apparatus behind gill cavity. A single dorsal fin; origin in the middle of standard length, about half eye diameter before pelvic origin; base 1.4 times anal base. Pectorals low, moderate, 1.3 in head. Pelvics long, well developed, 1.8 in head; origin an eye diameter behind dorsal. Anal small; origin nearer to caudal origin than to pelvic origin; anal base 1.4 in dorsal base. Caudal long, deeply forked, 1.4 times head; upper lobe slightly longer than lower. Lateral line straight and distinct. Scales small, some rows over nape enlarged. Gill rakers 147—160+107—165, fine, very slender, 2.3—3.0 in gill filaments. Pyloric caeca numerous.

Bluish grey above becoming silvery on sides and below; snout light brown; dorsal and caudal rays greyish and edged black; caudal greyish at base; pectorals and pelvics white with the anterior half minutely dotted dark brown; anal white, with the anterior half dotted black.

It attains 1,500 mm. in length and is much esteemed as food and cultured in ponds and tanks; ascends estuaries; littoral, euryhaline.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Red Sea, Arabia, Zanzibar, Mozambique, Mauritius, S. Africa, Natal, Scyelles, Chagos Archipelago, Maldives, Laccadives, Malaya, Indonesia, Philippines, Thailand, Indo-China, China, Formosa, Japan, Polynesia, Hawaii, Queensland, Tahiti; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 27°N.—29°S., 30°E.—149°W. in the Indo-Pacific=(25°N.—29°S., 30°—140°E. in the Indian Ocean + 27° N.—18°S., 101°—149°W. in the Pacific Ocean).

vii. Suborder *SALMONOIDEI*

No gular plate. No photophore. Air bladder large, simple, with pneumatic duct. Head scaleless. Body scaly. Adipose fin. No suprabranchial. Upper jaw formed by premaxillaries and maxillaries. Branchiostegals 3—10. Pseudobranchiae. Pyloric caeca numerous, rarely absent.

Lower Eocene to recent.

The suborder *SALMONOIDEI* is represented by 2 families in the Indian region.

Key to families of suborder SALMONOIDEI

1. Mouth wide, oblique ; opisthotic present ; freshwater, anadromous fishes	SALMONIDAE
2. Mouth small, terminal ; no opisthotic ; deep sea fishes	MICROSTOMIDAE

XXIX. Family SALMONIDAE

Body scaly, elongate, subcylindrical. Abdomen rounded, non-keeled, non-serrated. Head scaleless. Cleft of mouth wide, oblique; maxilla extending to below or beyond eye. Eyes moderate, lateral. Teeth conical on jaws, vomer, palatines and tongue, none on pterygoids. Branchiostegals 8-20. Pyloric caeca numerous, 17—200 or absent. Rayed dorsal fin opposite or nearly opposite to pelvics. Adipose fin present. Pseudobranchiae. Lateral line. Opisthotic.

Miocene to recent.

The family SALMONIDAE is represented by a single subfamily in the Indian region.

x. Subfamily *SALMONINI*

Basisphenoid. No hypethmoid. A suprapreopercular. No dermosphenotic.

The subfamily *SALMONINI* is represented by a single genus in the Indian region.

84. Genus *Salmo* Linnaeus

1758. *Salmo* Linnaeus, *Syst. Nat.*, 1, ed. 10, p. 308 (type, *S. salar* L.).

Body elongate, scales small. Head scaleless. Photophores absent. Eyes moderate. Cleft of mouth wide. Branchiostegal rays 9—13. Teeth on jaws, vomer, palatine and tongue, absent from pterygoid. Anterior dorsal fin with 10—15 rays; dorsal origin in front of pelvic origin. Anal fin with 10—13 rays. Adipose dorsal fin present both in young and adult. Anal origin in front of adipose fin origin. Caudal crescentic to forked.

Distribution.—South Africa (introduced), India (introduced), Pakistan (introduced), Sri Lanka (introduced), Australia (introduced), S. America (introduced), North America, British Columbia to California, England, Scotland, Eurasia.

Key to species and subspecies of genus Salmo Linnaeus

1. Lateral line scales 115-130 ; spotted below lateral line, colour greenish or brownish ; no lateral band 3
2. Lateral line scales 127-160 ; not spotted below, colour steel blue ; a flesh coloured lateral band *S. gairdnerii gairdneri*
3. Colour brownish ; lateral line scales 115-130 *S. trutta fario*
4. Colour greenish ; lateral line scales 120—130 *S. levenensis*

3. *Salmo gairdnerii gairdnerii* Richardson

(Rainbow trout, Steel-head trout)

1836. *Salmo gairdnerii* Richardson, *Fauna Bor. Ameri* 3, p. 221). (type locality : Columbia river at Fort Vancouver)
1855. *Salmo irideus* Gibbons, *Proc. California Acad. Sci.*, p. 36 (type locality : San Leandro Creek, Alameda County, California).
1896. *Salmo gairdneri* Jordan & Evermann, *Bull. U.S. nat. Mus.*, No. 47, pt. 1, p. 497.
1896. *Salmo irideus* Jordan & Evermann, *Bull. U.S. nat. Mus.*, No. 47, pt. 1, p. 500.
1921. *Salmo irideus* Wilson, *Madras Fish. Bull.*, 12, p. 151 (Nilgiris).
1929. *Salmo irideus* Mc Culloch, *Mém. Austral. Mus.*, Sydney, 5, pt. 1, p. 45 (introduced into Australia).
1939. *Salmo (Oncorhynchus) irideus* Malik, *J. roy. As. Soc. Bengal, Sci.*, 5, pp. 1, 4 (Kashmir, Hazara Dt.).
1943. *Salmo irideus* Phayre, *U. Serv. J. India*, p. 329.
1949. *Salmo gairdnerii gairdnerii* Misra, *Rec. Indian Mus.*, 45, p. 41

1953. *Salmo gairdnerii gairdnerii* Misra, *Rec. Indian Mus.*, 50, p. 395.

B. 11-12; D. 11/0; A. 10-12; L.1. 127-160.

Body more or less elongate, subcylindrical; abdomen rounded, non-serrated. Head scaleless, convex, 4.2—5.5, depth 4.2—5.0 in total length (3.7—4.7 and 3.7—4.3 in standard length). Eyes 6.5 in head, 1.5—2.1 in snout, 2.0 in interorbital. Cleft of mouth oblique; maxilla extending beyond postorbit. Teeth small; vomerine in 2 alternating or irregular series, as long as the palatine series. A single rayed dorsal fin; origin nearer to caudal origin than to snout end or nearer to snout end than to caudal origin, before pelvic origin. Adipose dorsal above anal, nearer to caudal origin than to last dorsal ray. Pectorals low, 1.6 in head. Pelvics 1.7 in head; origin below middle of dorsal base. Anal opposite adipose dorsal; origin nearer to caudal origin or midway between pelvic and caudal origins. Caudal emarginate to cut square, 1.0—1.2 in head. Lateral line straight. Scales small, cycloid, adherent.

Olive green to steel blue above; sides silvery with a broad flesh-coloured lateral band.

It attains 762 mm. in length; migratory, good eating, exotic.

Distribution.—India (introduced) : Pakistan (introduced) : Sri Lanka (introduced).—S. Africa (introduced), N. America (British Columbia to California), England (introduced).

208. *Salmo levenensis* Walker

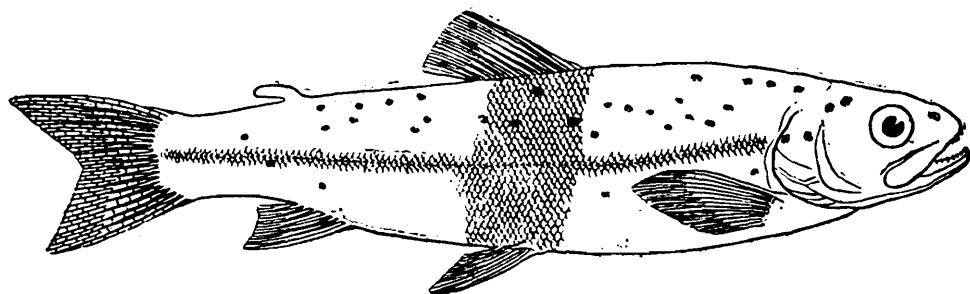
(Loch Leven trout)

(Pl. VIII, fig.5; Text-fig. 54)

1877. *Salmo levenensis* Day, *Fish. India*, p. 508, pl. 118, fig. 3 (Neilgherry hills introduced from Loch Leven).
- 1880-84. *Salmo levenensis* Day, *Fish. Great Brit. & Ireland*, p. 92 (Loch Leven in Fifeshire and other lochs in south of Scotland and north of England).
1889. *Salmo fario levenensis* Day, *Fauna Brit. India*, Fish., 1, p. 404 (introduced into the Nilgiri hills).
1929. *Salmo levenensis* Mc Culloch, *Mem. Austral. Mus., Sydney*, 5, pt. 1, p. 45 (Introduced into Australia).
1949. *Salmo levenensis* Misra, *Rec. Indian Mus.*, 45, 412

1953. *Salmo levenensis* Misra, *Rec. Indian Mus.*, **50**, p. 395.

1808. *Salmo levenensis* Walker, *Wern. Mem.*, **1**, p. 541 (type locality : Loch Leven).



TEXT-FIG. 54.—Lateral view of *Salmo levenensis* Walker

B. 10-12; D. 12-14/0; P. 12-14; V 9; A. 10-12; C. 19; L. 1. 120-130; L. tr. 24-28/26-30.

Body elongate, subcylindrical; abdomen rounded, non-keeled, non-serrated. Ventral profile more convex than dorsal profile. Head scaleless, 4.7—5.2 (longest in males), depth 4.5 in total length (4.7 and 4.1 in standard length). Eyes 5.5—6.0 in head, 1.5 in snout and 1.5 in interorbital. Interorbital convex. Cleft of mouth slightly oblique ; maxilla extending slightly behind postorbit; lower jaw with groove or knob at upper end of mandible. A double or rarely single row of teeth along body of vomer and a transverse row of 3 or 4 opposite its junction with palatines. A single rayed dorsal fin; origin nearer to snout end than to caudal origin and before pelvic origin. Adipose dorsal opposite last anal rays. Pectorals low, 1.3 in head. Pelvics equal to pectorals; origin below middle of dorsal or opposite 5th dorsal ray. Anal origin nearer to pelvic origin than to caudal base and before adipose origin; base 1.1 in dorsal base. Caudal 1.2 in head, emarginate, becoming square in large examples. Lateral line straight. Scales small, cycloid, adherent. Pyloric caeca 47—90.

Greyish or greenish above becoming lighter on sides and below; numerous brown or black spots encircled by light rings; gill covers, upper surface of head and upper half or 2/3rd of body with numerous X-shaped or even round, black spots; white edged spots on dorsal.

It attains 534 mm. in length and is a non-migratory species, exotic.

Distribution.—India (introduced).—S. Africa (introduced), Australia (introduced), England, Scotland.

4. *Salmo trutta fario* Linnaeus (Brown trout)

1748. *Salmo trutta* Linnaeus, *Syst. Nat.*, 1, ed. 10, p. 308 (type locality : Europe).
1758. *Salmo fario* Linnaeus, *Syst. Nat.*, 1, ed. 10, p. 309 (type locality : Europe).
- 1880-84. *Salmo trutta* Day, *Fish. Great Brit. Ireland*, 2, p. 84, pl. 111, fig. 1; pl. 112, figs. 1, 2 (Great Britain & Ireland).
- 1880-84. *Salmo fario* Day, *Fish. Great Brit. Ireland*, 2, p. 95, pl. 109, fig. 3; pls. 113, 114 and 116, fig. 1 (Great Britain and Ireland).
1929. *Salmo fario* Mc Culloch, *Mem. Austral. Mus.*, 5, pt. 1, p. 45 (introduced into Australia).
1932. *Salmo trutta* Boulenger, *Camb. nat. Hist.*, 7, p. 567.
1936. *Salmo fario* Mukerji, *J. roy. As. Soc. Bengal, Sci.*, 2, p. 157 (Hazara).
1938. *Salmo fario* Bhatti, *J. Bombay nat. Hist. Soc.*, 40, p. 429 (Kulu Valley).
1940. *Salmo trutta fario* Malik, *J. roy. As. Soc. Bengal, Sci.*, 5, pp. 7, 8 (Kashmir, Hazara Dt.).
1949. *Salmo trutta fario* Misra, *Rec. Indian Mus.*, 45, p. 412.
1953. *Salmo trutta fario* Misra, *Rec. Indian Mus.*, 50, p. 395.

B. 10-12; D. 12-14/0; P. 13-14; V. 9; A. 11-13; C. 18-19; L. 1. 115-130; L. tr. 24-27/32-38.

Body elongate, subcylindrical; abdomen rounded, non-keeled, non-serrated. Ventral profile more convex than dorsal. Head scaleless, 4.2—4.5, depth 4.4—5.0 in total length (3.7—4.1 and 4.0—4.5 in standard length). Eyes 4.2 —5.0 in head, 2.0 in snout, 1.5 in interorbital. Interorbital convex. Cleft of mouth oblique; maxilla extending to postorbit or beyond by an eye diameter. Teeth in jaws, palatines and vomer in single row in adults; 3—6 strong, sharp, recurved ones, on either side of tongue. A single dorsal fin; origin nearer to snout end than to caudal origin or midway between the two, before pelvic origin. Adipose dorsal; origin just behind last anal ray on above last 3 anal rays. Pectorals low, 1.8 in head. Pelvics 1.8—2.1 in head; origin below middle of dorsal base or slightly before it but behind dorsal origin. Anal before adipose dorsal; origin nearer to pelvic origin than to caudal origin;

base nearly 1.2 in dorsal base. Caudal slightly lunate, 1.4—1.5 in head. Lateral line straight. Scales small, cycloid, adherent. Pyloric caeca 49—61.

Silvery with light brownish red tint all over body; sides with irregular black spots.

It attains 912 mm. in length and is migratory, exotic.

Distribution.—India (introduced); Pakistan (introduced)—S. Africa (introduced), S. Australia (introduced), N. America (introduced), and Eurasia.

XXX. Family MICROSTOMIDAE

Body saly, elongate, subcylindrical; abdomen rounded, non-keeled, non-serrated. Head scaleless. Cleft of mouth small, terminal; maxilla extending to front margin of eye. Eyes very large. Lower jaw and vomer with a narrow series of teeth; no other teeth. Branchiostegals 3 or 4. Rayed dorsal fin before pelvics. Adipose fin present or absent. Pseudobranchiae. No pyloric caeca. No opisthotic. Deep-sea fishes.

The family MICROSTOMIDAE is represented by a single genus and species in the Indian region.

85. Genus *Nansenia* Jordan & Evermann

1896. *Nansenia* Jordan & Evermann, *Bull. U.S. nat. Mus.*, **47**, pt. 1, p. 528 (type, *Microstoma groenlandicus* Reinhardt, orthotypic).
 1922. *Bathymacrops* Gilchrist, *Rep. Fish. Mar. biol. Surv. S. Africa*, **2** (1921), *Spec. Rep.*, **3**, p. 53 (type, *B. macrolepis* Gilchrist, orthotypic).
 1933. *Euproserpa* Fowler, *Proc. Acad. nat. Soc. Philad.*, **85**, p. 256 (type, *Microstoma schmitti* Fowler, orthotypic).

Body elongate, cylindrical, scales large. Photophores absent. Eyes large. Mouth small, terminal. Teeth in lower jaw and vomer. Dorsal fin with 11 rays; origin in front of pelvic origin. Anal fin with 10 rays. Adipose dorsal well developed in young only. Caudal forked.

Distribution.—N. Atlantic, S. Africa near Zanzibar, OT, 640 to 658 m.; off Natal and Delagoa Bay, 439—475 m.; Maldivé area, Arabian Sea, 494 m.

209. *Nansenia groenlandicus* (Reinhardt)

1839. *Microstomus groenlandicus* Reinhardt, *Overs. danske Vidensk. Selsk. Forh.*, p. 8 (type locality : Greenland).
1866. *Microstoma* (?) *groenlandicum* Günther, *Cat. Fish. Brit. Mus.*, 6, p. 205 (Sea of Greenland).
1896. *Nansenia groenlandica* Jordon & Everman, *Bull. U.S. nat. Mus.*, No. 47, pt. 1, p. 528 (Greenland).
1939. *Nansenia groenlandicus* Norman, *Sci. Rep. John Murray Exped.* 7, p. 16 (Maldivé area, AT, 494 m., Zanzibar area, OT, 640-658 m).
1949. *Nansenia groenlandicus* Misra, *Rec. Indian Mus.*, 45, p. 412 (Maldivé area).
1953. *Nansenia groenlandicus* Misra, *Rec. Indian Mus.*, 50, p. 395.
1953. *Bathymacrops macrolepis* Smith, *Sea Fish. South. Africa*, p. 97, fig. 129 (in 240-260 fms., off Natal and Delagoa Bay).

B. 3; D. 10; P. 14; V. 11-12; A. 9-10; L. 1. *ca* 50.

Body elongate, cylindrical; abdomen rounded, non-serrated, non-keeled. Dorsal profile slightly more convex than ventral profile. Head scaleless, 5.3, depth 8.8—10.0 in total length (7.5—8, and 7.5—8.0 in standard length). Eyes large, 2.5 in head, interorbital 3.0 in eye. Snout less than half eye. Cleft of mouth small, terminal, slightly oblique; maxilla reaching anterior margin of eye. No teeth in upper jaw; a single series of close-set, compressed, conical teeth in lower jaw; vomer with a row of slender, curved, sharply-pointed teeth. A single dorsal fin; origin much nearer to snout end than to caudal origin and before pelvic origin. A small adipose dorsal above anal; origin nearer to caudal origin than to last ray of dorsal. Pectorals low, 1.8 in head. Pelvics 2.0 in head; origin just behind or below last dorsal ray, nearer to anal origin than to pectoral base and before middle of total length. Anal origin much nearer to caudal base than to pelvic origin, more than 4 times as distant from snout end as from caudal origin; base 3.5 in head, more or less equal to dorsal base. Caudal forked, 1.1 in head. Lateral line straight. Scales moderate, cycloid. Lower gill rakers 20-22.

It attains 180 mm. in length and has been obtained at a depth of 439—658 m., bathypelagic.

Distribution.—Maldiva area, 4° 58' 42" N., 73° 16' 24" E., 494 m., 10. 86° C.—S. Africa near Zanzibar, OT, 640-658 m., off Natal and Delagoa Bay, 439—475 m., North Atlantic : in the mean annual isotherm of 20° C. and beyond 6°C. in the frigid zone with the latitudinal and longitudinal range of 4° N.—29° S., 30°—73° E. in the Indian Ocean and 72° 15' N., 40° W. in the Atlantic.

viii. Suborder *STOMIATOIDEI*

No gular plate. Photophores always present in constant series ; on the branchiostegal membrane between the rays; two series on each side of body, a ventral along isthmus thence below pectorals and pelvics to the anal and along anal base to caudal and a lateral series from above pectoral to above the origin or anterior part of anal. Serial photophores with lens, with or without lumen and ducts. Air bladder present. Dorsal and anal adipose fins present or absent. Pelvics. Barbels present or absent. Parietals, posttemporal, supracleithrum, mesocoracoid, orbitosphenoid and opisthotic present or absent. Upper jaw formed by premaxillaries and maxillaries. No suprabranchial organ. Body naked or scaly, low or elevated. Bathypelagic or pelagic.

Miocene to recent.

The suborder *STOMIATOIDEI* is represented by 3 superfamilies in the Indian region.

Key to superfamilies of suborder STOMIATOIDEI

1. Tail markedly short in relation to length of trunk ; body always naked ASTRONESTHOIDAE (Gymnophotodermi)
2. Tail not markedly short in relation to length of trunk ; body naked or scaly 3
3. Gill-rakers rudimentary or absent ; body elongate STOMIATOIDAE (Lepidophotodermi)
4. Gill-rakers present ; body elongate or elevated GONOSTOMOIDAE (Hetercophotodermi)

V Superfamily GONOSTOMOIDAE (HETEROPH-
OTODERMI)

Body low, elongate, or short, elevated, with or without scales. Gape of mouth very wide, oblique or vertical. Single postocular, luminous organ present or absent. Photophores in continuous or discontinuous series. No barbels. Gill arches with rakers. Parietals large. No orbitosphenoid, no opisthotic. Lagena present or absent. 2 supramaxillaries. Dorsal, pectorals and pelvics. Adipose dorsal fin present or absent. Gill membranes free or united with isthmus. Branchiostegals 5—14. Pseudobranchiae present or absent. Eyes normal or telescopic. Pyloric caeca present or absent.

Miocene to recent.

The superfamily GONOSTOMOIDAE is represented by 2 families in the Indian region.

Key to families of superfamily GONOSTOMOIDAE

1. Body elongate, low ; gape of mouth
oblique GONOSTOMIDAE
2. Body short, elevated ; gape of
mouth vertical STERNOPTYCHIDAE

XXXI. Family GONOSTOMIDAE

Body scaly or without scales, low, elongate, compressed ; abdomen non-keeled, non-serrated. Head scaleless. Pre-maxillary and vomer toothed or non-toothed. Eyes non-telescopic. Gape of mouth oblique, moderate to large. No postocular luminous organs. No barbels. Gill arches with rakers. Pseudobranchiae present or absent. Dorsal fin before or above anterior part of anal. Adipose dorsal fin present or absent. Pectorals low. Pelvics entirely before or opposite dorsal. Anal very long, longer than dorsal or rarely equal to dorsal. Caudal forked. Branchiostegals 9—17.

The family GONOSTOMIDAE is represented by 6 genera in the Indian region.

Key to genera of family GONOSTOMIDAE

1. Dorsal origin in advance of anal origin . 3
2. Dorsal origin opposite to or behind anal origin .. 7
3. No additional serial photophores on sides of body ; anal rays 14-32 5
4. With additional serial photophores on sides of body ; anal rays 57-61 **Triplophos**
5. Anal rays 23-32 **Yarrella**
6. Anal rays 14-16 .. . **Vinciguerria**
7. Serial photophores on body more or less distinctly divided into groups, each group on a black background; pseudobranchiae present .. . **Valenciennellus**
8. Serial photophores on body arranged in continuous longitudinal rows ; pseudobranchiae absent 9
9. Premaxillary toothed ; eye moderate; anal rays 22-31 **Gonostoma**
10. Premaxillary not* toothed ; eye small ; anal rays 16-20 **Cyclothone** ;

86. Genus *Gonostoma* Rafinesque

1810. *Gonostoma* Rafinesque, *Ind. Ittiol. Sicil.*, p. 64 (type, *G. denu-datum* Rafinesque).
1883. *Sigmops* Gill, *Proc. U.S. nat. Mus.*, 6, p. 256 (type, *S. stigmaticus* Gill, orthotypic).
1888. *Neostoma* Vaillant, *Exp. Sci. "Travailleur" & "Talisman"*, *Poiss.*, p. 385 (type, *N. bathyphilus* Vaillant).

Body elongate, compressed, scales large, more or less concealed in skin ; with 3 uninterrupted series of photophores on each side of body. Eyes moderate. Gape of mouth very wide. Teeth in premaxillary, palatine, pterygoid. Vomerine teeth present or absent. Gill openings very wide. Pseudobranchiae absent. Gill membranes free from isthmus. Branchiostegals 11—14. Gill rakers long, slender, few in number. Dorsal fin with 13—15 rays ; origin somewhat nearer to root of pectorals than to base of caudal and opposite to anal. Pelvic origin in advance

of dorsal origin. Anal fin with 22—31 rays, extending nearly to base of caudal. Adipose fin present. Caudal forked.

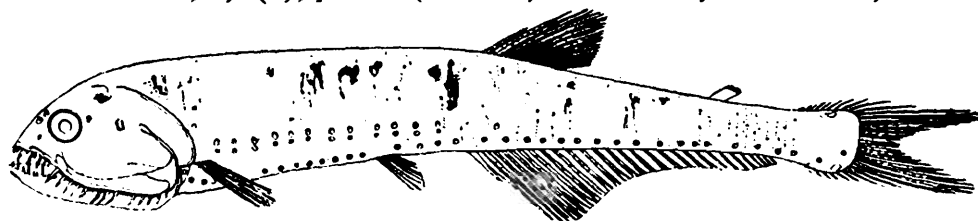
Distribution.—Atlantic : East coast of N. America, 480—4333 m., Havana, 292—914 m., Azores Is., 1420—2285 m., Cape Verde I., 460—1180 m., Morocco, 460—1180 m., Gulf of Guinea, 2000 m., Bermuda Sea, 260—1500 m., Indian Ocean : Laccadive Sea, 1349—2194 m., off Minekoy Is., 2194 m., W. coast of Sumatra, 614—677 m.; Pacific Ocean : Banda Sea, 658 m., Arfura Sea, 1463 m., Japan, 630—4433 m.

210. *Gonostoma elongatum* Günther

(Text-fig. 55)

- 1878. *Gonostoma elongatum* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 187 (type locality : South of New Guinea, 800 fms. 3·9° C.).
- 1884. *Sigmops stigmaticus* Gill, *Proc. U.S. nat. Mus.*, 6, p. 256 (type locality : Gulf Stream in 30° 19' 26" N., 68° 20' 20" W.).
- 1891. *Gonostoma elongatum* Wood-Mason & Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 127 (Laccadive Sea, 7° 41' N., 78° 21' E., 738 fms., 5·6° C.).
- 1892. *Gonostoma elongatum* Alcock, *Ann. Mag. nat. Hist.*, (6) 10, p. 354 (off Minekoy Is., Arabian Sea, 1200 fms.).
- 1896. *Gonostoma elongatum* Alcock, *J. As. Soc. Bengal*, 65, p. 331 (Laccadive Sea, 738-1200 fms.).
- 1899. *Cyclothone elongata* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 139
- 1905. *Cyclothone rhodadenia* Gilbert, *Bull. U.S. Fish. Comm.*, 23 (1903), p. 602, pl. 71, fig. 1.
- 1906. *Gonostoma elongatum* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 75, pl. 4, fig. 4; text-fig. 27.
- 1911. *Gonostoma polyphos* Zugmayer, *Bull. Inst. Ocean. Monaco*, 193, p. 4 (type locality : 36° 7' N., 10° 18' W., 0-4745 m., 36° 6' N., 9° W., 0-3660 m., 2 specimens).
- 1913. *Gonostoma elongatum* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 122, fig. 45 (West coast of Sumatra, 614-677 m., 10° C.).
- 1930. *Gonostoma elongatum* Norman, "*Discovery*" *Rep.*, 2, p. 283.
- 1939. *Gonostoma elongatum* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 17 (1° 25' 54" S., 66° 34' 12" E., MT, 3385 m., 1·92° C. at 3000 m., 7° 14' N., 68° 38' 42" E., MT, 2937-3182 m.).
- 1949. *Gonostoma elongatum* Misra, *Rec. Indian Mus.*, 45, p. 413.

1953. *Gonostoma elongatum* Misra, *Rec. Indian Mus.*, 50, p. 396, fig. 14a.
1955. *Gonostoma elongatum* Grey, *Fieldiana Zool*, 37, p. 270 (Off Bermuda, 3 specimens caught at night in depths between 260 and 820 m., 6 specimens during day in 730 to 1500 m.).
1958. *Gonostoma elongatum* Briggs, *Bull. Florida State Mus., Biol. Sci.*, 2, (8), p. 256 (Florida, 24°-31° N., 82°-88° W.).



TEXT-FIG. 55.—Lateral view of *Gonostoma elongatum* Gthr. (After A. Brauer)

B. 14; D. 13; P. 11—13; V 7—8; A. 27—30.

Body scaly but concealed in skin, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral slightly concave. Head scaleless, 5.1, depth 7.5 in total length (4.3—4.5 and 6.5—7 in standard length). Eyes 5.1—7.0 in head, 0.8—1.0 in snout and less than interorbital. Nostrils nearer to eye than to snout end. Suborbital broad, dilated, covering about anterior half of cheek. Gape of mouth exceedingly very wide; maxilla extending to angle of preopercle, and intermaxilla reaching anterior border of eye. Lower jaw prominent with a pointed symphysis. Intermaxilla with 2—4, maxilla with 12—15, curved, larger teeth; 2 hindmost directed backwards with smaller teeth in between them; about 10 large curved teeth on mandibles with numerous smaller ones between them; palatines with a series of 3—5 teeth; vomer with a pair of conical teeth. A single rayed dorsal fin, shorter than anal; origin behind middle of standard and total lengths. An adipose dorsal much nearer to caudal base than to last dorsal ray. Pectorals low, 2.0 in head, not reaching pelvic origin. Pelvics 3.2 in head, not reaching anal; origin before dorsal origin and before middle of total length, nearer to anal origin than to pelvic origin. Anal very long, 3.6 times dorsal base; origin opposite dorsal origin, behind middle of standard length, with its base extending beyond adipose dorsal. Caudal deeply forked, nearly equal to head. No lateral line. Luminous organs; a black suborbital ventrally connected with a yellowish organ obliquely directed backwards; one dorsally at the hind border of preopercle ventrally connected with a yellow

glandular patch; one behind end of maxilla and a conspicuous one on each side behind the symphysis; nine between branchiostegal rays; in the ventral series 4 between isthmus and pectoral, 7 between pectoral and pelvic, 4 between pelvic and anal, 19 between anal origin and caudal base; in the lateral series, 8 pairs between pectoral and pelvic; 4 pairs between pelvic and anal origin, and a single detached one close behind anal origin in a line with the first lateral row; 2 glandular patches, ventrally dorsally above them a similar organ below the anterior caudal rays. Lower gill rakers 12.

Black with a broad silvery lateral band; fins translucent.

It attains 200 mm. in length and has been obtained at depth of 614—1,463 metres; bathypelagic.

Distribution.—Laccadive Sea, 7° 41' N., 78° 21' E., 1349—2194 m., 5.6°C. Off Minikoy Is., 2194 m., 7° 14' N., 60° 38' 42" E., MT 2937—3182 m., 1° 25' 34" S., 66° 34' 12" E., MT, 3385 m., 192° C. at 3000 m.,—East coast of N. America, 36°—41° N. 99° W., 795—4333 m., Gulf of Guinea 1° 51' N., 0° 31' 2" E., 2000 m., West coast of Sumatra, 0° 16' N., 98° 8' E. 614—677 m., Banda Sea 5° S., 128° E., 658 m., W. of New Guinea, 5° S., 135° E. 1463 m., in the mean annual isotherms of 20° C. and 12°C. with the latitudinal and longitudinal range of 7° N.—5° S., 60°—135° E. in the Indo-Pacific=(7° N.—1° S., 60°—98° E. in the Indian Ocean + 5° S., 128°—135° E. in the Pacific) and 1°—41° N., 0° 31' E.—92° W. in the Atlantic).

87. Genus *Cyclothone* Goode & Bean

1882. *Cyclothone* Goode & Bean, *Bull. Harv. Mus. Comp. Zool.*, 10, p. 221 (type, *C. lusca* G.B., orthotypic).

Body elongate, somewhat compressed, scaly or scaleless; with uninterrupted lateral series of photophores. Eyes small. Gape of mouth very wide. Premaxillary not toothed; palatine, pterygoid and vomer toothed. Gill openings wide. Pseudobranchiae absent. Gill membranes free from isthmus. Branchiostegals 12—14. Gill rakers long, numerous. Dorsal fin with 13—15 rays, origin nearer to caudal base than to root of pectoral and opposite to anal origin. Pelvic origin in advance of dorsal origin. Anal fin with 16—20 rays. Adipose dorsal, when present, small. Caudal forked.

Distribution.—Atlantic Ocean : Gulf of Panama, 3278 m., West coast of Americas (from 0°—37°N. 223—4411 m., West coast of Africa between Canary Is. and Cape of Good Hope, 520—4000 m., North coast of Africa, 800—4000 m., West coast of Africa between Cape Verde Is. and Cape of Good Hope, 800—4000 m., South Atlantic, 2500—2700 m., Middle and West Atlantic, 914—5202 m., Denmark Strait, 538—2623 m., Antarctic Ocean, 1500—3611 m., Indian Ocean : between Seychelles and Chagos Archipelago, 800—4000 m., South of Socotra, 800—4000 m., between Zanzibar and Chagos Is. 520—2500 m., Gulf of Aden, 520—2500 m., between Chagos and Maldives, 600—1000 m., Andaman Sea, 483—786 m., between Sri Lanka and Chagos Archipelago, 520—4000 m., between New Amsterdam and Sumatra, 520—4000 m., between Cocco Is. and Sumatra, 800—4000 m., Pacific Ocean : South of Sandwich Is., 940—5202 m. North of New Zealand, 940—5202 m., North of New Guinea, 940—5202 m., South of Japan, 940—5202 m., North of New Guinea, 940—5202 m., South of Japan, 940—5202 m., between Chile and C. Horn, 600—3000 m., Arctic zone.

Key to species and subspecies of genus Cyclothone Goode & Bean

1. Photophores clearly visible along sides of body 3
2. Photophores hidden along sides of body *C. obscura*
3. Ground colour pinkish white ; scales absent .. 7
4. Ground colour dark ; scales present 5
5. Pectorals almost reaching pelvic bases ; distance between pelvic and anal origins equal to distance between pelvic and pectoral origins *C. acclinidens*
6. Pectorals not reaching pelvic bases ; distance between pelvic and anal origins contained twice in the distance between pelvic and pectoral origins 9
7. 7 photophores in lateral row ; 4 photophores between pelvic and anal in ventral row ; no photophore between last anal ray and caudal origin . *C. signata signata*

8. 6 photophores in lateral row ; 3 photophores between pelvic and anal in ventral row ; one photophore between last anal ray and caudal origin. *C. signata alba*
9. Length of head 4 times in standard length ; area between pelvic and anal fins unpigmented *C. microdon pallida*
10. Length of head 5 times in standard length ; area between pelvic and anal fins pigmented *C. microdon microdon*

211. *Cyclothone acclinidens* Garman

1899. *Cyclothone acclinidens* Garman, *Mem. Harv. Mus., Comp. Zool.*, 24, p. 247, pl. J., fig. 4 (type locality : 36° 47' 10" N., 122° 3' 22" W., 122 fms.).
1906. *Cyclothone acclinidens* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 85, 374, pl. 6, fig. 1, fig. 34a-c (Antarctic Ocean, 56° 30' S., 14° 29' E.).
1913. *Cyclothone acclinidens* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 127.
1930. *Cyclothone acclinidens* Norman, "*Discovery*" *Rep.*, 2, p. 288.
1939. *Cyclothone acclinidens* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 18 (Arabian Sea : 23° 2' 48" N., 64° 31' 54" E. to 23° 2' 30" N., 64° 41' E., N 100, 1000-1500 (—0) m., N 200, 2000 (—0) m., 9° C. at 1000 m., 5·57° C. at 1500 m., 3·18° C. at 2000 m., 23° 2' 12" N., 64° 33' 39" E. to 23° 2' 30" N., 64° 15' 54" E., N 100, 1500—0 m., N 200, 2000 (—0) m., 13° 25' 36" N., 65° 8' 6" E. to 13° 24' N., 65° 8' 8" E., N 200, 984—1045 m., 12° 8' 6" N., to 3° 4' 36" E. to 12° 5' 18" N., 63° 1' 42" E., N 200, 430—984 m., 12·12° C. at 400 m., 10·64° C. at 600 m., 9·58° C. at 800 m., 8·48° C. at 1000 m., 1° 39' 6" S., 61° 13' 48" E., 2° 7' 30" S., 61° 21' 12" E., N 100, 1500 (—0) m., N 200, 2500 m., 9° 40' 24" N., 54° 33' 36" to 9° 42' 18" N., 54° 39' E., N 100, 850 (—0) m., N 200, 2091 (—0) m.).
1949. *Cyclothone acclinidens* Misra, *Rec. Indian Mus.*, 45, p. 413.
1953. *Cyclothone acclinidens* Misra, *Rec. Indian Mus.*, 50, p. 397.
1953. *Cyclothone acclinidens* Smith, *Sea Fish. South. Africa*, p. 103 (off Cape Point in 600—1000 fms.).

B. 14; D. 13—14; P 10; V. 6—7; A. 18—20.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile nearly straight. Head naked, compressed, conical, 4.8—6.0,

depth 8.0 in total length (4.2—5.0 and 7.0—7.1 in standard length). Eyes small, 8.0—10.0 in head, 2.0 in snout, equal to interorbital. Gape of mouth very wide; maxilla extending to angle of preopercle. Lower jaw prominent, with a short point at the symphysis directed downwards, 6—10 vertical, uniformly large teeth in intermaxillary; 30—35 small, vertical teeth in the anterior third of maxilla, increasing in size backwards; behind them, about 20 stronger teeth inclined forwards and becoming larger backwards; about 15 uniformly small teeth in the anterior part of mandible, with a large vertical fang behind the third and the second fang at the end of the series, behind which a series of 70) vertical teeth on vomer; 4—6 on palatines, 6—8 on pterygoids. A single rayed dorsal fin in the middle of total length, far behind pelvic origin and opposite to anal origin. No adipose dorsal. Pectorals low, almost reaching pelvics, 1.3 in head. Pelvics not reaching anal, 2.0 in head; origin before dorsal, midway between pectoral base and anal origin. Anal longer than dorsal, 1.3 times dorsal base; origin opposite dorsal. Caudal deeply forked, with rudimentary rays at its base, almost equal to head. Luminous organs, a black suborbital; 2 operculars one above the other, the dorsal on a level with eye, the ventral in a level with pectoral; 10 between branchiostegal rays; in the ventral series, 3 between isthmus and pectoral, 10 between pectoral and pelvic; 5 between pelvic and anal origin, 15 between anal origin and caudal base, the last 4 being behind anal base; in the lateral series, 5 between operculum and pelvic, 3 between pelvic and anal origin; a conspicuous luminous supracaudal patch. No lateral line. Scales thin, large, deciduous. Pyloric caeca 3.

It attains 44 mm. in length and has been obtained at a depth of 223—4411 m., abyssal.

Distribution.—Bay of Bengal, 5°—7°N., 85°—94°E., 520—4000 m., Arabian Sea, 13° 25' 36" N., 65° 8' 6" E. to 13° 24' N., 65° 8' 6" E., 20°, N 984—1045 m., 12° 8' 6" N., 63° 4' 36" E. to 12° 5' 18" N., 63° 1' 42" E., 20°, N 430—984 m., 12.12°C. at 400 m., 10.64°C. at 600 m., 9.85°C. at 800 m., 8.48°C. at 1000 m., 54°23'E., 10°, N 850(0) m., 20°, N 2091 (-o) m. 23° 2' 48" N., 64° 31' 54" E. to 23° 2' 30" N., 64° 41' E., 100, N 1000—1500 (—0) m.; N 200, 2000 (—0) m., 9°C. at 1000 m., 5.57°C. at 1500 m., 3.18°C. at 2000 m., 23° 2' 12" N., 64° 33' 39" E. to 23° 2' 30" N., 64° 15' 54" E., 100, N 1500 (—0) m.,

N 200, 2000 (—0) m., —Arabian Sea : $9^{\circ} 40' 24''$ N., $54^{\circ} 33' 36''$ to $9^{\circ} 42' 18''$ N., $1^{\circ} 39' 6''$ S., $61^{\circ} 13' 48''$ E., $2^{\circ} 7' 30''$ S., $61^{\circ} 21' 12''$ E., N. 100, 1500 (—0) m., N 200, 2500 m., Gulf of Aden, 13 N., 49° E., N 200, 952 (—0) m., Gulf of Oman, 24° N., 59° E., N 100, 1500 m., N 200, 2500 m., West Coast of America from 0° — 37° N., 223—4411 m. West Coast of Africa between Canary I. and Cape of Good Hope, 31° N.— 28° S., 9° E.— 21° W., 520—4000 m., Northeast Coast of Africa, 1° — 13° N., 45° — 53° E., 520—4000 m., between Chagos I. and Zanzibar, 2° — 6° S., 41° — 70° E., 520—2500 m., between Chagos I. and Ceylon 4° N.— 6° S., 73° — 88° E., 520—2500 m., between New Amsterdam and Sumatra, 10° — 26° S., 93° — 97° E., 520—4000 m., Antarctic Ocean, $56^{\circ} 31'$ S., $14^{\circ} 29'$ E., 1500 m., in the mean annual isotherms of 20 C, 12° C. and beyond 6° C. in the Antarctic Zone with the latitudinal and longitudinal range of 24° N.— 26° S., 41° — 97° E. in the Indian Ocean, 37° N.— 28° S., 9° E.— 21° W. in the Atlantic and $56^{\circ} 31'$ S., $14^{\circ} 29'$ E. in the Antarctic Ocean.

5. *Cyclothone microdon microdon* (Günther)

1878. *Gonostoma microdon* Günther, *Ann. Mag. nat. Hist.*, (5) 2, p. 187 (type locality : Atlantic and Pacific, 500—2900 fms.)
1883. *Cyclothone lusca* Goode & Bean, *Bull. Harv. Mus. Comp. Zool.*, 10, p. 221 (type locality : $31^{\circ} 41'$ N., $74^{\circ} 35'$ W., 1047 fms.; $33^{\circ} 19'$ N., $76^{\circ} 12' 30''$ W., 457 fms.; $34^{\circ} 28' 25''$ N., $75^{\circ} 22' 50''$ W., 1632 fms.; $33^{\circ} 27' 20''$ W., $75^{\circ} 53' 30''$ W., 1386 fms.).
1888. *Neostoma quadrioculatum* Vaillant, *Exp. Sci. "Travailleur" & "Talisman"*, Poiss., p. 99, pl. 8, fig. 2 (type locality : Gulf of Goscogne, 1353 m., 1600 m., 1420 m., Coast of Morocco, 2000 m., Coast of Portugal, 1350m).
1889. *Gonostoma microdon* Alcock, *Ann. Mag. nat. Hist.*, (6) 4, p. 399 (Bay of Bengal, 30 miles west of Middle Andaman, 485 fms., 9.5° C.; Andaman Sea, $11^{\circ} 41'$ N., $92^{\circ} 43'$ E. 7 miles south east of Ross Is., 265 fms.)
1906. *Cyclothone microdon*. Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 82, 373, pl. 6, fig. 4, text-fig. 32.
1913. *Cyclothone microdon* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 126 fig. 46 (Flores Sea 538 m. ; Banda Sea, 1000—2474 m., Timor, 421 m., Manipa Str., 1556 m., Molucco Passage, 1500 m., Celebes sea, 700—2291 m., Halmahera Sea, 1000 m.).
1930. *Cyclothone microdon* Norman, "*Discovery*" *Rep.*, 2, p. 287 (North and south Atlantic, 32° — 60° S., 16° E.— 57° W., at depths ranging from 0—2500 m., specimens measuring from 12 to 70 mm. in length).

1941. *Cyclothone microdon* Herre, *Mem. Indian Mus.*, 13, p. 336.
 1949. *Cyclothone microdon* Misra, *Rec. Indian Mus.*, 45, p. 413.
 1953. *Cyclothone microdon* Misra, *Rec. Indian Mus.*, 50, p. 398.
 1953. *Cyclothone microdon* Smith, *Sea Fish. South. Africa*, p. 103, fig. 149 (off south coast in 1000-15000 fms.).
 1955. *Cyclothone microdon* Grey, *Fieldiana Zool.*, 37, p. 272 (276 specimens from 800—2000 m. during day and 441 specimens from 250—2000 m. at night).
 1958. *Cyclothone microdon* Briggs, *Bull. Florida State Mus., Biol. Sci.*, 2, (8), p. 256 (Florida, 24°—31° N., 78°-88°W.)

B. 12—13; D. 13—14; P. 9—10; V 6; A. 19.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile nearly straight. Head naked, compressed, conical, 5.5, depth 9.1 in total length (4.9—5.0 and 8.1 in standard length). Eyes small, 13.0 in head, 2.1 in snout, 2.1 in interorbital. Cleft of mouth very wide; maxilla extending to angle of preopercle. Lower jaw prominent, with a ventrally directed spine at the symphysis. 8—10 unequal teeth, one or two enlarged, on the intermaxillary; maxillary teeth 90—100, anterior third smaller, vertical, posterior ones obliquely directed forwards increasing in size backwards with nearly 10—12 larger ones between them; about 12 subequal teeth in the anterior part of mandible with 2 large ones between them, and a continuous series of nearly 100 behind them gradually increasing in size backwards; 2—3 teeth on palatines; 4—6 on pterygoids. A single rayed dorsal fin; origin nearly in the middle of total length far behind pelvic origin and opposite anal. No adipose dorsal. Pectorals low, ends far away from pelvics, 1.8 in head. Pelvics 2.1 in head, not reaching anal; origin nearer to anal origin by a distance equal $1/2$ of the distance between pectorals and pelvics. Anal longer than dorsal, its base 1.5 time dorsal base; origin opposite dorsal. Caudal deeply forked, equal to head, with rudimentary rays at its base. No lateral line. Scales thin, large, deciduous. Luminous organs; a black suborbital; 2 operculars one above the other, the dorsal in a level with eye, the ventral in a level with maxilla; 9—10 between branchiostegals; in the ventral series 2 between isthmus and pectoral, 10 between pectoral and pelvic, 6 between pelvic and anal origin, and 14 between anal origin and caudal base, the last 3 being behind anal base; in the lateral series 7 between operculum and pelvic, 1 between pelvic and anal origin.

Uniform brown or blackish brown.

It attains 70 mm. in length and has been obtained at a depth of 538—2,623 m.

Distribution.—India : Bay of Bengal, 30 miles West of Middle Andaman, 887 m., Andaman Sea, 7 miles south east of Ross Is., 484 m., 9.5° C.—Middle and West Atlantic Ocean, 40° N.—40° S., 914—5202 m.; South Atlantic Ocean, 48°—52° S., 37°—49° W., 2500—2700 m., Canary Is., 950—4105 m., West Coast of Africa between Canary Is. and Cape of Good Hope, 31° N.—42° S., 18° E.—21° W., 700—4000 m., Arctic Ocean, Davis Str. and Denmark Str., 65°—67° N., 30°—58° W., 538—2623 m.; between Maldives and Chagos Is., 1°—4° S., 73° E., 600—1000 m., between New Amsterdam and Sumatra, 10°—34° S., 80°—97° E., 1000—3000 m., North of New Zealand, 35° S., 175° E., 940—5202 m., North of New Guinea, 940—5202 m. South of Sandwich Is., 940—5202 m., South of Japan, 34° N., 135° E., 940—5202 m., Galapagos Is., 1° S., 90° W., Antarctic Ocean, 62°—26° S., 95° 44' E., 50° 1' S., 123° 4' E., 3292—3611 m., Gulf of Naples, Mediterranean, 40° 51' N., 14° 26' E., Florida, 24°—31° N., 82°—88° W., in the mean annual isotherms of 20° C, 12° C, 6° C, and beyond 6° C in the Arctic and Antarctic zones with the latitudinal and longitudinal range of 11° N.—50° S., 18° E.—90° W., in the Indo-Pacific = (11° N.—50° S., 18°—125° E. in the Indian Ocean + 35° N.—5° S., 120° E.—80° W. in the Pacific Ocean), 40° N.—50° S., 18° E.—88° W. in the Atlantic Ocean, 65°—67° N., 30°—58° W. in the Arctic Zone, 53°—62° S., 95° E.—57° W. in the Antarctic Zone and 40° 51' N., 14° 26' E. in the Mediterranean.

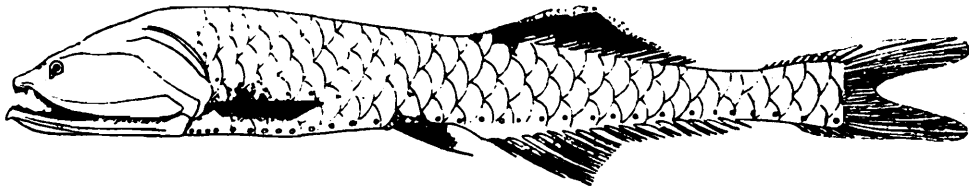
6. *Cyclothone microdon pallida* Brauer

(Text-fig. 56)

- 1902. *Cyclothone pallida* Brauer, *Zool. Ann.*, 25, p. 281 (type locality : Atlantic ; Indian Ocean ; original description based on specimens from the Bay of Bengal, 5° 23' 3" N., 94° 48' 1" E., 800 m.).
- 1906. *Cyclothone microdon pallida* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 84, 373. pl. 6, fig. 2, fig. 33 (7° 1' 2" N., 85° 56' 5" E., 2500 m.).
- 1939. *Cyclothone pallida* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 18 Arabian Sea : 23° 2' 48" N., 61° 3' 54" E., 23° 2' 30" N., 64° 41' 11" E., N 200, 2000 (-0) m., 12° 8' 6" N., 63° 4' 36" E., 12° 5' 18" N., 63° 1' 42" N. 200, 430—984 m., 1° 39' 6" S., 61° 13' 48" E., 2° 7' 30" S., 61° 21' 12" E., N 100, 1500 (-0) m., 7° 14' N., 60° 38' 42" E., 7° 14' 18" N., 60° 39' 30" E., MT, 2937—3182 m., 9° 40' 24" N., 54° 33' 36" E., 9° 42' 18" N., 54° 39' E., N 100, 850 (-0) m., 4° 44' 30" N., 72° 46' E., 4° 41' 12" N., 72° 42' 48" E.

4° 42' 30" N., 72° 42' 30" E., 4° 36' 48" N., 72° 48' 54" E.,
MT, 2937—3182m., Gulf of Aden, N 200, 900 (-0) m.,
N 200, 952 (-0) m., AT, 1061—1080 m., Gulf of Oman,
N 100, 1500 m., 7.5° C.).

1949. *Cyclothone microdon pallida* Misra, *Rec. Indian Mus.*, 45, p. 414.
1953. *Cyclothone microdon pallida* Misra, *Rec. Indian Mus.*, 50, p. 397.
1955. *Cyclothone pallida* Grey, *Fieldiana Zool.*, 37, p. 272 (off Bermuda, 32 N., 64 W., 41 specimens from 800—2000 m. during day, 97 specimens from 260—1400 m. at night).



TEXT-FIG. 56.—Lateral view of *Cyclothone microdon pallida* Br. (After A. Brauer)

B. 12—13; D. 13—14; P. 9—10; V. 6; A. 19.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated; dorsal profile convex, ventral profile nearly straight. Head naked, compressed, conical, 4.7, depth 7.7 in total length (4.1 and 6.7 in standard length). Eyes small, 15.0 in head, 2.1 in snout, 2.1 in interorbital. Cleft of mouth wide; maxilla extending to angle of preopercle. Lower jaw prominent. Dentition more or less similar to the previous species with a ventrally directed spine at the symphysis. A single rayed dorsal fin; origin slightly before middle of total length and behind pelvic origin and nearly opposite to anal origin. No adipose dorsal. Pectorals low, 1.7 in head, not reaching pelvics. Pelvics almost reaching anal origin, 2.1 in head; origin much nearer to anal origin than to pectoral base. Anal longer than dorsal, 1.3 times dorsal base; origin opposite dorsal origin. Caudal deeply forked, with rudimentary rays at its base, equal to head. No lateral line. Scales large, thin, deciduous. Luminous organs; suborbitals, operculars and branchiostegals as in the previous species; in ventral series, 3 between isthmus and pectorals, 10 between pectoral and pelvic, 4 between pelvic and anal origin, 16 between anal origin and caudal base, the last 4 being behind anal base; in the lateral series, as in the above species.

Uniform brown becoming bluish grey towards abdomen, with the area between pelvics and anal unpigmented.

Found at a depth of 250—5071 m., abyssal.

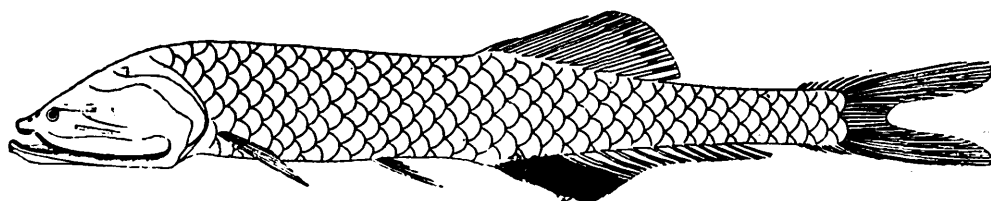
Distribution.—India : Bay of Bengal, $7^{\circ} 1' 2''$ N., $85^{\circ} 56' 5''$ E., 2500 m., Arabian Sea, $12^{\circ} 8' 6''$ N., $63^{\circ} 4' 36''$ E., $12^{\circ} 5' 18''$ N., $63^{\circ} 1' 42''$ E., N 200, 430—984 m., $7^{\circ} 14' 18''$ N., $60^{\circ} 38' 42''$ E., $7^{\circ} 14' 18''$ N., $60^{\circ} 39' 30''$ E., MT, 2937—3182 m., $9^{\circ} 40' 24''$ N., $54^{\circ} 33' 36''$ E., $9^{\circ} 42' 18''$ N., $54^{\circ} 39' 39''$ E., N 100, 850 (—0) m., $23^{\circ} 2' 48''$ N., $61^{\circ} 3' 54''$ E., $23^{\circ} 2' 30''$ N., $64^{\circ} 41' 11''$ E., N 200, 2000 (—0) m., Maldive area; $4^{\circ} 44' 30''$ N., $72^{\circ} 46' 48''$ E., $4^{\circ} 41' 12''$ N., $72^{\circ} 42' 48''$ E., $4^{\circ} 42' 30''$ N., $72^{\circ} 42' 30''$ E., $4^{\circ} 36' 48''$ N., $72^{\circ} 48' 54''$ E., MT 2937—3182 m.—Indian Ocean $1^{\circ} 39' 6''$ S., $61^{\circ} 13' 48''$ E., $2^{\circ} 7' 30''$ S., $61^{\circ} 21' 12''$ E., N 100, 1500 (—0) m., Gulf of Aden, 10° — 13° N., 45° — 49° E., N 200, 900 (—0) m., N 200, 952 (—0) m., AT, 1061—1080 m., Gulf of Oman, 25° N., 56° E., N 100, 1500 m., 5.75° C., Cape Verde Is., 14° N., 21° W., 250—550 m., Gulf of Guinea 0° — 1° N., 7° E.— 10° W., South West Coast of Africa 9° — 31° S., 8° — 9° E., between Zanzibar and Seychelles 4° — 6° S., 41° — 53° E., 2000—5071 m., between Seychelles and Chagos Archipelago, 2° — 3° S., 58° — 65° E., 1500—4129 m., between Chagos Archipelago and Ceylon, 2° N.— 6° S., $73^{\circ} 76'$ E., 2500—4133 m., North East Coast of Africa, 0° — 9° N., 43° — 53° E., 1000—5064 m., North of New Amsterdam; between New Amsterdam and Sumatra, 0° — 32° S., 83° — 101° E., 1100—2400 m., 8.7° C.— 1.1° C.; North West of Chagos Is., 2° S., 67° E., South of Cape Verde Is., 6° N., 14° W., 250—550 m., in the mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of 25° N.— 6° S., 43° — 101° E. in the Indian Ocean and 32° N.— 31° S. 9° E.— 64° W. in the Atlantic = (14° N.— 31° S., 9° E.— 21° W. in 20° C and 12° C mean annual isotherm + 32° N., 64° W. in 20° C mean annual isotherm).

212. *Cyclothone obscura* Brauer

(Text-fig. 57)

1902. *Cyclothone obscura* Brauer, *Zool. Ann.*, 25, p. 280 (type locality : Atlantic and Indian Oceans; original description based on specimens from Indian Ocean, $4^{\circ} 45'$ S., $48^{\circ} 58' 6''$ E., 2000 m.).
1906. *Cyclothone obscura* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 88, 374, pl. 6, fig. 3, text-fig. 35 (Bay of Bengal, $7^{\circ} 43' 2''$ N., $88^{\circ} 44' 9''$ E., 2000 m., $7^{\circ} 1' 2''$ N., $85^{\circ} 56' 5''$ E., 2500 m.).
1930. *Cyclothone obscura* Norman, "*Discovery*" *Rep.*, 2, p. 288 (Atlantic Ocean, $5^{\circ} 30' 30''$ N., $17^{\circ} 45'$ W., TYF, 2500—2700 (—0) m., 2.85° C. at 2598 m.).

1949. *Cyclothone obscura* Misra, *Rec. Indian Mus.*, 45, p. 414.
 1953. *Cyclothone obscura* Misra, *Rec. Indian Mus.*, 50, p. 397.
 1953. *Cyclothone obscura* Smith, *Sea Fish. South. Africa*, p. 103 (S. Africa).



TEXT-FIG. 57.—Lateral view of *Cyclothone obscura* Br. (After A. Brauer)

B. 13; D. 13—15; P. 9—10; V. 6; A. 17—19.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile nearly straight. Head naked, compressed, conical, 4.8, depth 8.3 in total length (4.1 and 7.5 in standard length). Eyes small, 14.5 in head, 2.0 in snout, 2.0 in interorbital. Cleft of mouth very wide; maxilla extending to angle of opercle. Lower jaw prominent, with a ventrally directed spine at the symphysis. About 14 unequal teeth, 1 or 2 enlarged on intermaxillary; maxillary teeth about 100, anterior third smaller, vertical, posterior one obliquely directed forwards increasing in size backwards, with 13 larger ones between them; about 14 uniform teeth on the anterior part of mandible, with 2 large ones between them and a continuous series of nearly 7—4 behind them gradually increasing in size backwards; 3—5 teeth on palatine. A single rayed dorsal fin; origin before middle of total length, nearer to snout end than to caudal origin, almost opposite to anal origin and behind pelvic origin. No adipose dorsal. Pectorals low, not reaching pelvics, 1.6 in head. Pelvics 2.1 in head, not reaching anal; origin nearer to anal origin than to pectoral base. Anal longer than dorsal, its base 1.5 times dorsal; origin nearly opposite dorsal. Caudal deeply forked, with rudimentary rays at its base, equal to head. Luminous organs hidden beneath scales. Pyloric caeca 3.

Uniform deep brownish grey, vertical fins lighter.

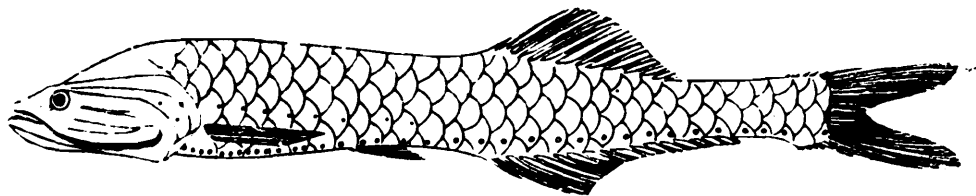
It attains 58 mm. in length and has been obtained at a depth of 800—4000 m., abyssal.

Distribution.—India : Bay of Bengal, $7^{\circ} 43' 2''$ N., $88^{\circ} 44' 9''$ E., 2000 m., $7^{\circ} 2' 2''$ N., $85^{\circ} 56' 5''$ E., 2500 m. —West Coast of Africa, between Cape Verde Is. and Cape of Good Hope, 14° N.— 31° S., 9° E.— 21° W., 800—4000 m., between Seychelles and Chagos I., 2° — 4° S., 48° — 70° E., 800—4000 m., South of Socotra, 9° N., 53° E., 800—4000 m., between Cocos Is. and Sumatra, 8° — 10° S., 97° — 98° E., 800—4000 m., between Chagos Is. and Sri Lanka, 2° — 4° S., 48° — 70° E., 1000—2500 m., 1.7° — 1.4° C., in the mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of 9° N.— 10° S., 48° — 98° E. in the Indian Ocean and 14° N.— 31° S., 9° E.— 21° W. in the Atlantic.

7. *Cyclothone signata signata* Garman

(Text-fig. 58)

- 1899 *Cyclothone signata* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 246, pl. 1, fig. 3 (type locality : $61^{\circ} 21'$ N., $80^{\circ} 41'$ W.).
1906. *Cyclothone signata* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 78, 373, pl. 6, fig. 6, text-figs. 28, 29 (Bay of Bengal, $7^{\circ} 1' 2''$ N., $85^{\circ} 56' 5''$ E., 2500 m., $5^{\circ} 23' 2''$ N., $94^{\circ} 48' 1''$ E., 800m.).
1913. *Cyclothone signata* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 125 (Bali Sea, 1310 m., Macassar Str., 450 m., Banda Sea, 1000—2081 m., Molucca Passage, 1500 m., Manipa Str., 1536m., Halmahera Sea, 1000m., Timor sea, 421 m.).
1939. *Cyclothone signata* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 18 (Arabian sea, $9^{\circ} 40' 24''$ N., $51^{\circ} 33' 36''$ E., $9^{\circ} 42' 18''$ N., $54^{\circ} 39'$ E., N 100, 400 (-0) m., N 200, 2001 (-0) m., Gulf of Aden, N 100, 600 (-0) m., N 200, 952 (-0) m.).
1949. *Cyclothone signata* Misra, *Rec. Indian Mus.*, 45, p. 414.
1953. *Cyclothone signata* Misra, *Rec. Indian Mus.*, 50, p. 397.
1953. *Cyclothone signata* Smith, *Sea Fish. South. Africa*, p. 103 (off coast of S. Africa in 300—1500 fms.).



TEXT-FIG. 58.—Lateral view of *Cyclothone signata signata* Garman (After A. Brauer)

B. 12—13; D. 12—14; P. 9—10; V. 6—7; A. 19—20.

Body scaleless, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile straight. Head naked, compressed, conical, 5.0, depth 7.5 in total length (4.1 —4.5 and 6.2 —7.0 in standard length). Eyes small, 1.4—2.0 in snout, 2.0 in interorbital. Cleft of mouth oblique, wide; maxilla extending to angle of preopercle. Lower jaw prominent, with a ventrally directed spine at symphysis. 6—7 nearly subequal, short teeth on intermaxilla; maxillary teeth 52—60, anterior third smaller, vertical, posterior ones obliquely directed forwards increasing in size backwards; about 62—66 teeth in the mandible of which the anteriormost 12 ones subequal with 2 large between them and a continuous series of 50—54 behind them gradually increasing in size backwards; vomer toothless, palatines 3—4; pterygoids 2—3. A single rayed dorsal fin; origin before middle of total length, almost opposite anal and behind pelvics. No adipose dorsal. Pectorals low, 1.8 in head, not reaching pelvics. Pelvics 1.8 in head, almost reaching anal; origin nearer to anal origin than to pectoral base and before dorsal origin. Anal base 1.4 in dorsal base; origin opposite dorsal. Caudal deeply forked, 1.1 in head, with rudimentary rays at its base. No lateral line. No scales. Luminous organs : a small black suborbital; 2 operculars, the dorsal one below level of eye, the ventral in a level with the lower base of pectoral; 9—10 between branchiostegals; in the ventral series, 2 between isthmus and pectoral, 10 between pectoral and pelvic, 4 between pelvic and anal origin, 12 between anal origin and caudal base, none between last anal ray and caudal origin; in the lateral series, 6 between operculum and pelvic, the anteriormost one higher up outside the series, and 1 between pelvic and anal. Pyloric caeca 3.

Pinkish white, tinted with blackish blue on abdomen; eyes and photophores black with silvery sheen; a series of black spots above photophores from operculum to caudal base; 2 transverse streaks at caudal base; a pair of elongate spots on occiput diverging from nape towards eyes.

It attains 45 mm. in length and has been obtained at a depth of 520—3278 m.; abyssal.

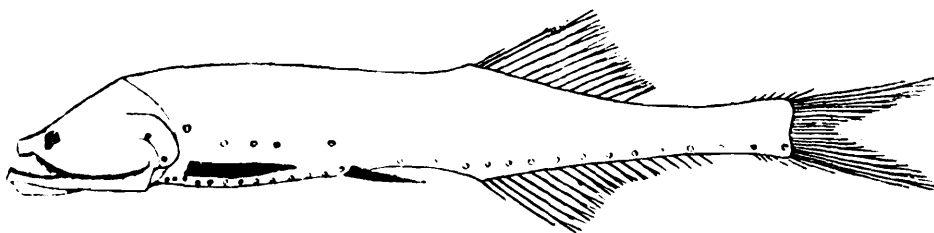
Distribution.—India : Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m., 5° 23' 2" N., 94° 48' 1" E., 800 m.—

Gulf of Panama, 9°N., 79°W., 3278 m., West Coast of Africa, between Canary Is. and Cape of Good Hope, 31°N.—37°S., 18°E.—21°W., 600—3000 m., Gulf of Aden, 13°N., 49°E., 520—2500 m., North East Coast of Africa, 9°N., 53°E., 520—2500 m., between Zanzibar and Chagos 1. 2°—4°S. 48°—70° E., 520—2500 m., between New Amsterdam and Sumatra, 10°—30°S., 87°—97°E., 520—2500 m., between Sri Lanka and Chagos Archipelago, 4°N.—6°S., 73°—78°E., between Chile and Cape Horn, 42°—55° S., 67°—74°W., in the mean annual isotherms of 20°C. 12°C. and 6°C. and beyond 6°C. in the Arctic Zone, with the latitudinal and longitudinal range of 13°N.—30°S., 48°—97°E. in the Indian Ocean, 31°N.—37°S., 18°E.—21°W. in the Atlantic and 61° 21' N., 80° 41' W. in the Arctic Zone.

8. *Cyclothone signata alba* Brauer

(Text-fig. 59)

1906. *Cyclothone signata* var. *alba* Brauer, "Valdivia" Tiefsee Fische, 15, p. 80, fig. 30 (type locality : Atlantic Ocean, 24° 43' 4" N. 17° 1' 3" W.).
1949. *Cyclothone signata alba* Misra, *Rec. Indian Mus.*, 45, p. 413.
1953. *Cyclothone signata alba* Misra, *Rec. Indian Mus.*, 50, p. 397.



TEXT-FIG. 59.—Lateral view of *Cyclothone signata alba* Br.
(After A. Brauer)

B. 12—13; D. 12—14; P. 9—10; V. 6—7; A. 19—20.

Body scaleless, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile straight. Head naked, compressed, conical, 5.3, depth 7.5 in total length (4.5 and 6.4 in standard length). Eyes small, 12.0 in head, 2.0 in snout. Cleft of mouth oblique; maxilla extending to angle of preopercle. Lower jaw prominent, with a ventrally directed spine at symphysis. Dentition more or less similar to the previous species. A single rayed dorsal fin; origin in the middle of total length, opposite to anal origin. No adipose dorsal. Pectorals 16—1341ZSI/71

low, not reaching pelvics, 1.5 in head. Pelvics not reaching anal, 1.8 in head; origin nearer to anal origin than to pectoral base. Anal base 1.5 times dorsal base; origin opposite to dorsal. Caudal deeply forked, with rudimentary rays at its base, 1.2 times the head. No lateral line. No scales. Luminous organs : a small, black suborbital; 2 operculars; 8 between branchiostegals; in the ventral series, 2 between isthmus and pectoral, 11 between pectoral and pelvic, 3 between pelvic and anal origin, 13 between anal origin and caudal base of which one between last anal ray and caudal origin; in the lateral series, 2 between operculum and pelvic and none between pelvic and anal. Pyloric caeca 4.

It attains 45 mm. in length and has been obtained at a depth of 520—2500 m.; abyssal.

Distribution.—India : Bay of Bengal, 5°—7°N., 85°—94°E., 800—2500 m.—West coast of Africa, between Canary Is. and Cape of Good Hope, 24°N.—33°S., 10°E.—21°W., 600—3000 m., between Chagos Archipelago and Zanzibar, 2°—6°S., 41°—70°E., 4°—13°N., 46°—53°E., between Chagos archipelago and Sri Lanka, 4°N.—6°S., 73°—78°E., 1900—2500 m., Northeast coast of Africa, 520. 2500 m., Gulf of Aden, 520—2500 m., between New Amsterdam and Sumatra, 0° 16' N.—26°S., 93°—99°E., 520—2500 m., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 13°N.—26°S., 41°—99°E. in the Indian Ocean and 24°N.—33°S., 10°E.—21°W. in the Atlantic Ocean.

88. Genus *Vinciguerria* Goode & Bean

1895. *Vinciguerria* Goode & Bean, *Ocean Ichth.*, p. 513 (type, *Maurolicus attenuatus* Cocco).
 1895. *Zalarges* Jordan & Williams, *Proc. Calif. Acad. Sci.*, (2) 5, p. 793 (type, *Z. nimbarius* J. & W., orthotypic).

Body elongate, sides moderately compressed, scales thin, cycloid deciduous, with uninterrupted series of lateral photophores. Eyes large. Gape of mouth wide. Teeth on both jaws, palatines, pterygoids and vomer. Gill openings wide. Gill rakers well developed. Gill membranes free from isthmus and from each other. No pseudobranchiae. Branchiostegals 9—11. Dorsal fin with 9—14 rays ; origin midway from snout and base of caudal and in advance of anal origin. Pelvic origin in advance of dorsal origin.

Anal with 14—15 rays. Adipose fin present. Caudal equally forked or lunate.

Distribution.—Atlantic Ocean : Bahmas; Gulf of Guinea, 2000—3500 m., Azores Is., Mediterranean; Indian Ocean : between Zanzibar and Chagos Is., 200—2500 m., between Chagos Is. and Sri Lanka, 800—2500 m., Arabian Sea, 549—640 m., Bay of Bengal, 549—2500 m., between New Amsterdam and Sumatra, 800—2500 m., Pacific Ocean : New Zealand; Gulf of Panama, 182—3339 m., West coast of Central Americas, 182—3339 m.

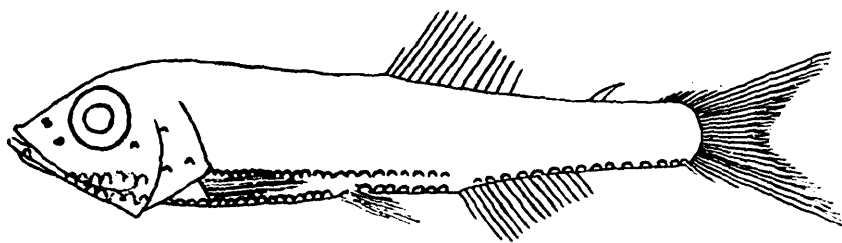
Key to species of genus Vinciguerria Goode & Bean

1. Nine photophores between pelvics and anal in the lateral series; an adipose dorsal. *V. lucetius*
2. Eleven photophores between pelvics and anal in the lateral series; no adipose dorsal *V. nimbarius*

213. *Vinciguerria lucetius* (Garman)

(Text-fig. 60)

1899. *Maurolicus lucetius* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 242, pl. J. fig. 2 (typelocality : 21° 36' 30" N., 106° 25' W., 238 fms., 48·1°F.).
1906. *Vinciguerria lucetia* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 97, 374, fig. 40 (Bay of Bengal ; 5° 23' 2" N., 94° 48' 1"E., 800 m., 7° 1' 2" N., 85° 56' 5" E., 2500 m.)
1913. *Vinciguerria lucetia* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2. p. 119, fig. 44 (Molucca Passage, 1° N., 128° E., 1500 m.).
1930. *Vinciguerria lucetia* Norman, "Discovery" Rep., 2, p. 292.
1949. *Vinciguerria lucetius* Misra, *Rec. Indian Mus.*, 45, p. 413.
1953. *Vinciguerria lucetius* Misra, *Rec. Indian Mus.*, 50, p. 398.
1953. *Vinciguerria lucetia* Smith, *Sea Fish. South. Africa*, p. 106 (Delagoa Bay).



TEXT-FIG. 60.—Lateral view of *Vinciguerria lucetius* (Garm.)
(After S. Garman)

B. 11; D. 13—14/0; P. 8—9; V 7; A. 14—16.

Body scaly, elongate, moderately compressed; abdomen non-keeled, non-serrated; dorsal profile convex, ventral more or less straight. Head scaleless, compressed, conical, 4.0—4.2, depth 6.0—6.1 in total length (3.3 and 4.9 —5.1 in standard length). Eyes large, 3.5 in head, 0.8 in snout. Interorbital concave, 0.5 in eye. Gape of mouth oblique. Nostrils small, nearer to eye than to snout end; maxilla extending to angle of preopercle. Lower jaw longer, with the symphysial angle prominent. Teeth small, unequal, a series along the entire edge of maxillary; a short series of 4 or more on each palatine. A single rayed dorsal fin; origin midway between snout end and caudal base or nearer to caudal base than to snout end, and half an eye diameter behind pelvic origin. A small adipose dorsal just above or behind last anal ray. Pectorals very low, reaching pelvics, 1.8 in head. Pelvics not reaching anal, 2.0 in head; origin half an eye diameter before dorsal and midway between pectoral base and anal origin. Anal base equal to dorsal base; origin below 9th or 10th dorsal ray, nearer to pelvic origin than to caudal base. Caudal deeply forked, with rudimentary rays at its base, 1.1 in head. No lateral line. Scales thin, deciduous. Luminous organs globular in appearance and directed downwards, each with a silvery face on the lower side and black above; a small antorbital; one suborbital on a level with the antorbital; 3 operculars, the dorsal in a line with midorbit, the 2 ventrals nearly in a line with lateral series; one on each side of symphysis; 8 between branchiostegals; 8 on each side of isthmus; in the ventral series, 4 between isthmus and pectoral, 13 between pectoral and pelvic, 9 between pelvic and anal origin, 15 between anal origin and caudal base, 7 being between last anal ray and caudal base; in the lateral series 13 between operculum and 9 between pelvics and anal origin and none beyond anal. Pyloric caeca 4. Lower gill rakers 18—20.

Blackish above, sides of head and body silvery; some short, black, transverse, stripes on back.

It attains 51 mm. in length and has been obtained at a depth of 182—3,500 m.; abyssal.

Distribution.—India : Bay of Bengal, 5° 23' 2" N., 94° 48' 1" E., 800 m., 7° 1' 2" N., 85° 56' 5" E., 2500 m.—

Gulf of Guinea, 5° N.—3° S., 7° E.—13° W., 2000—3500 m., Delagoa Bay, 25° S., 32° E., between Chagos Is. and Zanzibar, 2°—4° S., 53°—70° E., 800—2500 m., between Chagos Is. and Sri Lanka, 4° N.—6° S., 73°—78° E., 800—2500 m., between New Amsterdam and Sumatra, 0°—34° S., 80°—99° E., 800—2500 m., Molucca Passage, 1° N., 128° E., 1500 m.; Gulf of Panama, 9° N. 79° W., 182—3339 m., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 21° N.—34° S., 32° E.—79° W. in the Indo-Pacific=(7° N.—34° S., 32°—99° E. in the Indian Ocean +1°—9° N., 128° E.—79° W. in the Pacific Ocean) and 5° N.—3° S., 7° E.—13° W. in the Atlantic.

214. *Vinciguerria nimbarius* (Jordan & Williams)

1896. *Zalarges nimbarius* Jordan & Williams, *Proc. Calif. Acad. Sci.*, (2) 5, p. 793, pl. 76 (type locality : Pacific Ocean).
 1930. *Vinciguerria nimbarius* Norman, "Discovery" *Rep.*, 2, p. 292 (reference only).
 1935. *Vinciguerria nimbaria* Horsburgh, *Proc. Calif. Acad. Sci.*, (4) 21, p. 230.
 1939. *Vinciguerria nimbarius* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 19. (Arabian Sea, 23°2' 30" N., 64° 41' E.; N 100, 1500 (-0) m., 5.57 °C., N 200, 2000 (-0) m., 3.18° C., 23°2' 12" N., 64° 33' 39" E., 23° 2' 30" N., 64° 15' 54" E., N 100, 100°(-0) m., 9° C., N 100, 15000 (-0) m., 5.57° C., 19° 2' 18" N., 69° 30' 30" E., 19°19' N., 69° 30' 24" E., AT, 549—640 m., 11.80°C. at 579 m., 9° 40' 24" N., 54° 33' 36" E., 9° 42' 18" N., 54° 39' E., N 100, 400m.).
 1949. *Vinciguerria nimbarius* Misra, *Rec. Indian Mus.*, 45, p. 413.
 1953. *Vinciguerria nimbarius* Misra, *Rec. Indian Mus.*, 50, p. 398.
 1955. *Vinciguerria nimbaria* Grey, *Fieldiana Zool.*, 37, p. 273 (off Bermuda, 32 N., 64 W.; 1 specimen, a post-larva 14.5 (12.5) mm. in 2000 m.) (error in spelling).

B. 8; D. 9; P. 13; V 7; A. 15.

Body scaly, elongate, subfusiform; sides moderately compressed; abdomen non-keeled, non-serrated; dorsal and ventral profiles equally convex. Head naked, compressed, conical, 5.0, depth 6.5 in total length (4.1 and 5.4, in standard length). Eyes large, 3.2 in head, 0.7 in snout. Gape of mouth large, oblique; maxilla extending to preopercular angle. Lower jaw somewhat projecting, with the symphysial angle prominent. A single series of slender, sharp, somewhat unequal teeth along entire

edge of maxilla, some longer but not fanglike; teeth in lower jaw similar and those of both jaws mainly directed forwards; a row of small, slender teeth on each palatine; vomer and tongue toothless. A single rayed dorsal fin; origin nearer to caudal base than to snout end, about an eye diameter behind pelvic origin; base extending over third or fourth of anal. Adipose fin not evident. Pectorals low, narrow, pointed, not reaching pelvics, 1.5 in head. Pelvics not reaching anal, 2.3 in head; origin about an eye diameter before dorsal origin, nearer to anal origin than to pectoral base. Anal base 1.3 in head, 1.1 in dorsal base; origin below 10th or 11th dorsal ray, nearer to pelvic origin than to caudal origin. Caudal somewhat lunate, 1.4 in head. No lateral line. Scales thin, deciduous. Luminous organs : large, conspicuous forming pearly bodies on dark background; a small antorbital; one sub-orbital, on a level with antorbital; 2 operculars, one on a line with the lateral series; one on each side of symphysis; 8 branchiostegals; 10 on isthmus; in the ventral series, 4 between isthmus and pectoral, 11 between pectoral and pelvic, 9 between pelvic and anal, 15 between anal origin and caudal base, the last 7 being between last anal ray and caudal base; in the lateral series, 13 between operculum and pelvic, 11 between pelvic and anal and none beyond anal. Gill rakers long, 5+17.

Brownish above, burnished silvery below; fins with some dark dots; obscure cross bars on caudal; a few dark dots on body.

It attains 60 mm. in length and has been obtained at a depth 400—2000 m., bathypelagic.

Distribution.—Arabian Sea, 19° 21' 18" N., 69° 30' 30" E., 19° 19' N., 69° 30' 24" E., AT, 549—640 m., 11.80° C. at 579 m., 23° 2' 48" N., 64° 31' 54" E., 23° 2' 30" N., 64° 41' E., N 100, 1500 (—0) m., 5.57° C., N 200, 2000 (—0) m., 3.18° C., 23° 2' 12" N., 64° 31' 54" E., 23° 2' 30" N., 64° 15' 54" E., N 100, 1000 (—0) m., 9°C., N 100, 1500 (—0) m., 5.57°C.—Arabian Sea, 9° 40' 24" N., 54° 3' 36" E.; 9° 42' 18" N., 54° 39' E., N 100, 460 m., Gulf of Oman 24° N., 59° E., N 100, 600 m., 12.38°C., Off Bermuda, 32° N., 64°W.; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 9°—24°N., 54°—69°E. in the Arabian Sea and 32°N., 64°W. in the Atlantic.

89. Genus *Valenciennellus* Jordan & Evermann

1896. *Valenciennellus* Jordan & Evermann, *Bull. U. S. nat. Mus.*, **47**, (pt. 1), p. 577 (type, *Maurolicus tripunctulatus* Esmark, orthotypic).

Body moderately elongate, much compressed, scales deciduous, with interrupted series of lateral photophores. Eyes large. Gape of mouth wide. Both jaws with a single series of minute teeth; a single transverse row of similar teeth on head of vomer. Gill-openings very wide. Pseudobranchiae well developed. Gill-rakers long, numerous. Dorsal with 78 rays, origin opposite to anal origin. Pelvic origin in front of dorsal origin. Anal with 23—25 rays. Adipose fin present. Caudal fairly forked.

Distribution.—Atlantic Ocean : Denmark; Gulf of Guinea, 3000 m., Indian Ocean : between Chagos Is. and Sri Lanka, Seychelles, Bay of Bengal, 2500 m., Pacific Ocean : West coast of California, 548 m.

215. *Valenciennellus stellatus* Garman

1899. *Valenciennellus stellatus* Garman, *Mem. Harv. Mus. Comp. Zool.*, **24**, p. 239, pl. 53, fig. 2 (type locality : 30° 31' 35" N., 14° 5' 30" W., 300 fms.).
1906. *Valenciennellus stellatus* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 100, 375, fig. 42 (Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m.).
1949. *Valenciennellus stellatus* Misra, *Rec. Indian Mus.*, **45**, p. 415.
1953. *Valenciennellus stellatus* Misra, *Rec. Indian Mus.*, **50**, p. 398.

B. 9; D. 12/0; P. 12; V. 8—9; A. 23.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated; dorsal and ventral profiles equally convex. Head scaleless, small, short, as deep as long, narrow, 3·8, depth 5·3 in total length (3·3 and 4·5 in standard length). Eyes large, 3·5 in head, longer than snout. Nostrils minute close together, nearer to eye than snout end. Symphysial angle of lower jaw prominent. Cleft of mouth wide, oblique; maxilla extending to postorbit. Teeth very small, acuminate, irregular in jaws; a single transverse row of similar teeth on head of vomer. A single rayed dorsal fin; origin nearer to caudal base than to snout end, just behind pelvic origin, nearly opposite

to anal origin. Adipose dorsal above anal. Pectorals low, long, reaching ventral. Pelvics minute, reaching anal; origin before dorsal origin, very close to anal origin than to pectoral base. Anal longer than dorsal; origin opposite to dorsal; its base 2.0 times dorsal base and extending within less than one eye diameter to the caudal. Caudal forked, 1.3 in head. No lateral lines. Scales deciduous. Luminous organs : in groups, each group on a black back ground varying in size, larger below belly and on head; a series of 6 at base of branchiostegal rays; a group of 3 isthmus, and a second group of 4 between isthmus and shoulder; in the ventral series, from isthmus to vent 17, followed between pelvic and anal by a group of 4; a group of minute ones above the ninth and another of 4 above the 15th and a 3rd group of 3 above the 19th anal ray; a group of several below caudal base; in the lateral series 5 larger ones on shoulder backwards, a row of 17 from operculum to the tail along the lateral line, hindmost the largest.

Muscular areas light, rusty brown; snout and fins whitish, back and lower part of head and abdomen blackish.

It has been obtained at a depth of 548—3000 m., abyssal.

Distribution.—India : Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m.—Gulf of Guinea, 3° S., 7° E., 3000m. Seychelles; between Chagos Is. and Sri Lanka, 2°—4° N., 76°—78° E., 2000—2500 m., West coast of California, 27° N., 111° W., 548 m., Seychelles, 2°—4° S., 53°—65° E., 2000—2500 m.; in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 27° N.—4° S., 53° E.—111° W. in the Indo-Pacific=(7° N.—4° S., 53°—85° E. in the Indian Ocean+27° N. 111° W. in the Pacific Ocean) and 30° N.—3° S., 7° E.—14° W in the Atlantic Ocean.

90. Genus *Yarrella* Goode & Bean

1895. *Yarrella* Goode & Bean, *Ocean-Ichth.*, p. 103 (type, *Y. blackfordi* G. B., orthotypic).

1926. *Polymetme* Mc Culloch, *Biol. Res. "Endeavour"*, 5, p. 166 (type, *P. illustris* Mc Culloch, orthotypic).

Body elongate, compressed, scales thin large, deciduous; with uninterrupted series of lateral photophores and without additional serial photophores on sides of body. Eyes moderate. Gape of mouth wide. Both jaws, palatines

and pterygoids toothed; teeth present or absent on vomer. Gill membranes free from isthmus. Pseudobranchiae absent. Gill rakers not very numerous, those on first and long bristle-like. Branchiostegals 12—14. Dorsal with 10—12 rays; origin in front of anal, midway between pelvic and anal. Anal with 23—32 rays. Adipose fin present. Caudal forked. No air bladder.

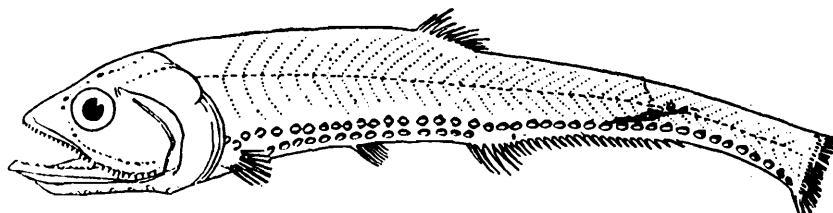
Distribution.—Atlantic Ocean : Gulf of Mexico, 589 m., Indian Ocean : Gulf of Aden, OT, 457—549 m., Zanzibar area, 640 m., Natal coast, 365 m., Maldiva area, 494 m., Andaman Sea, 338—740 m.; Pacific Ocean : Great Australian Bight.

216. *Yarrella corythaeolum* (Alcock)

(Text-fig. 61)

1898. *Diplophos corythaeolum* Alcock, *Ann. Mag. nat. Hist.*, (7) 2, p. 147° (type locality : Andaman Sea, 11° 31' 40" N., 92° 46' 6" E., 188—220 fms., 13·3°C., 11°25' 5" N. 92° 45' 6" E., 405 fms., 8·3° ., type in the Zoological Survey of India).
1899. *Diplophos corythaeolum* Alcock, *Illus. Zool. Investig. Fish.*, pl. 25, fig. 3.
1899. *Photichthys corythaeolus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 142 (Andaman Sea).
1924. *Yarrella africana* Gilchrist & Von Bonde, *Rep. Fish. Mar. Biol. Surv. S. Africa*, 3 *Spec. Rep.*, 7, p. 8. pl. 1, fig. 2 (type locality : Natal).
1926. *Polymetme illustris* Mc Culloch, *Biol. Res. "Endeavour"*, 5, p. 167. pl. 45, fig. 1 (type locality: Great Australian Bight 32° S., 130° E.).
1930. *Yarrella corythaeola* Norman, "*Discovery*" *Rep.*, 2, p. 289.
1939. *Yarrella corythaeola* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 19 (Maldiva area ; 4°58' 42" S., 73° 16' 24" E., AT, 494 m., 10. 86°C., at 400 m.).
1941. *Photichthys corythaeolus* Herre, *Mem. Indian Mus.*, 13, p. 336.
1949. *Yarrella corythaelum* Misra, *Rec. Indian Mus.*, 45, p. 415.
1953. *Yarrella corythaelum* Misra, *Rec. Indian Mus.*, 50, p. 398.

1953. *Yarrella corythaeola* Smith, *Sea Fish. South. Africa*, p. 104 fig. 15 (off Natal, coast 29° S., 30° E., in 200 fms.)



TEXT-FIG. 61.—Lateral view of *Yarrella corythaeolum* Alc.,
(After A. Alcock)

B. 12; D. *ca.* 11/0; P. 10; V. 7; A *ca* 24.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral profile straight. Head scaleless, compressed, conical, 5.5, depth 7.5 in total length (4.6—4.0 and 6.1—5.7 in standard length). Eyes 4.5 in head, 0.7—1.0 in snout, 0.8 in interorbital. Gape of mouth oblique, very wide; maxilla extending to angle of preopercle. Lower jaw projecting. A single row of small distant, acicular, fang-like teeth of unequal size on each jaw; a row of similar, close-set teeth on part of palatine; a fang-like tooth on either side of the head of vomer; entire surface of mesopterygoid with short little denticles. A single rayed dorsal fin smaller than anal; origin in the middle of standard length, about an eye diameter behind pelvic origin. A small adipose dorsal above hind portion of anal. Pectorals low, not reaching pelvics, 1.1 in head. Pelvics not reaching anal, 2.3 in head; origin nearer to anal origin than to pectoral base and about an eye diameter before dorsal origin. Anal long, base 2.8 times dorsal base; origin nearer to pelvic origin than to caudal base and below last 3 or 4 dorsal rays. Caudal forked, with a few rudimentary rays at its base, equal to head. Lateral line scales thin, deciduous. Luminous organs, one antorbital; one suborbital on a level with antorbital; 3 operculars; one at mandibular symphysis; branchiostegals 12; 12—13 between isthmus and pectoral base; in the ventral series, 8 between pectoral and pelvic, 8 between pelvic and anal; 23 between anal origin and caudal base, the last 8 between last anal ray and caudal base; in the lateral series 9 between operculum and pelvic, 8 between pelvic and anal. Lower gill rakers 12.

Greyish silvery.

It attains 253 mm. in length and has been obtained at a depth of 338—740 m., bathypelagic.

Distribution.—Bay of Bengal, 11° 31' 40" N., 92° 46' 6" E., 11° 25' 5" N., 92° 45' 6" E., 338—740 m., 13.3°—8.3°C.—Maldivé area, 4° 58' 42" S., 73° 16' 24" E., AT 494 m., 10.86°C. at 400 m.; Gulf of Aden 13° N., 46° E., OT 457—549 m.; Zanzibar area, 5° S., 39° E., 640 m., 8.8°C. at 627 m., Natal coast 29° S. 30° E., 365 m., Great Australian Bight, 32° S., 130° E., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 13° N.—32° S., 30° —130° E. in the Indian Ocean.

91. Genus *Triplophos* Brauer

1902. *Triplophos* Brauer, *Zool. Anz.*, **25**, p. 282 (type, *T. elongatus* Br.).

Body elongate, compressed, scaly ; with uninterrupted series of lateral photophores and additional serial photophores. Eyes moderate. Gape of mouth very wide. Premaxillary, maxillary and mandible, each with a single series of small unequal teeth; 2 or 3 teeth on vomer and a single series on palatines. Gill openings wide. Branchiostegals 17. Dorsal with 10 rays ; origin in front of anal origin and more than twice as near to tip of snout as base of caudal. Pelvic origin opposite to dorsal origin. Anal very long with 57—61 rays ; origin immediately behind vertical from dorsal fin. Adipose fin absent. Caudal deeply forked.

Distribution.—South of Sri Lanka, 2000 m.

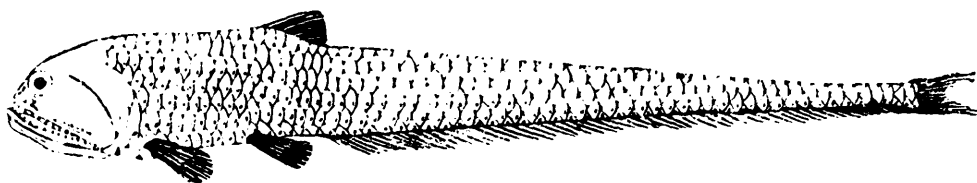
217. *Triplophos hemingi* (Mc Ardle)

(Text-fig. 62)

1901. *Photichthys hemingi* Mc Ardle, *Ann. Mag. nat. Hist.*, (7) **8**, p. 521 (type locality : Indian Ocean).
 1902. *Triplophos elongatus* Brauer, *Zool. Ann.*, **25**, p. 282 (type locality : South of Ceylon, 4° 56' N., 78° 15' 3" E., 2000 m.).
 1905. *Photichthys hemingi* Alcock, *Illus. Zool. Investig. Fish.*, pl. 36, fig. 2.
 1906. *Triplophos elongatum* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 99, 375, pl. 7, fig. 4, text-fig. 41.
 1930. *Photichthys hemingi* Norman, "*Discovery*" *Rep.*, **2**, p. 296.

1949. *Triplophos elongatum* Misra, *Rec. Indian Mus.* 45, p. 415.

1953. *Triplophos elongatum* Misra, *Rec. Indian Mus.*, 50, p. 399, fig. 15b.



TEXT-FIG. 62.—Lateral view of *Triplophos hemingi* (Mc Ardle)
(After A. Brauer)

B. 17; D. 10; P. 10; V. 6; A. 57; L. 1.60.

Body scaly, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile convex, ventral slightly concave. Head scaleless, short, 6.8, depth 8.2 in total length (6.3 and 7.6 in standard length). Eyes moderate, 6.0 in head, 0.7 in snout. Cleft of mouth very wide; maxilla extending to angle of preopercle. A single series of small, unequal, teeth on premaxillary, maxillary and mandible; 2 or 3 teeth on vomer; a single series on palatines. A single rayed dorsal fin; origin anteriorly in the second fourth of total length, slightly behind pelvics and before anal. No adipose dorsal. Pectorals low, 2.0 in head, not reaching pelvics. Pelvics 2.1 in head, almost reaching anal origin; origin slightly before or opposite to dorsal, nearer to anal origin than to pectoral base. Anal very long, base 9.5 times dorsal base, almost reaching caudal base. Caudal forked, with rudimentary rays at its base, 1.8 in head. No lateral line. Scales large. Luminous organs : one antorbital; one opercular; branchiostegals 13; 3 between isthmus and pectoral base; in the ventral series, 11 between pectoral and pelvic, 6 between pelvic and anal origin, 41 between anal and caudal base, the last one between last anal ray and caudal origin; in the lateral series, 10 between operculum and pelvic, 6 between pelvic and anal, 34—37 between 1st and 45th—50th anal rays; in the additional series 4 rows; in the 1st row, 9 between operculum and pelvic and none behind; in the 2nd row 10 between operculum and pelvics, 6 between pelvic and anal, 28 between 1st and 37th anal rays; in the 3rd row 11 between operculum and pelvic, 4 between pelvic and anal, 4 between 1st and 10th anal rays and none behind; in the 4th row 11 between operculum and pelvic, 5 between pelvic and anal origin, and none behind; in the 5th row

4 from above level of opercular to the vertical from pectoral base.

Dark brownish violet; fins lighter grey; caudal pinkish; eyes blue.

It attains a length of 144 mm. and has been obtained at a depth of 2,000 m., bathypelagic.

Distribution.—Sri Lanka : South of Sri Lanka, $4^{\circ} 56'$ N., $78^{\circ} 15' 3''$ E., 2000 m., in the mean annual isotherm of 20° C.

XXXII. Family STERNOPTYCHIDAE

Body scaleless or scaly, short, elevated anteriorly, compressed; abdomen more or less keeled, non-serrated. Head scaleless. Upper and lower jaw toothed; palatines toothed or non-toothed; vomer toothed or non-toothed. Eyes large, telescopic or non-telescopic. Gape of mouth almost vertical. Postocular organ present on each side. No barbels. Gill arches with rakers. Pseudobranchiae. Dorsal preceded by spines or not; origin nearly in the middle of standard length, above or before anal origin. Adipose dorsal low totally or partially above anal. Pectorals low. Pelvics small, below or before dorsal. Scales if present deciduous. Anal divided or undivided, nearly equal to dorsal; origin behind or below dorsal. Caudal forked.

The family STERNOPTYCHIDAE is represented by 3 genera in the Indian region.

Key to genera of family STERNOPTYCHIDAE

1. Dorsal fin preceded by a large triangular transparent plate ; an abrupt ventral constriction between trunk and tail 3
2. Dorsal fin preceded by a forked spine ; no abrupt ventral constriction between trunk and tail **Polyipnus**
3. Eye normal ; anal undivided ; ventral constriction between trunk and tail with integumentary plate **Sternoptyx**
4. Eye telescopic ; anal divided ; ventral constriction between trunk and tail without integumentary plate **Argyropelecus**

92. Genus **Sternoptyx** Hermann

1781. *Sternoptyx* Hermann, *Der Naturforscher*, 16, p. 8 (type, *S. diaphana* Hermann).

Body short, elevated, compressed, scaleless, with an almost ventral constriction between trunk and tail ; with photophores. Eyes large, nontelescopic. Numerous small unequal teeth in jaws; palatines toothless. Gape of mouth wide, subvertical. Gill openings wide. Pseudobranchiae present. Gills 4. Gill membranes not free from isthmus. Gill rakers moderate. Dorsal fin with 9—12 rays, preceded by a large triangular plate with its upper border dentated, and strengthened along its hind margins by a short spine. Pectoral long, low. Pelvics small ; origin behind dorsal, arising on a broad transparent integumentary fold between trunk and tail. Adipose fin low, beginning immediately behind dorsal and extending to anterior rays of caudal. Caudal broad, forked.

Distribution.—Atlantic Ocean : North and South Atlantic, 0—2700 m.; St. Helena; Cape Verde Is., Antelles; Jamaica; Portugal, 1123—2792 m., Morocco, 1123—2792 m., Azores Is., 1123—2792 m.; between Tenerife and St. Thomas, 0—4571 m., Sierre Leone, 0—4571 m., Mid-Atlantic Ocean, 0—4571 m., between Canary Is. and Cape of Good Hope, 273—3082 m., East Coast of North America, 273—3082 m., West Indies, 273—3082 m., Indian Ocean : Arabian Sea, 1657—3676 m., between Zanzibar and Seychelles, 1100—3000 m., between Maldive and Sri Lanka, 1100—3000 m., Maldive area, 786—1170 m., Zanzibar area, 2926 m., Off Cape Point, 1828 m., Bay of Bengal, 1100—3000 m., between New Amsterdam and Sumatra, 1100—3000 m., Pacific Ocean : Timor Sea, 828 m.; about 60 miles north-west of Lubang Is., 1000 m., New Guinea, 914—3930 m., North of New Zealand, 914—3930 m., South of Australia, 914—3930 m., Sandwich Is., Japan, 914—3930 m., Philippines, 914—3930 m., California; Galapagos Is., 243—3330 m., Gulf of Panama, 243—3330 m.

218. *Sternoptyx diaphana* Hermann

- 1781. *Sternoptyx diaphana* Hermann, *Der Naturforscher*, 16, p. 8, pl. 1, figs. 1, 2 (typelocality : Jamaica, 18°N. 77°W.).
- 1896. *Sternoptyx diaphana* Alcock, *J. As. Soc. Bengal*, 65, p. 331 (off Malabar Coast, 15°11' N., 72°28' 45" E., 912—931 fms., 4·6° to 4·2°C.).
- 1906. *Sternoptyx diaphana* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 115, 376; Bay of Bengal, 7°1' 2" N., 85°56' 5" E., 2500 m., South of Australia, 47°25' S., 130°32' E.).

1913. *Sternoptyx diaphana* Weber & de Beaufort, , *Fish. Indo-Austral. Archipel.*, 2, p. 132, fig. 48 (Bali Sea, 1310 m.; Flores Sea, 1600 m., Banda Sea, 2477 m., Timor Sea, 828 m., Manipa Str., 1536 m., Ceram Sea, 0 m., Molucco Passage, 100—1500 m., Celebes Sea, 1264 m.).
1930. *Sternoptyx diaphana* Norman, "Discovery" Rep., 2, p. 305 (North & South Atlantic, 29°N.—35°S., 16°E.—19°W. at depths upto 2700 m).
1939. *Sternoptyx diaphana* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 20 (Arabian Sea: 12°8' 6" N., 63°4' 36" E., 12°5' 18" N., 63°1' 42" E., N 200, 430—984 m., 8·48°C. at 1000 m., 7°38' 48" N., 58°18' 30" E., 7°38' N., 58°25' 24" E., AT, 3676 m., 1·93°C. at 3000 m., Zanzibar area : AT, 1789 m., 3·04°C. at 1780 m., AT. 2926 m., 2·17°C at 2886 m., Mal-dive area : 4°56' N., 78°15' 3" E., 200 m., 2°29' 9" N., 76° 47' E., 2500 m., 4°44' 30" N., 72°46' E., 4°41' 12" N., 72°42' 48" E., 4°42' 30" N., 72°42' 30" E., 4°36' 48" N., 72°48' 54" E., AT, 786—1170 m.
- 1949 *Sternoptyx diaphana* Misra, *Rec. Indian Mus.*, 45, p. 115.
1953. *Sternoptyx diaphana* Misra, *Rec. Indian Mus.*, 50, p. 399.
1953. *Sternoptyx diaphana* Mead & Taylor, *J. Fish. Res. Bd. Canada*, (8)10, p. 570, fig. 5 (off Iwate Prefecture, north-eastern Japan).
1953. *Sternoptix diaphana* Herre, *Check List Philippine Fish.*, p. 86 (about 60 miles N. W. of Lubang Is., 1000 m.).
1953. *Sternoptyx diaphana* Smith, *Sea Fish. South. Africa*, p. 106 (off Cape Point to a depth of 1000 fms.).
1955. *Sternoptyx diaphana* Grey, *Feldiana Zool.*, 37, p. 277 (off Bermuda, 32°N., 64°W., 6 specimens from 700 m.).
1958. *Sternoptyx diaphana* Briggs, *Bull. Florida State Mus.*, 2, (8), p. 256 (24°—30°N., 78°—87°W.).

B. 5; D. 9—12; P. 10; V. 3—5; A. 12—14.

Body scaleless, short, elevated, compressed; abdomen keeled, non-serrated. Dorsal profile abruptly convex, abdominal edge straight with a narrow cartilage-like fold, passing abruptly at right angle into the short, compressed tail the angle being filled by a cartilage-like plate supported by interhaemal rays. Head scaleless, short, about 1·5 times as high as long, 3·8, depth 1·5 in total length measured between pelvics and dorsal origin (3·0 and 1·3 in standard length). Eyes very large, lateral, normal, close together, 1·6—2·0 in head, 0·2 in snout. Cleft of mouth subvertical, wide; maxilla extending to postorbit. Lower jaw received in the upper, with a short spine at its posterior, inferior angle on each side. Teeth numerous, unequal in jaws; palatines toothless. Short spine at angles of preopercle,

a pair of short spines on occiput and on nape, one at the symphysis of humeral bones; 2 spines, the larger directed forward, the smaller backwards at the symphysis of pelvic bones. A single rayed dorsal fin preceded by a translucent pear-shaped plate with its upper border denticulated and its hind margin supported by strong spine; origin behind middle of total length and behind pelvic origin. Adipose dorsal low, immediately behind dorsal, reaching nearly anterior caudal rays. Pectorals low, above level of pelvics, equal to head. Pelvics small, about 2.0 in head; origin entirely before rayed dorsal, nearer to anal origin than to pectoral base. Anal long, undivided, with feeble rays on the integumentary plate between trunk and tail, preceded by a pair of short spines similar to those at pectoral and pelvic symphysis. Caudal broad, forked, with rudimentary rays at its base, equal to head. No lateral line. No scales; body covered with skin not so brilliant. Luminous organs : a postorbital behind middle of eye; a suborbital close to preopercular spine; a group of 5 on isthmus; in the abdominal series 2 rows, the lower of a group of 10, the upper above pectoral base of a group of 3; in the post-abdominal series a group of 2 preanals, 2 rows of supranals, the lower of a group of 3 and the upper of a single one, and a group of 4 in the caudal. Gill rakers moderate.

Silvery grey becoming lighter below; fins translucent.

It attains 45 mm. in length; abyssal.

Distribution.—India : off Malabar coast, 15° 11' N., 72° 28' 45" E., 1667—1702 m., 4.6°—4.2° C., Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m., Arabian Sea, 12° 8' 6" N., 63° 4' 36" E., 12° 5' 18" N., 63° 1' 42" E., N 200, 430—984 m., 8.48° C. at 1000 m., Sri Lanka : 4° 56' N., 78° 15' 3" E., 200 m., 2° 29' 9" N., 76° 47' E., 2500 m., 4° 44' 30" N., 72° 46' E., 4° 41' 12" N., 72° 42' 48" E., 4° 42' 30" N., 72° 42' 30" E., 4° 36' 48" N., 72° 48' 54" E., AT, 786—1170 m., Atlantic, 2700 m., St. Helena; Cape Verde Is., Antelles; Jamaica; Portugal, 1123—2792 m., Morocco, 1123—2792 m., Azores Is., 1123—2792 m., between Tenerife and St. Thomas, 4571 m., Sierre Leone, 4571 m., Mid Atlantic Ocean, 4571 m., between Canary Is., and Cape of Good Hope, 29° N.—35° S., 16° E.—19° W., 273—3082 m., East coast of North America, 273—3082 m., West Indies, 273—3082 m., Zanzibar area, AT, 1789 m., 3.04° C. at 1780 m., AT, 2926 m., 2.17° C. at 2886 m., between Zanzi-

bar and Seychelles, 1100—3000 m., Zanzibar area, 2926 m., Off Cape Point, 1828 m., between New Amsterdam and Sumatra, 0° — 27° S., 43° — 99° E., 1100—3000 m., Timor Sea, 828 m., about 60 miles north-west of Lubang Is., 1000 m., Philippines, 914—3930 m., New Guinea, 914—3930 m., North of New Zealand, 37° S., 175° E., 914—3930 m., South of Australia, $47^{\circ} 25'$ S., $130^{\circ} 32'$ E., 914—3930 m., Sandwich Is., Japan, 35° N., 130° E., 914—3930 m., California, North Atlantic Ocean, 46° N., 24° W., 44° N., 56° W., in the mean annual isotherms of 20° C., 12° C. and 6° C. with latitudinal and longitudinal range of 35° N.— 47° S., 18° E.— 115° W. in the Indo-Pacific=(15° N.— 47° S., 18° — 130° E. in the Indian Ocean + 35° N.— 37° S., 120° E.— 115° W. in the Pacific), 46° N.— 35° S., 16° E.— 87° W. in the Atlantic.

93. Genus *Argyropelecus* Cocco

1829. *Argyropelecus* Cocco, *Arch. della R. Acad. Peloritano*, p. 146 (type, *A. hemigymnus* Cocco).

Body elevated, compressed, scaleless, with the posterior part sharply deflected from the anterior; with photophores. Eyes large, telescopic. Cleft of mouth wide, subvertical. Upper jaw with minute teeth, lower jaw and palatines with a series of small curved teeth. Gill-openings wide. Gill membranes free from isthmus and from each other. Gill-rakers long. Pseudobranchiae present. Anterior 7 to 9 rays of dorsal fin transformed into a foliaceous, serrated plate, succeeded by 7 to 9 normal rays originating before anal origin. Pelvics small; origin behind dorsal. Pectorals large, low. Anal VI—VII+5·6, divided in the middle by a free interspace; origin behind dorsal. A low, long adipose fin in the middle, between dorsal and caudal. Caudal broad, forked.

Distribution.—Atlantic Ocean: Off South of West Indies, 1249 m., South west coast of Africa, 1828—2000 m., Gulf of Guinea, 2000—4000 m., Coast of Norway upto North Cape; Arctic Ocean; Portugal, 950—1650 m., Cape Finisterre, 2056 m., Azores; Madiera; East Coast of North America, 263—3782 m., Indian Ocean : Off Cape of Good Hope, 914 m., between Zanzibar and Chagos Is., 1500—2400 m., between Chagos Is., and Sri Lanka, 1500—2400 m., between Chagos and Seychelles, 1000—2500 m., west of Chagos Is., 2200-2500 m., Arabian Sea, 3840—3872 m., Maldive area, 1829—2249 m., Zanzibar area, 2926 m., Bay

of Bengal, 3297 m., between New Amsterdam and Sumatra, 1500—2400 m.; Pacific Ocean; Sandwich Is., Gulf of Panama, 520—4080 m.; Galapagos, 520—4080 m.; west coast of Central America, 520—4080 m., Antarctic and Arctic Zones.

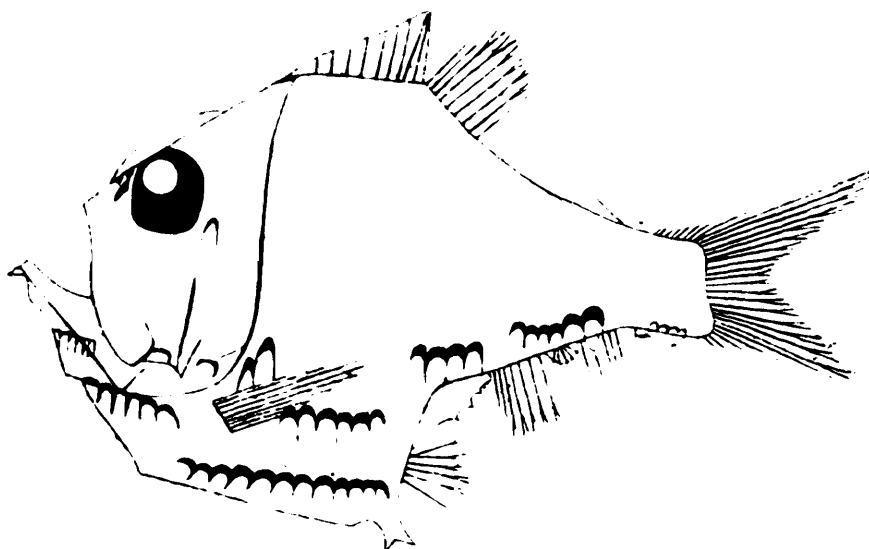
Key to species of genus Argyropelecus Cocco

1. Photophores forming a nearly continuous series	<i>A. affinis</i>
2. Photophores, forming groups (preanal, supraanal and caudal)	3
3. A single serrated abdominal spine	<i>A. hemigymnus</i>
4. A pair of smooth abdominal spines	5
5. Posterior abdominal spine longer than anterior; double series of spines on lower edge of caudal peduncle	<i>A. aculeatus</i>
6. Posterior abdominal spines subequal or shorter; no spine on caudal peduncle.	7
7. A single preopercular spine	<i>A. olfersii</i>
8. Two preopercular spines	<i>A. sladeni</i>

219. *Argyropelecus aculeatus* Valenciennes
(Text-fig. 63)

1849. *Argyropelecus aculeatus* Valenciennes, *Hist. nat. Poiss.*, 21, p. 406 (type locality: Azores).
1850. *Sternoptyx acanthurus* Valenciennes, *Hist. nat. Poiss.*, 22, p. 405.
1888. *Sternoptychides amabilis* Ogilby, *Proc. Linn. Soc. N. S. Wales*, (2) 3, p. 1313.
1906. *Argyropelecus aculeatus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 110, 376, fig. 47 (Bay of Bengal, 7°1'2" N., 85°56' 5"E., 2500 m.; between Ceylon and Chagos Archipelago; 4°N.—6°S., 73°—78°E., 1900—2500, m.).
1923. *Argyropelecus amabilis* Mc Culloch, *Rec. Austral. Mus.*, 14, p. 118, pl. 14, fig. 3.
1930. *Argyropelecus aculeatus* Norman, "*Discovery*" *Rep.*, 2, p. 303 (South Atlantic, 34°—35°S., 10°—16°E., TYF, 250—1000 (—0), (352° C. at 1000 m.).
1937. *Argyropelecus aculeatus* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 7, p. 50.
1949. *Argyropelecus aculeatus* Misra, *Rec. Indian Mus.*, 45, p. 416.
1953. *Argyropelecus aculeatus* Misra, *Rec. Indian Mus.*, 50, p. 401, fig. 16 (b).
1955. *Argyropelecus aculeatus* Grey, *Fieldiana: Zool.*, 37, p. 275 (off Bermuda; 81 specimens, 8—90.5 mm. in standard length; specimens longer than 10 mm. collected at night from 250—1100 m.; 2 juveniles caught during day from 350—400 m., and 3 in 1800 m.).

1958. *Argyropelecus aculeatus* Briggs, *Bull. Florida State Mus., Biol. Sci.*, 2, (8), p. 256 (off Florida, 24°—30°N., 78°—87°W.).



TEXT-FIG. 63.—Lateral view of *Argyropelecus aculeatus* V.
(After A. Brauer)

B. 9; D. ix + 9/0, P. 9; V. 6; A. vii + 5.

Body scaleless, short, elevated, compressed; abdomen keeled. Dorsal profile abruptly convex, abdominal edge straight, passing abruptly into a short, compressed tail; dorsal and ventral ridges serrated. Head scaleless, short, 1.3 times as high as long, 3.5 depth, 1.9 in total length (2.7 and 1.5 in. standard length). Cleft of mouth subvertical; maxilla reaching midorbit. Lower jaw received in the upper, with a prominent spine in the mandibular symphysis and a short, flat one at the posterior inferior angle on each side. Upper jaw with minute teeth; lower jaw and palatines with a series of small, curved teeth. A single downwardly directed spine on the preopercle, one spine at shoulder, a short anterior and 2 such stronger, posterior, non-serrated spines directed downwards and backwards at hind end of ventral keel. Double series of spines on the lower surface of caudal peduncle. A single dorsal with 9 spines and 9 soft rays immediately behind head and before pelvics. A low, long adipose dorsal behind rayed dorsal, almost reaching anterior caudal rays. Pectorals low, reaching pelvics, 1.3 in head. Pelvics not reaching anal, 2.5 in head; origin below middle of rayed portion of dorsal. Anal divided; origin opposite adipose dorsal origin; base shorter than dorsal base. Caudal forked, with rudimentary rays at its base, equal to head. No lateral line. No scales; body covered with brilliant skin. Luminous organs :

one antorbital, below nostrils; one suborbital near hind end of maxillary; 2 operculars, the upper one nearly in a level with the lower margin of eye, the lower one behind preopercular spine; a group of 6 on branchiostegal membrane; a group of 6 behind isthmus; in the abdominal series, 3 rows, the lower row of a group of 12, the middle row of 6 and the upper row, above pectoral base of 2; in the postabdominal series, a group of 4 preanals, a group of supraanals, a group of 4 caudals.

It attains 45 mm. in length; abyssal.

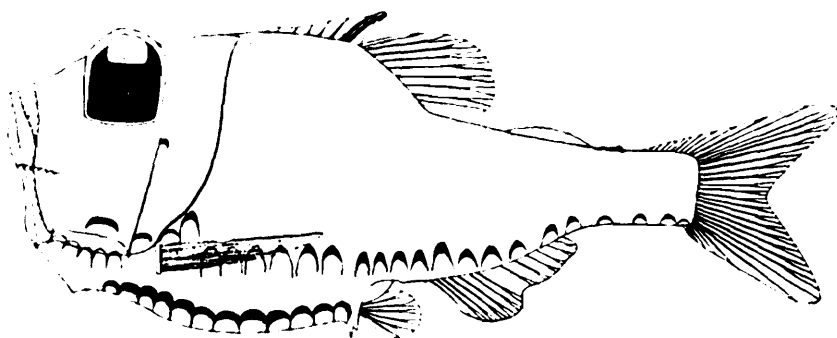
Distribution.—India : Bay of Bengal, $7^{\circ} 1' 2''$ N., $85^{\circ} 56' 5''$ E., 2300 m., Sri Lanka : $4^{\circ} 56'$ N., $78^{\circ} 15' 3''$ E. 2000 m., $2^{\circ} 29' 9''$ N., $76^{\circ} 47'$ E., 2500 m.—Coast of Norway; Azores; Canary Is., 24° N., 17° W.; West coast of Africa, 250—1000 m., Gulf of Guinea, 2° N.— 3° S., 0° — 7° E., 600—3000 m., West of Cape of Good Hope, 31° — 33° S., 8° — 16° E., 2000 m., between Chagos Archipelago and Zanzibar 2° — 4° S., 51° — 65° E., 2000—2500 m., between Chagos Archipelago and Sri Lanka, 2° N.— 6° S., 73° — 78° E., 1900 m.; Red Sea; South of Madagascar 32° S., $44^{\circ} 10'$ E.; between New Amsterdam and Sumatra, $0^{\circ} 58'$ — 29° S., 89° — 99° E., 1100—2500 m., South Atlantic, 34° — 35° S., 10° — 16° E., 250—1000 (—0), 3.52° C. at 1000 m., in the mean annual isotherms of 20° C., 12° C. and 6° C. with the latitudinal and longitudinal range of 20° N.— 32° S., 39° — 99° E., in the Indian Ocean and 65° N.— 33° S., 16° E.— 87° W. in the Atlantic.

220. *Argyrolepecus affinis* Garman

(Text-fig. 64)

- 1899. *Argyrolepecus affinis* Garman, *Mem. Harv. Mus., Comp. Zool.*, 24, p. 237 (type locality : Atlantic, $15^{\circ} 24' 40''$ N., $63^{\circ} 31' 30''$ W., 683 fms.).
- 1906. *Argyrolepecus affinis* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 103, 375, pl. 7, figs. 1—2; text-figs. 43—44 (Bay of Bengal, $7^{\circ} 1' 2''$ N., $85^{\circ} 56' 5''$ E., 2500 m.).
- 1930. *Argyrolepecus affinis* Norman, "*Discovery*" *Rep.*, 2, p. 301 ($8^{\circ} 12''$ N., $18^{\circ} 49'$ W., TYF, 450—500 m.)
- 1939. *Argyrolepecus affinis* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 20 (Arabian Sea, $10^{\circ} 54' 42''$ N., $61^{\circ} 20' 54''$ E., $10^{\circ} 53' 18''$ N., $61^{\circ} 22' 24''$ E., N 200, 400—645 m., Maldives area; $4^{\circ} 31' 30''$ N., $72^{\circ} 38'$ E., MT, 2249m., $8^{\circ} 8' 30''$ N., $72^{\circ} 58'$ E., AT, 1829—2051m., Arabian Sea : $9^{\circ} 7' 6''$ N., $55^{\circ} 27' 6''$ E., $9^{\circ} 8' 48''$ N., $55^{\circ} 31' 48''$ E., AT, 3840—3872 m., 1.93° C. at 3500 m., Gulf of Aden, AT, 1061—1080m.)

1939. *Argyropelecus affinis* Parr Bull. [Binglon: Coccrogr., Coll. 3, art 7, p. 49.
1949. *Argyropelecus affinis* Misra, Rec. Indian Mus., 45, p. 400.
1953. *Argyropelecus affinis* Smith, Sea Fish. South. Africa, p. 107 (off West Coast of S. Africa in 1000 fms.)
1958. *Argyropelecus affinis* Briggs, Bull. Florida State Mus., Biol. Sci., 2 (8), p. 256 (off Florida, 24°—36° N., 78°—87° W.)



TEXT-FIG. 64.—Lateral view of *Argyropelecus affinis* Garm.3
(After A. Brauer)

B. 9; D. vii+9/0; p. 11; V. 6; A. vii+6.

Body scaleless, short, elevated, compressed; abdomen keeled, non-serrated. Dorsal profile gradually convex, abdominal edge straight, passing abruptly into a moderate, compressed tail. Head naked, 1.1 times as high as long, 3.5, depth 2.7 in total length (2.8 and 2.2 in standard length). Eyes large vertical, telescopic, close together; 2.5 in head, 6.5 in snout. Cleft of mouth subvertical maxilla extending a little beyond anterior border of eye. Lower jaw received in the upper, with a prominent spine at mandibular symphysis and a short flat one on each side at the posterior inferior angle. Upper jaw with minute teeth; the lower jaw and palatines with a series of small curved teeth. A downwardly directed spine on preopercle, one on shoulder, a short anterior and 2 stronger, posterior, non-serrated spines directed downwards and backwards at hind end of ventral keel. A single dorsal fin with 7 spines; origin immediately behind head, before pelvics. A low adipose dorsal above the second half of the divided anal, not reaching the caudal rays. Pectorals low, 1.1 in head, not reaching pelvics. Pelvics small, 3.0 in head, not reaching anal; origin below rayed portion of dorsal. Anal divided; origin about 1/4 eye diameter, behind last dorsal ray, and nearer to pelvic origin than to caudal base. Caudal

forked, with rudimentary rays at its base, 1.1 in head. No lateral line. No scales; body covered with brilliant skin. Luminous organs : an antorbital below nostril; one suborbital near hind end of maxillary; 2 operculars; the upper one below eye level, the lower behind preopercular spine; a group of 6 on branchiostegal membrane; a group of 6 behind isthmus; in abdominal series three rows, the lower of a group of 12, the middle of a group of 6, the upper above pelvic base of a group 2; the postabdominals in continuous series; 4 preanals, 5 supra-anals and 5 caudals.

Silvery grey.

It attains 45 mm. in length and has been obtained at a depth of 1000—3872 m.; abyssal.

Distribution.—Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m., Arabian Sea, 10° 54' 42" N., 61° 20' 54" E., 10° 53' 18" N., 61° 22' 24" E., N 200, 400—645 m., Maldiva area; 4° 31' 30" N., 72° 38' E., MT, 2249 m., 8° 8' 30" N., 72° 58' E., AT, 1829—2051 m.—West Indies, 15° 24' 40" N., 63° 31' 30" W., 1248 m., Gulf of Guinea, 1° N.—31° S. 0°—8° E., 2000 m., South-West Coast of Africa, 100—2500 m., North East coast of Africa, 0° 25' N., 43° 37' E., 1000—2500 m., Coast of South Africa, 1828 m., Chagos Is. 6° S., 73° E., 100—2500 m., W. of Seychelles Is. 4° S., 53° E., 1000—2500 m., Gulf of Aden, 13° N. 46° E., 1000—2500 m., Arabian Sea, 9° 7' 6" N., 55° 27' 6" E., 9° 8' 48" N., 55° 31' 48" E., AT, 3840—3872 m., 1.93° C. at 3500 m., in the mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of 13° N.—6° S., 46°—85° E. in the Indian Ocean and 30° N.—31° S., 8° E.—87° W. in Atlantic.

221. *Argyropelecus hemigymnus* Cocco

- 1829. *Argyropelecus hemigymnus* Cocco, *Giorn. Sci. Sic.*, 77, p. 146 (type locality: Mediterranean).
- 1896. *Argyropelecus hemigymnus* Alcock, *J. As. Soc. Bengal*, 65, p. 331 (Bay of Bengal, 12° 20' N., 85° 8' E., 1803 fms., 1.7° C.)
- 1899. *Argyropelecus hemigymnus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 135 (Bay of Bengal, 1803 fms.).
- 1906. *Argyropelecus hemigymnus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 106, 375, fig. 45.
- 1930. *Argyropelecus hemigymnus* Norman, "*Discovery*" *Rep.*, 2, p. 303 (S. Atlantic 24°—35° S., 16° E.—13° W., at depths ranging from 0—2500 m., measuring 9 to 34 mm. in length).

1937. *Argyrolepecus hemigymnus* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 7, p. 49.
1949. *Argyrolepecus hemigymnus* Misra, *Rec. Indian Mus.*, 45, p. 416.
1953. *Argyrolepecus hemigymnus* Misra, *Rec. Indian Mus.*, 50, p. 401.
1953. *Argyrolepecus hemigymnus* Smith, *Sea Fish. South. Africa*, p. 107 (off the Cape in 600 fms.).
1955. *Argyrolepecus hemigymnus* Grey, *Fieldiana Zool.*, 37, p. 274 (off Bermuda; 44 specimens caught during day from 400—3000 m., at night 260—1460 m.; larger specimens over 10 mm. taken above 700 m. at any time).
1958. *Argyrolepecus hemigymnus* Briggs, *Bull. Florida State Mus. Biol. Sci.*, 2, (8), p. 256 (off Florida, 24°—30°N., 78°—87° W.).

B. 9; D. vii—viii+7-8/0; P. 9—11; V. 5—6; A. vi+5.

Body scaleless, short, elevated, compressed; abdomen keeled, non-serrated; dorsal profile convex; abdominal edge straight, passing abruptly into short, compressed tail. Head naked, short, 1.1 times as high as long, 2.9, depth 2.2 in total length (2.3 and 1.9 in standard length). Eyes large, close together, telescopic, vertical, 2.2 in head, 0.5 in snout. Cleft of mouth subvertical; maxilla reaching behind anterior margin of eye. Lower jaw received in the upper, with a prominent spine at mandibular symphysis, and a short, flat one on each side at the posterior inferior angle. Upper jaw with minute teeth; lower jaw and palatines with a series of small curved teeth. Two spines on preopercle, one directed downward, the other backwards; one on shoulder; a single backwardly directed, serrated, spine posteriorly at hind end of ventral keel. A single dorsal fin with 7-8 spines; origin immediately behind head, before pelvics. A low, long adipose dorsal at a short distance behind last dorsal ray, almost reaching anterior caudal rays. Pectorals low, reaching beyond pelvics, 1.1 in head. Pelvics small, almost reaching anal, 3.3 in head; origin below middle of rayed portion of dorsal. Anal divided; origin just behind last dorsal ray and nearer to pelvic origin than to caudal base. Caudal forked, with rudimentary rays; 1.3 in head. No lateral line. No scales; body covered with brilliant skin. Luminous organs: an antorbital below nostril; one suborbital behind end of maxillary; 2 operculars, the upper on a level with lower margin of eye, the lower one behind preopercular spine; a group of 6 branchiostegals; a group of 6 behind isthmus;

in the abdominal series, 3 rows, the lower of a group of 12, the middle of a group of 6, the upper above pectoral base of a group of 2; in the postabdominal series, a group of 4 preanals, a group of 6 supraanals and a group of 4 caudals..

Silvery grey.

It attains 36 mm. in length and has been obtained at a depth of 1500—3297 m.; abyssal.

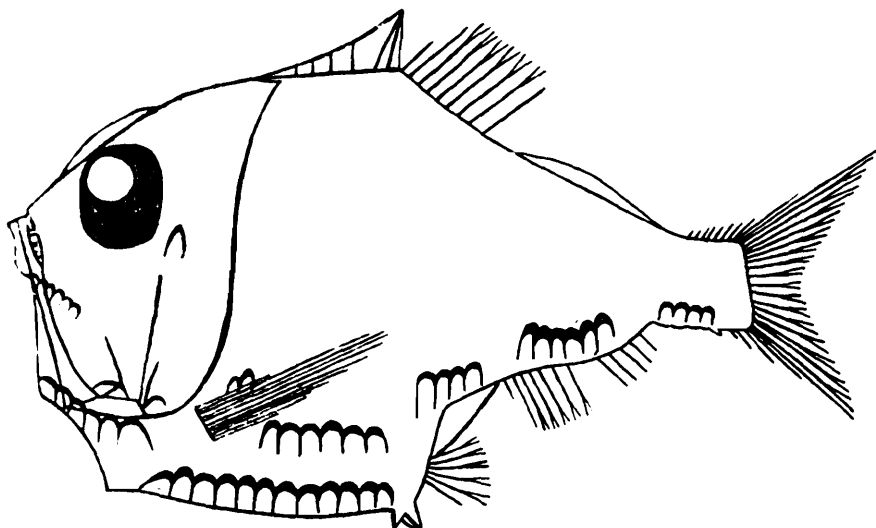
Distribution.—India : Bay of Bengal, 12° 20' N., 85° 8' E., 3297 m., 1·7° C., Sri Lanka : 4° 56' N., 78° 15' 3" E., 2000 m.—Azores, 39° N. 27° W., West Coast of South Europe; W. Cape of Good Hope, 30°—33° S., 8°—16° E., 2000 m.; Messina, Mediterranean, 38° N., 15° E.,; West Coast of Africa, 24°—35° S., 16° E.—13° W., between Shetland and Feroes Is., 63° N., 30° W., between Zanzibar and Chagos Is., 2°—4° S., 51°—61° E., 1500—2400 m., between New Amsterdam and Sumatra, 10°—30° S., 87°—97° E., 1500—2400 m., coast of Norway, 60° N., 5° E., between Sri Lanka and Chagos Is., 4° N.—4° S., 73°—78° E., 2000 m. 1·8° C., in the mean annual isotherms of 20° C., 12° C. and 6° C. with the latitudinal and longitudinal range of 12° N.—30° S., 51°—97° E., in the Indian Ocean, 63° N.—35° S., 16° E.—87° W. in the Atlantic Ocean and 38° N. 15° E. in Mediterranean.

222. *Argyropelecus olfersii* (Cuvier)

(Text-fig. 65)

- 1829. *Sternoptyx olfersii* Cuvier, *Regne Animal*, 2, ed 2, p. 316, pl. 13, fig. 2 (type locality : Atlantic Ocean).
- 1906. *Argyropelecus olfersii* Brauer, "Valdivia" Tiefsee Fische, 15, pp. 108, 375, fig. 46 (South of Ceylon).
- 1913. *Argyropelecus olfersi* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 134, fig. 49 (Banda Sea, 2798m.).
- 1930. *Argyropelecus olfersii* Norman, *Discovery Rep.*, 2, p. 304, fig. 12 (young) (00° 46' S. 5° 49' 15" E., 850—950 (—0) m.)
- 1937. *Argyropelecus olfersii* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art 7, p. 50, fig. 18(5).
- 1949. *Argyropelecus olfersii* Misra, *Rec. Indian Mus.*, 47, p. 416.
- 1953. *Argyropelecus olfersii* Misra, *Rec. Indian Mus.*, 50, p. 401, fig. 16a.

1953. *Argyropelecus olfersi* Smith, *Sea Fish. South. Africa*, p. 107 (off the Cape in 500 fms.).



TEXT-FIG. 65.—Lateral view of *Argyropelecus olfersii* (C.) (After A. Brauer)

B. 9; D. vii+9/0; P. 10-11; V 6; A. vii+5.

Body scaleless short, elevated, compressed; abdomen keeled, non-serrated. Dorsal profile convex; abdominal edge straight, passing abruptly into short, compressed tail. Head naked, short, 1.5 times as high as long, 3.8, depth 2.0 in total length (3.0—3.3 and 1.6 in standard length). Eyes large, telescopic, vertical, close together, 2.2—3.0 in head, 1/5 to 1/3 longer than snout. Cleft of mouth wide, subvertical; maxilla reaching midorbit. Lower jaw received in the upper, with a prominent spine at mandibular symphysis and a short flat one on each side of the posterior inferior angle. Upper jaw with minute teeth, lower jaw and palatines with a series of small, curved teeth. A downwardly directed spine on preopercle, one on shoulder, a short anterior and 2 stronger posterior, non-serrated spines directed downwards and backwards at the hind end of ventral keel. A single rayed dorsal fin, with 7 spines immediately behind head, before pelvics. A low, long, adipose dorsal at a short distance behind the last dorsal ray, and almost reaching anterior caudal rays. Pectorals low, almost reaching pelvics, 1.1 in head. Pelvics small, not reaching anal, 3.0 in head; origin below middle of rayed portion of dorsal. Anal divided; origin entirely behind rayed dorsal, and opposite origin of adipose dorsal. Caudal forked, with rudimentary rays at its base, 1.1 in head. No spine on caudal peduncle. No lateral line. No scales; body covered with brilliant skin. Luminous organs: an antorbital below nostrils: one suborbital behind end of

maxillary; 2 operculars, the upper on a level with lower margin of eye, the lower behind preopercular spine; a group of 6 branchiostegals; a group of 6 behind isthmus; in the abdominal series, 3 rows, the lower of a group of 12, the middle of a group of 6, the upper above pectoral base of a group of 2; in the postabdominal series, a group of 4 preanals, a group of 6 supraanals and a group of 4 caudals.

Silvery grey.

It attains a length of 100 mm. and has been obtained at a depth 263—4,080 m., abyssal.

Distribution.—Sri Lanka : South of Sri Lanka, $4^{\circ} 56' N.$, $78^{\circ} 15' 3'' E.$, 2000m.—Coast of Norway upto Cape North, 63° – $71^{\circ} N.$ 10° – $25^{\circ} E.$ Portugal 950—1650m., Azores, $39^{\circ} N.$, $27^{\circ} W.$, Madiera : Cape Finisterre $42^{\circ} 50' N.$ $9^{\circ} 15' W.$, 2056m., between Canaries Is. and Brazil, $2^{\circ} N.$ – $3^{\circ} S.$, $7^{\circ} E.$,— $10^{\circ} W.$, Gulf of Guinea, 2000—4000 m., Cape of Good Hope, $35^{\circ} S.$, $18^{\circ} E.$, 914 m., East Coast of North America, 39° – $42^{\circ} N.$, 66° – $74^{\circ} W.$, 263—3782m., West of Chagos Is. $2^{\circ} S.$, $65^{\circ} E.$, 2200—2500 m. Galapagos : $1^{\circ} S.$, $90^{\circ} W.$, 520—4080m., Gulf of Panama, $9^{\circ} N.$, $79^{\circ} W.$, 520—4080 m., West Coast of Central Americas, 520—4080m., Banda Sea, $5^{\circ} S.$, $128^{\circ} E.$, 2798m., New Amsterdam and Sumatra, 10° – $26^{\circ} S.$, 43° – $97^{\circ} E.$, 2200—2400 m., $1 \cdot 2^{\circ} C.$, at 2200 m., in the mean annual isotherm of $20^{\circ} C.$, $12^{\circ} C.$, $6^{\circ} C.$ and beyond $6^{\circ} C.$, in the Arctic Zone with the latitudinal and longitudinal range of $9^{\circ} N.$ – $35^{\circ} S.$, $18^{\circ} E.$, $79^{\circ} W.$ in the Indo-Pacific = ($4^{\circ} N.$ — $35^{\circ} S.$ 18° – $97^{\circ} E.$, in the Indian Ocean+ $9^{\circ} N.$ — $5^{\circ} S.$, $128^{\circ} E.$ – $79^{\circ} W.$ in the Pacific Ocean), $63^{\circ} N.$ – $3^{\circ} S.$, $7^{\circ} E.$ – $74^{\circ} W.$ in the Atlantic Ocean and $71^{\circ} N.$ $25^{\circ} E.$ in the Arctic Ocean.

223. *Argyropelecus sladeni* Regan

1908. *Argyropelecus sladeni* Regan, *Trans. Linn. Soc.*, (2) **12**, p. 218 (type locality: Chagos Archipelago, 400—500 fms.; type in the British Museum).
1930. *Argyropelecus sladeni* Norman, "*Discovery*" *Rep.*, **2**, p. 304, fig. 13 (Atlantic Ocean : $12^{\circ} N.$ — $61^{\circ} S.$, $11^{\circ} E.$ – $53^{\circ} W.$, TYF, 150—300 (—0)m.).
1937. *Argyropelecus sladeni* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 7, p. 50, fig. 18(4).

1939. *Argyrolepecus sladeni* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 20 (Arabian Sea ; 12°8' 16"N., 63°4' 36"E., 12°5'18" N., 63°1'42"E., N 200, 430—984m., 8·48°C. at 1000m., 1°39' 6"S., 61°13' 48"E., 2°7' 3"S. 61°21' 12"E., N 200, 600m., Zanzibar area: AT, 2926m., 2·17°C at 2886 m.).
- 1949 *Argyrolepecus sladeni* Misra, *Rec. Indian Mus.*, 45, p. 416.
1953. *Argyrolepecus sladeni* Misra, *Rec. Indian Mus.*, 50, p. 401.

B.9; D. vii +9/0; P. 11; V. 5; A. vii+5.

Body scaleless, short, elevated, compressed; abdomen keeled, non-serrated. Dorsal profile convex, abdominal edge straight, passing abruptly into a short, compressed tail. Head naked, short, 3·1—3·6, depth 2·0 in total length (2·7 and 1·7 in standard length). Eyes large, telescopic, vertical, close together, 3·8 in head, 0·5 in snout. Cleft of mouth wide, subvertical; maxilla extending to mid-orbit. Lower jaw received in the upper, with a prominent spine at mandibular symphysis, and a short, flat one on each side of the posterior, inferior angle. Upper jaw with minute teeth ; lower jaw and palatines with a series of small, curved teeth. Two spines on preopercle, one directed downward, the other backwards ; one on shoulder, a short anterior and 2 strong, posterior, non-serrated spines directed downwards and backwards at the hind end of ventral keel. A single rayed dorsal fin with 7 spines immediately behind head, before pelvics. A low, long adipose dorsal at a short distance behind last dorsal ray, almost reaching anterior caudal rays. Pectorals low, 1·1 in head. Pelvics small, 3·0 in head ; origin below middle of rayed portion of dorsal. Anal divided; origin just behind last dorsal ray, and before adipose dorsal origin. Caudal forked, with rudimentary rays at its base, 1·1 in head; no spine on caudal peduncle. No lateral line. No scales; body covered with brilliant skin. Luminous organs : an antorbital below nostrils; one suborbital behind end of maxillary ; 2 operculars, the upper nearly on a level with midorbit, the lower behind preopercular spine ; a group of 6 branchiostegals; a group of 6 behind isthmus; in the abdominal series 3 rows, the lower of a group of 12, the middle of a group of 6, the upper above pectoral base of a group of 2 ; in the post-abdominal series a group of 4 preanals, a group of 6 supra-anals and a group of 4 caudals.

Silvery grey.

It attains 28 mm. in length and has been found at a depth 430—2886 m.; abyssal.

Distribution.—India : Arabian Sea, $12^{\circ}8'16''$ N., $63^{\circ}4'36''$ E., $12^{\circ}5'18''$ N., $63^{\circ}1'42''$ E., N 200, 430—984 m., 8.48° C, at 2886 m., $1^{\circ}39'6''$ S., $61^{\circ}13'48''$ E., $2^{\circ}7'3''$ S., $61^{\circ}21'12''$ E., N 200, 600 m., Off Cape Bowles, $61^{\circ}25'30''$ S., $53^{\circ}46'$ W., Clarence Is. 200 m., Chagos Archipelago, 2° S., 65° E., 731—914 m., Zanzibar area, 5° S., 41° E., AT, 2926 m., 2.17° C. at 2886 m., in the mean annual isotherm of 20 and beyond 6° C. in the Antarctic zone, with the latitudinal and longitudinal range of 12° N.— 5° S., 41° — 65° E., in the Indian Ocean, 12° N.— 15° S., 11° E.— 20° W., in the Atlantic Ocean and $61^{\circ}25'30''$ S., $53^{\circ}46'$ W. in the Antarctic Ocean.

94. Genus *Polyipnus* Günther

1887. *Polyipnus* Günther, "Challenger" Rep., Deep Sea Fish., 22, p. 170 (type, *P. spinosus* Gthr., orthotypic).

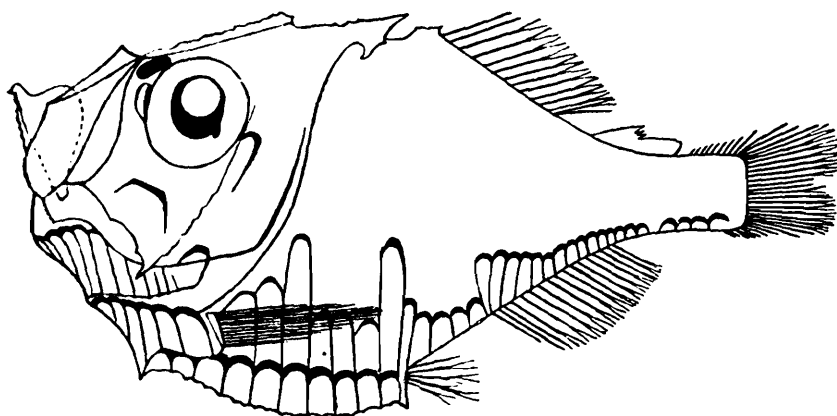
Body elevated, compressed, scales thin, deciduous, without abrupt ventral constriction; with photophores. Eyes large, nontelescopic. Spiny ridges on head and abdomen. Gape of mouth vertical, rather small. Gill openings wide. Gill membranes free from isthmus delicately connected with each other. Branchiostegals 9—11 Gill-rakers long. Pseudobranchiae present. Minute teeth in bands on intermaxillary and mandible, single series on maxilla and vomer. No triangular or foliaceous plate before dorsal fin. Dorsal fin with 12—13 rays, origin nearly midway in length of body; preceded by a short bifid spine. Pectorals long, low. Pelvics small, origin opposite to dorsal origin. Anal undivided, with 15—17 rays. Adipose fin present. Caudal forked.

Distribution.—Atlantic Ocean : Barbados Is., 404 m., Gulf of Guinea, 1200 m., North Coast of Africa, 1362 m., Indian Ocean, 457m., Zanzibar area, OT, 640—658; South Africa, 1188m., between North and South Sentinel Is., 400—438m., Off the Andaman Is., 343—438m., West Coast of Sumatra, 371—470 m., Pacific Ocean : Celebes Sea, 457m., between Philippines and Borneo, 456 m., Sandwich Is., 394—592m., Sagami Bay, Japan; Australia; Hawaii.

224. *Polyipnus spinosus* Günther

(Text-fig. 66)

1887. *Polyipnus spinosus* Günther, "Challenger" Rep. Deep Sea Fish, p. 170, pl. 51, fig. B (type locality : Indian Ocean between Borneo and Philippines, 250 fms.).
1889. *Polyipnus spinosus* Alcock, Ann. Mag. nat. Hist., (6) 4, p. 398 (Bay of Bengal, between North and South Sentinel Is., 220—240 fms.).
1896. *Polyipnus spinosus* Alcock, J. As. Soc. Bengal, 65, p. 331 (off the coast of Andaman Is., $15^{\circ}56'50''N.$, $81^{\circ}30'30''E.$; 240 fms.; $11.1^{\circ}C$; $11^{\circ}31'40''N.$, $92^{\circ}40'6''E.$, $13.3^{\circ}C.$).
1899. *Polyipnus spinosus* Alcock, Cat. Ind. Deep Sea Fish., p. 138.
1904. *Polyipnus stereope* Jordan & Starks, Bull. U.S. Fish. Comm., 22, p. 581, pl. 2, fig. 3 (type locality : Sagami Bay, Japan).
1906. *Polyipnus spinosus* Brauer, "Valdiva" Tiefsee Fische, 15, pp. 120, 376, pl. 7, fig. 3, text-fig. 64—66.
1913. *Polyipnus spinosus* Weber & de Beaufort, Fish. Indo-Austral. Archipel., 2, p. 130, fig. 47 (W. coast of Sumatra, 470 m., Madura Sea, 287m., Bali Sea, 538 m., Macassar str. 450 m., Molucco Passage, 397m. Arfura Sea, 397m., Timor Sea, 421 m., Celebes Sea, 457m.)
1914. *Polyipnus tridentifer* McCulloch, Biol. Rec. "Endeavor" 2, pp. 78, 87, pl. 16, fig. 4 (type locality : Great Australian Bight, $130^{\circ}E.$, $32^{\circ}S.$).
1927. *Polyipnus spinosus* Parr, Bull. Bingham Oceanogr. Coll., 3, art. 7, p. 55.
1941. *Polyipnus spinosus* Herre, Mem. Indian Mus., 13, p. 336.
1949. *Polyipnus spinosus* Misra, Rec. Indian Mus., 45, p. 417.
1953. *Polyipnus spinosus* Misra, Rec. Indian Mus., 50, p. 401, fig. 16c.
1953. *Polyipnus spinosus* Herre, Check List. Philippine Fish., p. 85.
1953. *Polyipnus spinosus* Smith, Sea Fish. South. Africa, p. 107, fig 159 (Cape to Natal upto 650 fms.).



TEXT-FIG. 66.—Lateral view of *Polyipnus spinosus* Gthr. (After A. Brauer)

B. 9—11; D. 12—13/0; P. 12; V. 5; A. 15—17.

Body scaly, oval, elevated, short, compressed; abdomen keeled, serrated. Dorsal profile convex, abdominal edge straight, passing gradiently into a compressed tail. Head large, naked, 2.4 depth 2.1 in total length (1.8 and 1.8 in standard length); upper part of head narrow, compressed, bounded on each side by a serrated ridge ending in a large, sharp, semi-recumbent spine. Eyes large, non-telescopic, close together, 2.5 in head, 1.1 in snout. Cleft of mouth small, vertical; maxilla not extending to front margin of eye. Lower jaw received in the upper, with its lower edge finely serrated, ending in a spinule. Minute teeth in bands in intermaxillary, mandibles and in a series on maxilla; similar teeth on vomer. Preopercular serrated, with a strong, claw-like spine pointing vertically downwards. A single dorsal fin preceded by a bifid spine; origin nearly opposite to pelvic origin. A moderate notched adipose dorsal at a short distance behind last dorsal ray, almost reaching anterior caudal rays. Pectorals low, 1.7 in head. Pelvics small, 3.8 in head; origin nearly opposite to rayed dorsal origin, in the middle of total length. Anal undivided; origin almost below middle of rayed dorsal fin. Caudal forked, with rudimentary rays at base, 2.5 in head. No lateral line. Scales small, deciduous. Luminous organs; an antorbital before midorbit; a postorbital on the same level as antorbital; a suborbital below middle of eye; a small opercular below the level of suborbital; a group of 6 branchiostegals; a group of 6 between isthmus and pectoral base; in the abdominal series 2 rows, the lower of a group 10, the upper of a group of 2 above pectoral base and a group of 3-5 behind pectoral base; in the continuous postabdominal series, a group of 5 preanals, a group of 12 supra-anals and a group of 8 caudals, the last 4 with slight interspaces between them.

Silvery on sides, yellowish brown above.

It attains 85 mm. in length and has been obtained at a depth of 371—1200 m.; bathypelagic, rises to surface at night.

Distribution.—India *: between north and south Sentinel Is., 400—438 m., Off the Andaman Is., 15°56' 50" N., 81°31' 30" E., 438 m., 11 1°C; 11° 31' 40" N., 92°40' 6" E., 13.3°C.—Gulf of Guinea, 1200 m., North East Coast of Africa 2°58' 5" N., 46°50' 8" E., 1362 m., Indian Ocean, 457 m., Zanzibar area, OT, 640—658 m., Cape to Natal, 29°—35°S., 18°—30°E., 1188 m.; West Coast of Sumatra 0°15' 5" N.—0°43' 2" S., 98°E., 371—470 m., Celebes Sea, 2°S., 120°E., 457 m., between Philippines and Borneo; Sagami Bay, Japan; 35°N. 137°30'E., Australia, 130°E., 32°S.,; Macassar str., 5° S. 119°E., Indonesia; in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 35°N.—35°S., 18°—137°E. in the Indo-Pacific=(15°N.—35°S., 18°—130°E., in the Indian Ocean+35°N.—5°S., 119°—137°E. in the Pacific) and 2°36' 5"N., 3°27' 5" E. in the Atlantic.

VI. Superfamily STOMIATOIDAE

Body low, elongate, compressed, naked or covered with very thin deciduous scales and tenacious slime. Head naked, short, compressed, oblong or elevated. Gape of mouth exceedingly wide, oblique. opercular apparatus poorly developed. Lateral margin of upper jaw formed by maxillary or intermaxillary. Postocular luminous organ present or absent. Barbel present or absent. Gill membranes free, not united with isthmus. Gill rakers rudimentary or absent. Branchiostegals 12—20. No pseudobranchiae. Pectorals low, present or absent. Lagena present or absent. Pelvics. Rayed dorsal short or moderate, anterior, median or posterior. Adipose dorsal present or absent. Preanal adipose fin present or absent. Caudal distinct. Eyes normal. Mesocoracoid present or absent. Pyloric caeca absent.

The superfamily STOMIATOIDAE is represented by 2 families in the Indian region.

Key to families of superfamily STOMIATOIDAE

1. Adipose dorsal fin absent	STOMIATIDAE
2. Adipose dorsal fin present	CHAULIODONTIDAE.

XXXIII. Family STOMIATIDAE

Body naked or scaly, elongate, compressed; abdomen non-keeled, non-serrated. Head scaleless, compressed, short. Lagena. Cleft or mouth oblique, wide; maxilla

*Tholasilingam, Venkataraman and Kartha (1964, *J. mar. biol. Ass. India*, 6(1) p. 270 also recorded it off the Kerala coasted.

extending to preopercular angle. Opercular bones poorly developed. Lower jaw prominent, projecting over upper. Barbel present or absent. Teeth strong, some fang-like. A single rayed dorsal in the posterior part of body, near caudal. No adipose fin. Pectorals low, present or absent. Pelvics before dorsal. Anal below rayed dorsal; origin opposite or slightly before dorsal. Anal below rayed dorsal; origin opposite or slightly before dorsal. Caudal forked or pointed. No lateral line. Photophores in 2 continuous series. No pyloric caeca. Gill rakers rudimentary. Air bladder present or absent. Branchiostegals 16—17. No pseudobranchia.

The family STOMIATIDAE is represented by 2 genera in the Indian region.

Key to genera of family STOMIATIDAE

1. Pectorals present ; dorsal origin behind anal origin	Stomias
2. Pectorals absent; dorsal origin opposite anal origin	Phutostomias

95. Genus *Stomias* Cuvier

1817. *Stomias* Cuvier, *Regne Animal.*, 2, ed. 1, p. 184 (type *Esox boa* Risso).

Body low, elongate, compressed, scales thin, hexagonal, deciduous, with photophores. Head compressed with short snout. Eyes moderate. Gape of mouth wide, oblique. Teeth in maxilla numerous, small, approximate: those on intermaxilla and mandible more or less curved, large, wide apart; vomer with a pair of fangs; palatine and tongue with smaller pointed teeth. Chin with fleshy barbel ending in 3 filaments. Gill-openings moderate. Gill rakers absent. Pseudobranchiae absent. Opercle incomplete, gills 4. Dorsal, anal, and pelvics in posterior one third of body. Dorsal fin with 16—19 rays, behind anal origin. Pectorals present. Pelvics prolonged reaching anal; origin in front of dorsal origin. Anal with 21—22 rays. Adipose fin absent. Caudal small, forked. Air bladder. No pyloric appendage.

Distribution.—Atlantic Ocean: Mediterranean; West Indies, 82° m., West Coast of Africa, 1500—3000 m., Gulf of Guinea, 600 m., Northwest of Hebrides, 1200 m., East Coast of North America, 38—43 N., 218—3443 m., Coast

of Morocco; Indian Ocean : South Coast of Africa, 2000 m., East Coast of Africa, 693—1019 m., Gulf of Aden, 1200 m., Gulf of Mannar, 1093 m., Off the Laccadives, 1352 m., Pacific Ocean : South of New Zealand; West Coast of Central America, 3291 m., Gulf of Panama, 262—3761 m., Gulf of California, 2227 m., Greenland.

Key to species of genus Stomias Cuvier

1. Photophores between pectoral and pelvic bases 42-46 in the ventral series; caudal pointed; depth of body 16 in total length *S. affinis*
2. Photophores between pectoral and pelvic bases 34-38 in the ventral series; caudal forked; depth of body 12 in total length *S. nebulosus*

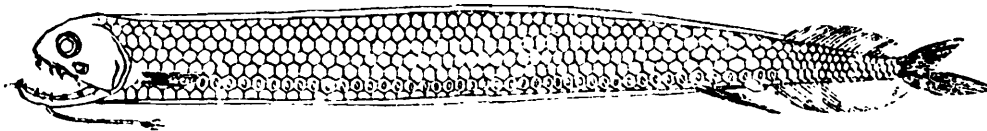
225. *Stomias affinis* Günther

(Text-fig.67)

1887. *Stomias affinis* Günther, "Challenger" Rep. Deep Sea Fish., 22, p. 205, pl. 54, fig. A (type locality: South of Sombbrero I., West Indies, 450 fms. 6·8° C.; type in the British Museum).
1891. *Stomias elongatus* Alcock, Ann. Mag. nat. Hist., (6) 8, p. 129 (type locality : Arabian Sea, off the Laccadives, 8° 23' N., 75° 47' E., 738 fms., 3·1°C.; type is in Zoological Survey of India).
1896. *Stomias elongatus* Alcock, J. As. Soc. Bengal, 65, p. 333 (Laccadive Sea, 738 fms.).
1899. *Stomias elongatus* Alcock, Cat. Ind. Deep Sea Fish., p. 147.
1934. *Stomias affinis* Edge, "Dana" Rep., 5, p. 5, figs. 1,2.
1939. *Stomias affinis* Norman, Sci. Rep. John Murray Exped., 7, p. 22 (Red Sea, TDH, 730—805m., Arabian Sea; 7° 14' N., 60° 38' 42" E., 7° 14' 18" N., 60° 39' 30" E., MT, 2937—3182 m., 2·33°C. at 2500 m.).
1906. *Stomias valdiviae* Brauer, "Valdivia" Tiefsee Fische, 15, pp. 48, 370, pl. 3, fig. 1, text-fig. 11-13 (type locality: West coast of Africa; Gulf of Guinea; west coast of Sumatra, 0°30' 5" N., 98° 14' 2" E., 594. m.).
1906. *Stomias affinis* Brauer, "Valdivia" Tiefsee Fische, 15, p. 371 (Gulf of Aden, 1200 m., 6·1°C.).
1930. *Stomias affinis* Norman, "Discovery" Rep., 2, p. 315 (0°—5°S., 5°—11°E., 100—300 (—0) m, specimens ranging from 32—158 mm. in length).
1949. *Stomias affinis* Misra, Rec. Indian Mus., 45, p. 417.
1953. *Stomias affinis* Misra, Rec. Indian Mus., 50, p. 402.

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1958. *Stomias affinis* Briggs, *Bull. Florida State Mus., Biol. Sci.*, 2, (8), p. 254 (off Florida, 24°—30° N., 78°—87° W.).



TEXT-FIG. 67.—Lateral view of *Stomias affinis* Gth. (After A. Brauer)

B. 16—17; D.19; P.6; V.6; A.21.

Body with deciduous scales embedded in hexagonal depressions or areolae, low, elongate, compressed, covered with tenacious slime; abdomen non-keeled, non-serrated. Dorsal and ventral profiles more or less equal, gradually tapering towards tail. Head naked, short, compressed, one-tenth, depth one-fifteenth in the standard length. Eyes longer than snout, not quite a fourth in head length. Mouth very wide; maxilla extending to preopercular angle. Lower jaw prominent, mandible widely distensible; a trifid barbel, as long as caudal fin, at the mandibular symphysis. Opercular bone membraneous. Fins large, distant, fixed fangs on each premaxilla, and a free, movable one near the symphysis; maxilla with a few minute, inconspicuous, distant denticulations, 8 or 9 moderate-sized, laterally projecting fangs on each part of mandible decreasing in size posteriorly; a fang on each side of vomer and 2 small, distant, uncurved teeth on each palatine. A single rayed dorsal fin close to caudal origin, opposite to third anal ray. No adipose dorsal. Pectorals low, equal to caudal. Pelvics long, reaching 6th anal ray; origin before dorsal. Anal longer than dorsal origin, before dorsal. Caudal pointed, about 1/12 of the total length. No lateral line. Scales deciduous. Luminous organs : one suborbita; 16—17 on branchiostegal membrane; one on barbel; in the ventral series 57 (+a few more) in a continuous row, 9 between isthmus and pectoral base, 42 between pectoral base pelvic, 6 between pelvic and anal origin, 15(+a few more) between anal and caudal origins; in the lateral series 45 in continuous row from pectoral base to anal origin. No pyloric caeca. Long slender air bladder.

Jet black with silvery hexagonal markings.

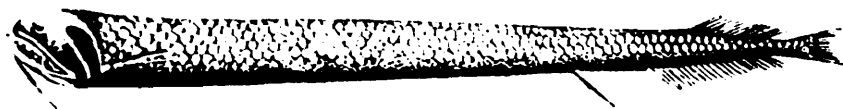
It attains 130 mm. in length and has been obtained at a depth of 594—3182 m., abyssal.

Distribution.—India : Off the Laccadives, 8°23' N., 75°47' E., 1349 m., 3.1° C. Arabian Sea : 7°14' N., 60°38'42" E., 7°14'.18"N., 60°39'30" E., MT, 2937—3182 m.—West Indies 25°N., 81°W., 820m., West Coast of Africa 0°—5°S., 5°—11°E., 100—300 (—0) m., Gulf of Guinea, 3°N.—1°S., 0°—7°E., 1800—2200 m., Gulf of Aden, 12°N., 45°E., 2000 m., Red Sea, 15°48'30" N., 41°30'30" E., 730—805 m., West Coast of Sumatra, 0°30' N., 98°E., 594—1800 m., in the mean annual isotherm of 20°C with the latitudinal and longitudinal range of 0°—15°N., 41°—98°E. in the Indian Ocean and 30°N.—5°S., 11°E.—87°W. in the tropical Atlantic.

226. *Stomias nebulosus* Alcock

(Text-fig.68)

1889. *Stomias nebulosus* Alcock, *Ann. Mag. nat. Hist.*, (6) 4, p. 451 (type locality : Gulf of Mannar, 6°29' N., 70°34' E., 597 fms., 6.4° C.; type in the Zoological Survey of India).
1892. *Stomias nebulosus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 7, fig. 1.
1896. *Stomias nebulosus* Alcock, *J. As. Soc. Bengal*, 65, p. 333. (Gulf of Mannar, 597 fms.).
1906. *Stomias nebulosus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 50, 370, fig. 14 (East African coast, 693—1019 m., 9°—6.4°C.).
1913. *Stomias nebulosus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 112, fig. 40 (Flores Sea, 521 m., Timor Sea, 421 m., Manipa str., 1536 m.).
1934. *Stomias nebulosus* Ege, "*Dana*" *Rep.*, 5, p. 39, figs. 11, 12.
1937. *Stomias nebulosus* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 22 (Zanzibar area, OT 640—658 m.).
1949. *Stomias nebulosus* Misra, *Rec. Indian Mus.*, 45, p. 417.
1953. *Stomias nebulosus* Misra, *Rec. Indian Mus.*, 50, p. 402.
1955. *Stomias nebulosus* Munro, *Mar. Freshwater Fish. Ceylon*, p. 34.



TEXT-FIG. 68.—Lateral view of *Stomias nebulosus* Alc. (After A. Alcock)

B. 16—17; D. 16—17; P. 6; V. 5; A. 21; L.I. ca 52.

Body with deciduous, hexagonal scales, low, elongaen compressed, covered with tenacious slime; abdomen not keeled, non serrated. Dorsal and ventral profiles more

or less equal, gradiently tapering towards tail. Head naked, short, compressed, 9.0—9.8, depth 10.7—12.0 in total length (8.2 and 10.1 in standard length). Eyes 4.0 in head, 0.5 in snout, larger in males. Cleft of mouth wide, oblique; maxilla reaching preopercular angle. Lower jaw prominent, mandibles widely distensible. A barbel as long as head ending in 3 elongate filaments at the mandibular symphysis. Opercle narrow, interopercle rudimentary. Teeth fixed; 25 small, unequal, curved ones in each premaxilla, about the same number in the form of minute, close-set, even serrations in each maxilla; a fang on each side of vomer; one or two moderate sized teeth in the palatines; teeth in the lower jaw very large, curved, acute, standing out laterally, 8 or 9 on each side, nearly at right angle to jaw. A single rayed dorsal fin in the posterior fifth of body; origin behind pelvic and anal origins. No adipose dorsal. Pectorals low, nearly equal to head. Pelvics very narrow, prolonged, reaching beyond anal origin, 1.5 times head. Anal longer than dorsal; origin before dorsal origin. Caudal small, slightly forked, 1.2 in head. No lateral line. Scales deciduous. Luminous organs: a small suborbital; 16–17 branchiostegals; in the ventral series 64—68 in a continuous row, 6 between isthmus and pectoral base, 34—38 between pectoral base and pelvic, 9 between pelvic and anal origin, 15 between anal and caudal origins, the last 3 between last anal ray and caudal origin; in the lateral series 35—36 in a continuous row ending before anal, 29—30 between pectoral and pelvic, 6 between pelvic and anal. No pyloric caeca. Air bladder present.

Uniform black with metallic gloss; fins and barbels white with black tips.

It attains 135mm. in length and has been obtained at a depth of 421—1536m., bathypelagic.

Distribution.—India : Gulf of Mannar, 6°29' N., 70°34'E., 1091 m., 6.4°C. East Coast of Africa, 0°25'N.—1°40' S., 41°—43°E., 693—1019m.; Zanzibar area, 4°S., 41°E., OT, 640—658m.; Flores Sea, 8°30' S., 121°E., Timor Sea, 10°S., 125°E., in the mean annual isotherm of 20° C with the latitudinal and longitudinal range of 6°N.—10°S., 41°—125°E. in the Indian Ocean and 8°30' S., 121°E. in Pacific Ocean.

96. Genus *Photostomias* Collett

1889. *Photostomias* Collett, *Bull. Soc. Zool. France*, 14, p. 291, (type *P. guernei* Collett, orthotypic).
 1890. *Thaumastomias* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 220 (type, *T. atrox* Alc., orthotypic).

Body low, elongate, compressed, scaleless ; with photophores. Eyes moderate. No barbels. Head compressed. Gape of mouth very wide, oblique. A postocular organ; a subocular organ (in males only) below anterior margin of eye. Teeth acute, unequal, in single series in premaxilla, maxilla, mandible and palatines; none on tongue and vomer. Gill-openings very wide; gill-covers rudimentary; gill-rakers rudimentary. One dorsal fin, with 23 rays; origin opposite to anal. Anal fin with 25 rays, situated in the posterior fourth of the body near the caudal. Pectoral absent. Pelvic origin very much in advance of dorsal origin, situated in the anterior half of body. Adipose fin absent. Caudal deeply forked. No air bladder.

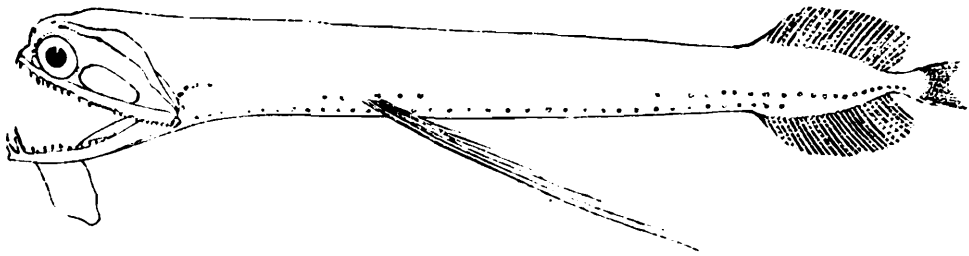
Distribution.—Atlantic Ocean: Azores, 1138m., Caribbean Sea; Indian Ocean: off Ganjam coast, Bay of Bengal, 2395m., off the Andamans, 1108m.

227. *Photostomias guernei* Collett

(Pl. V, fig. 6; Text-fig. 69)

1889. *Photostomias guernei* Collett, *Bull. Soc. Zool. France*, p. 123 (type locality : Azores, 1138 m., 6° 5' C.).
 1890. *Thaumastomias atrox* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 220, pl. 8, fig. 7 (type locality : Bay of Bengal, off Ganjam coast, 18° 26' N., 85° 24' E., 1310 fms., 2° 3' C.; type in the Zoological Survey of India).
 1899. *Photostomias atrox* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 150. (Bay of Bengal, off Ganjam coast, 1310 fms., off the Andamans, 606 fms.).
 1900. *Photostomias atrox* Alcock, *Illus. Zool. Investig. Fish.*, pl. 30, fig. 2.
 1906. *Photostomias guernei* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 371 (Azores, 1138 m., 6° 5' C.).
 1927. *Photostomias guernei* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 2, p. 102.
 1930. *Photostomias guernei* Regan & Trewavas, "*Dana*" *Exped.* (1920-22), (6), p. 134, pl. 13, fig. 1 (13°—38° N., 20°—84° W., 50—3000 m. MW).

1930. *Photostomias guernei* Norman, *Discovery Rep.*, 2, p. 317 (Atlantic, 0° 56' 13" N., 14°—18° W., Caribbean Sea).
 1949. *Photostomias atrox* Misra, *Rec. Indian Mus.*, 45, p. 418.
 1953. *Photostomias atrox* Misra, *Rec. Indian Mus.*, 50, p. 403, fig. 18b.
 1955. *Photostomias guernei* Gray, *Fieldiana Zool.*, 37, p. 283 (off Bermuda; 8 specimens from 730—3000m., collected during day and 7 specimens taken at night from 260—1370 m.).
 1958. *Photostomias guernei* Briggs, *Bull. Florida State Mus., Biol. Sci.*, 2, p. 255 (Florida, 24°—30° N., 78°—87° W.).



TEXT-FIG. 69.—Lateral view of *Photostomias guernei* Collett.
 (After A. Brauer)

D. 23; P. O.; V. 6; A. 25.

Body scaleless, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal and ventral profiles equal, gradually tapering posteriorly. Head naked, compressed, 5.2, depth 9.1—11.0 in total length (5.1 and 8.5—10.0 in standard length). Eyes large, circular, 4.0 in head, 0.3 in snout, interorbital greater than eye, convex. Mouth enormous, as long as head; its floor completely wanting except quite anteriorly, its place being taken by a long, elastic, muscular band extending from the hip of hyoid to the inner surface of mandibular symphysis; mouth cleft and gill cleft continuous beneath, nearly dividing the head from the rest of body. Lower jaw projecting beyond upper. Teeth everywhere except in the maxilla, in the form of slender, acute, rigid fangs; 8 or 9 in each premaxilla, 3 remote stouter ones at symphysis; in each half of mandible an uneven row of over 20 and 5 (one median flanked on each side by a pair) of superior size at symphysis; in each palatine of a row of 7 to 8, increasing in size backwards, and a patch on the upper pharyngeal; maxillary teeth in the form of even, close-set, recurved serrations, numbering over 30 in each row. Gill cleft extremely wide, oblique, its superior limit above midorbit; gill cover reduced to narrow straight preoperculum, very obliquely articulated, furnished with a membranous fringe; branchial arches extremely weak, flexible. A single rayed dorsal fin; origin opposite to anal origin and

far behind pelvic origin, slightly in advance of the posterior fifth of body. No adipose dorsal. Pectorals absent. Pelvics high, with its two outer ray thickened, coherent throughout, and prolonged, $\frac{2}{5}$ of the total length; inner ray short, weak and inconspicuous; origin nearer to tip of mandible than to anal origin. Anal base equal to dorsal base, opposite dorsal. Caudal small, deeply forked, with the lower lobe longer, about $\frac{1}{22}$ in total length. No lateral line. No scales; body with soft., velvety skin and adherent tenacious mucus. Luminous organs : antorbital about the size and shape of a caraway seed; a large slipper-shaped, postorbital more than $\frac{1}{3}$ of head, parallel with upper jaw and behind eye; in the ventral series, 16 between isthmus and pelvic, 24 between pelvic and 5th anal ray and none beyond; in the lateral series 13 between operculum and pelvic, 37 between pelvic and caudal origin; a few smaller luminous organs on crown of head. No pyloric caeca. Gill rakers rudimentary.

Jet black; the large, postorbital, luminous organs conspicuous, one being naked and rose-pink in colour, the other being silvery, and almost covered by a fold of black skin; small luminous organs not visible until after immersion in spirit.

It attains 128mm. in length and has been obtained at a depth 50—3000m., abyssal.

Distribution.—India : Off Ganjam coast, $18^{\circ}26'N$, $85^{\circ}24' E.$, 2395m, $2.3^{\circ}C.$, Off the Andamans, 1108m. —Azores, $39^{\circ}N.$, $27^{\circ}W.$, 1138 m., Caribbean Sea, $17^{\circ}N.$ $64^{\circ}W.$, MW, 1000m., Gulf of Mexico, $22^{\circ}N.$ $84^{\circ}W.$, MW., 1000m., in the mean annual isotherms of $20^{\circ}C.$ and $12^{\circ}C.$ with the latitudinal and longitudinal range of $18^{\circ}26' N.$, $85^{\circ}24' E.$ in the Bay of Bengal and 0° — $39^{\circ}N.$, 14° — $87^{\circ}W.$ in the Atlantic Ocean.

XXXIV. Family CHAULIODONTIDAE

Body scaly, elongate, compressed, covered with a thick coat of transparent mucus, filled with capillary blood vessels; abdomen non-keeled, non-serrated. Head naked, elevated, short, compressed. Eye large. No lagena. Cleft of mouth very wide; maxilla extending to preopercle. Opercular lines poorly developed. Lower jaw projecting over upper. Teeth strong, some fang-like, none of fangs

received within the mouth. Rudimentary barbel on chin. A single rayed dorsal fin before pelvics, in the anterior part of body. Adipose dorsal, far away from rayed dorsal. Preanal adipose present or absent. Pectorals and pelvics. Anal short, below adipose dorsal. Caudal short, forked. Lateral line. Each scale with a luminous spot in centre. Photophores in several tiers corresponding with longitudinal rows of scales, along sides and abdominal lines; with more prominent ventral and lateral series. No gill rakers. No pseudobranchiae. No air bladder. Branchiostegals 16—20.

The family CHAULIODONTIDAE is represented by a single genus in the Indian region.

97. Genus *Chauliodus* Schneider

1801. *Chauliodus* Schneider, *Syst. Ichth. Bloch*, (type, *C. sloani* Schn.).
 1839. *Leptodes* Swainson, *Nat. Fish. Animal.*, 2, p. 298 (type, *Chauliodus sloani* Schn., logotypic).

Body low, elongate, compressed, scales thin, deciduous, with photophores. Eye moderate. Gape of mouth very wide, oblique. About four large fangs in each premaxilla, about five in mandible; palatines with a single series of small teeth; no teeth on tongue. Chin with a rudimentary barbel. Gill-openings very wide; gill-rakers absent. Pseudobranchiae absent. Branchiostegals numerous. Dorsal fin with 6 rays, in advance of anal fin, placed far forwards on the body about two head-lengths from snout end. Pelvic origin behind dorsal origin. Anal fin with 12 rays, situated far back near the caudal fin. Adipose dorsal present; adipose ventral present or absent. Caudal forked.

Distribution.—Atlantic Ocean : Madiera, Mediterranean; Mid Atlantic, 4571 m., Bermuda Is., 4671 m., Morocco, 1123 m., East Coast of North and Central America, 795—3783 m., Gulf of Guinea, 600—3000 m., Southwest Coast of Africa, 600—3000 m., Indian Ocean : South Africa, 548—1828 m., Arabian Sea, 1091—2505 m., Maldive area, 494 m., between Zanzibar and Seychelles, 594—2200 m., Gulf of Aden, Laccadive Sea, 1091—2505 m., Gulf of Mannar, 1091—2505 m., 594—2200 m., South of Sri Lanka, 594—2200 m., Bay of Bengal, 594—2907 m., West coast of Sumatra, 594—2200 m., Pacific Ocean:

North of New Amsterdam, 594—2200m., New Guinea, 1463—3657m., South of Japan, 1033., Society Is., Gulf of Panama, 849m.

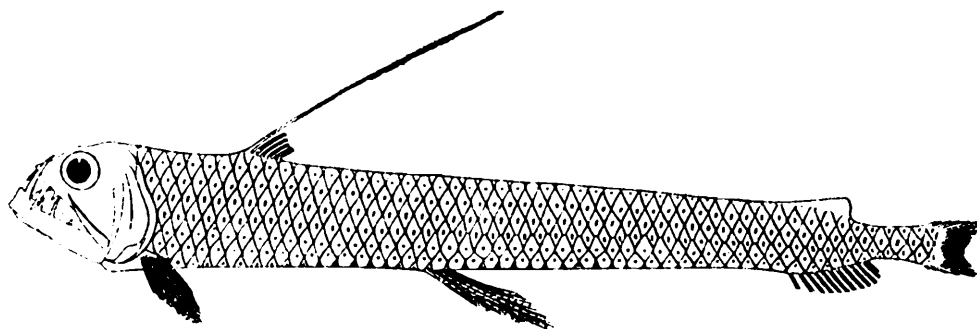
Key to species of genus Chauliodus Schneider

1. Luminous organs very prominent, those between pelvics and anal 23—26; preanal adipose ventral present *C. sloani*
2. Luminous organs less prominent, those between pelvics and anal 20—21; preanal adipose ventral absent *C. pammela*

228. *Chauliodus pammelas* Alcock

(Pl. IX, fig. 1; Text-fig. 70)

1892. *Chauliodus pammelas* Alcock, *Ann. Mag. nat. Hist.*, (6) 10, p. 355 (type locality: Laccadive Sea, 8°49' N., 73°18'45" E., 1370 fms., 2·2° C., type in the Zoological Survey of India).
1899. *Chauliodus pammelas* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 145 (Arabian Sea, in the neighbourhood of Minicoy, 1370 fms.).
1900. *Chauliodus pammelas* Alcock, *Ill. Zool. Investig. Fish.*, pl. 30, fig. 4.
1906. *Chauliodus pammelas* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 42, 371 (Gulf of Aden, 1200 m., 6·1° C.).
1913. *Chauliodus pammelas* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 110, fig. 38 (Flores Sea, 538 m.).
1939. *Chauliodus pammelas* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 21 (Arabian Sea; 12° 8' 6" N., 63°4' 36" E., 12°5' 18" N., 63° 1' 42" E., N 200, 430—984 m., 8·48° C. at 1000 m., 10° 54' 42" N., 61° 20' 54" E., 10° 53' 18" N., 61° 22' 24" E., N 200, 400—645m., 10·64° C. at 600 m., Maldive area; 4°58' 42" S., 73° 16' 24" E., AT 494 m., 10·86° C. at 400 m., Gulf of Oman, 24° N., 59° E. N 200, 2500 m., 2·27° C., Gulf of Aden, 13° N., 46°—48° E., AT 1022—1295 m., 7·16° C at 1280 m., 10·2° C. at 1000 m.).
1949. *Chauliodus pammelas* Misra, *Rec. Indian Mus.*, 45, p. 418.
1953. *Chauliodus pammelas* Misra, *Rec. Indian Mus.*, 50, p. 404, text-fig. 18d.



TEXT-FIG. 70.—Lateral view of *Chauliodus pammelas* Alc.
(After A. Alcock)

B. 16; D. 6/O; P. 11—12; V. 7; A. 12; L. 1. 52.

Body scaly, elongate, compressed, covered with a thick coat of transparent mucus filled with capillary blood vessels; abdomen non-keeled, non-serrated. Dorsal and ventral profiles equal, gradually tapering towards tail. Head naked, elevated, compressed, short, 6.5, depth 8.2 in total length (6.1 and 7.8 in standard length). Eyes 3.6 in head, 0.5 in snout. Cleft of mouth extremely wide; maxilla extending to preopercular angle. Lower jaw projecting over upper. About 4 enormous fangs in each premaxilla, about 5 fangs in each limb of mandible, the anterior on the largest and more than half head; none of the fangs received within the mouth; edge of maxilla finely denticulated; single series of small teeth in each palatine; tongue toothless. Gill cover narrow. A single short rayed dorsal fin with the anterior ray prolonged, reaching beyond pelvics; origin about half head length behind occiput, before pelvics. Adipose dorsal opposite anal, and far away from rayed dorsal. Pectorals low, 1.4 in head. Pelvics as long as head, about twice as long as pectorals, with median rays enlarged; origin far behind dorsal origin, nearer to anal origin than to pectoral base. Anal short, placed far back near caudal, opposite adipose dorsal; base twice dorsal base. No preanal adipose. Caudal short, forked, with rudimentary rays at its base, 2.4 in head. Lateral line. Scales hexagonal, deciduous, each with luminous spot in the centre. Luminous organs less conspicuous; one suborbital; one opercular; 16 branchiostegals; a series of 61 in the lowermost tier from chin to caudal, consisting of 30 between chin and pelvic, 21 between pelvic and anal, 10 between anal and caudal base; in the second tier 17 between pectoral and pelvic, 21 between pelvic and anal; besides these there are upper tiers less prominent and corresponding with longitudinal rows of scales and countless tiny spots in rows and clusters all along the abdominal line from chin to the caudal. No gill rakers.

Fins and iris uniform jet black, body silvery grey.

It attains 254mm. in length and has been obtained at a depth of 400—2500m., abyssal.

Distribution.—India : Laccadive Sea; 8°49' N., 73°18' 45" E., 2505 m., 2·2°C.; Arabian Sea, 12° 8' 6" N., 63°4' 36" E., 12°5' 18" N., 63°1' 42" E., N 200, 430—984 m., 8·48°C. at 1000m., 10°54' 42" N., 61°20' 54" E.; 10°53' 18" N., 61°22' 44" E., N. 200, 400—645m., 10·64°C. at 600m.—Maldivé area; 4°58' 42" S., 73°16' 24" E., AT, 494 m., 10·86°C. at 400m. Gulf of Oman, 24°N. 59°E., N 200, 2500m., 2·27°C., Gulf of Aden, 13°N., 46°—48°E., AT, 1022—1295m., 7·16°C. at 1280m., 10·2°C. at 1000m., Flores Sea, 8°30' S., 121°E., 538m., in the mean annual isotherm of 20°C with the latitudinal and longitudinal range of 24°N.—8°S., 46°—121° E., in the Indo-Pacific=(24°N.—4°S., 46°—73°E. in the Indian Ocean + 8°30' S., 121°E. in the Pacific Ocean).

229. *Chauliodus sloani* Schneider

1801. *Chauliodus sloanii* Schneider, *Syst. Ichth. Bloch.* p. 430 (type locality : Atlantic Ocean).
1889. *Chauliodus sloanii* Alcock, *Ann. Mag. nat. Hist.*, (6) 4, p. 399 (Bay of Bengal, 10° 36' 30" N., 93° 40' 15" E., 1595 fms., 5·0°C. ; Gulf of Mannar, 7°36' N., 78° 5' E., 597 fms.).
1892. *Chauliodus sloanii* Alcock, *Ann. Mag. nat. Hist.*, (6) 10, p. 355 (Laccadive Sea).
1896. *Chauliodus sloanii* Alcock, *J. As. Soc. Bengal*, 65, p. 332 (Bay of Bengal, 1595 fms., Gulf of Mannar, 597 fms., Laccadive Sea).
1899. *Chauliodus sloanii* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 144 (Gulf of Mannar, 597 fms. ; Bay of Bengal, 13°21' N., 93° 27' E., 922 fms., 5·1°C. ; 1595 fms.).
1906. *Chauliodus sloanii* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 40, 371, text-figs. 7—9 (7° 43' 2" N., 88° 44' 9" E., South of Ceylon, 4° 56' N., 78° 15' 3" E., 2000 m.).
1913. *Chauliodus sloani* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 110, fig. 38 (Northeast of New Amsterdam; West of Sumatra, Bay of Bengal ; between Seychelles and Zanzibar ; Gulf of Aden, 594—2200 m., 10·3°—6·1°C.).
1930. *Chauliodus sloanji* Norman, "*Discovery*" *Rep.*, 2, p. 308 (13°N.—33°S., 16°E.—15°W., 125—1000 m., 6·96°C. at 155 m., surf. temp. 8·20°C).
1939. *Chauliodus sloanji* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 21, (Maldivé area ; 4° 58' 42" S., 73° 16' 24" E., AT, 494 m., 10·86°C. at 400 m., Zanzibar area).
1941. *Chauliodus sloani* Herre, *Mem. Indian Mus.*, 13, p. 336 (Andamans).

1949. *Chauliodus sloani* Misra, *Rec. Indian Mus.*, **45**, p. 418.
 1953. *Chauliodus sloani* Misra, *Rec. Indian Mus.*, **50**, p. 404.
 1953. *Chauliodus sloani* Smith, *Sea Fish. South. Africa*, p. 102, (at a depth of 300—1000 fms. of most oceans).
 1955. *Chauliodus sloani* Munro, *Mar. Freshwater Fish. Ceylon*, p. 35.
 1955. *Chauliodus sloani* Grey, *Fieldiana Zool.*, **37**, p. 277 (off Bermuda; 32 specimens from 400—3000 m. collected during day and 43 from 260—2000 m. caught at night).
 1958. *Chauliodus sloani sloani* Briggs, *Bull. Florida State Mus., Biol. Sci.*, **2**, No. 8, p. 255 (Florida, 24°—30°N., 78°—87° W.).

B. 18—20; D. 6/O; P. 12—13; V. 7; A. O/12; L. I. 56—61.

Body scaly, elongate, compressed, covered with a thick coat of transparent mucus, filled with capillary blood vessels; abdomen non-keeled, non-serrated. Dorsal and ventral profiles equal, gradually tapering towards tail. Head naked, short, elevated, compressed, squarish, 7·0, depth 9·4 in total length (6·3 and 8·2 in standard length). Eye 3·5—4·7 in head, larger in males, 0·5 to 1·0 in snout. Cleft of mouth very wide; maxilla extending to preopercular angle. Lower jaw projecting over upper. Dentition as in the previous species. Gill cover narrow. A single rayed dorsal fin, with the anterior ray much prolonged to a length twice head to nearly $\frac{1}{3}$ length of body; origin less than half head length, behind occiput. Adipose dorsal slightly in advance of anal, far away from rayed dorsal. Pectorals low, 1·6 in head. Pelvics 1·3 times head, about twice as long as pectorals, with median rays enlarged; origin far behind dorsal origin, nearer to pectoral base than to preanal adipose. A preanal adipose fin smaller than adipose dorsal or anal. Anal short, close behind preanal adipose, near caudal; origin slightly behind adipose dorsal, base 1·5 times rayed dorsal base. Caudal moderate, equal to head, deeply forked, with rudimentary rays at its base, equal to head, lower lobe longer. Lateral line. Scales subhexagonal, deciduous, each with a luminous spot in the centre. Luminous organs conspicuous; 1 suborbital; 1 opercular, 18 branchiostegals; a series of 64—67 in the lowermost tier from the chin to caudal, consisting of 30 between chin and pelvic, 23—26 between pelvic and anal and 11 between anal and caudal origins; in the second tier a series of 17 between pectoral and pelvic, 23—26 between pelvic

and anal and 11 between anal and caudal origins; in the second tier a series of 17 between pectoral and pelvic and 21 between pelvic and posterior end of preanal adipose. Besides these, a few more upper tiers less prominent and corresponding with longitudinal rows of scales, and countless tiny spots in rows or clusters all along the abdominal line from chin to caudal. No gill rakers.

Greenish above; sides silvery; belly blackish.

It attains 304 mm. in length and has been obtained at a depth of 125—3000 m.; abyssal.

Distribution.—India : Bay of Bengal; 10°36' 30" N., 93°40' 15" E., 2907 m., 5°C.; 13°21' N., 93°27' E., 1686 m., 5.1°C., 7°43'2" N., 88°44'0" E., 2000 m., Gulf of Mannar, 7°36' N., 78°5' E., 1091 m., Sri Lanka : South of Sri Lanka, 4°56' N., 78°15' 3" E., 2000, m.—Madiera, 35°N., 17°W., Mediterranean, 36°8' N., 5°19' W., 38°13' N., 15°13' E., Mid-Atlantic, 4571m., Bermuda Is., 34°28'N., 58°56'W., 4671 m., Morocco, 1123m., East Coast of north and Central America, 795—3783 m. Gulf of Guinea, 2°N.—25° S., 0°—7° E., 600—3000 m., Southwest Coast of Africa, 600—3000 m., West Coast of Africa, 13°N.—34°S., 16°E.—18°W., 125—1000 m., Southeast Coast of Africa, 548—1828 m., between Zanzibar and Seychelles, 4 S., 53°E., 594—2200m., Gulf of Aden 13°28' N., 46° 41' 6" E., 594—2200m., Maldiva area; 4° 58' 42" S., 73° 16' 24" E., AT 494 m., 10.86°C. at 400 m., West Coast of Sumatra, 0°30' N., 98°E., 594—2200 m., North of New Amsterdam, 26°S. 93°E., 594—2200 m. New Guinea, 5° 41' S., 134°4' E., 2°56' N., 134°11' E., 1463—3657 m., South of Japan, 34°7' 0" N., 135°39' E., 1033 m., Florida, 24°—30°N., 78°—87°W., 260—2000m., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 34°N.—26°S., 16°—135°E. in the Indo-Pacific=(13°N.—26°S., 46°—98°E., in the Indian Ocean+34°N.—5°S., 134°—135°E. in the Pacific Ocean), 35°N.—34°S., 16°E.—87°W. in the Atlantic Ocean and 36°—38°N., 15°E.—5°W. in the Mediterranean.

VII. Superfamily ASTRONESTHOIDAE

Body low, elongate, compressed, naked. Head naked. Gape of mouth wide, oblique; lateral margin of upper

jaw formed by maxillary and premaxillary. A postocular luminous organ. Barbel present or absent. Gill rakers rudimentary or absent. Branchiostegals 8-23. No pseudobranchiae. Pectoral reduced or absent. Pelvics present or absent. A single rayed dorsal fin, placed nearer to snout end than to caudal end or nearer to caudal end than to snout tip. Adipose dorsal present or absent. Adipose ventral present or absent. Caudal distinct, forked or pointed. Eyes normal or stalked. Mesocoracoid. Photophores in 2 continuous series or 2 main series to much reduced to be clearly discernable.

The superfamily ASTRONESTHOIDAE is represented by 3 families in the Indian region.

Key to families of superfamily ASTRONESTHOIDAE

1. Dorsal and anal very long ; their rays with lateral spines at base	IDIACANTHIDAE
2. Dorsal and anal short ; their rays without lateral spines at base	3
3. Adipose dorsal present ; dorsal fin not confined to tail	ASTRONESTHIDAE
4. Adipose dorsal absent ; dorsal fin confined to tail	MELANOSTOMIATIDAE

XXXV. Family ASTRONESTHIDAE

Body naked, elongated, compressed; abdomen non-keeled, non-serrated. Head scaleless. Eye normal or stalked. Cleft of mouth oblique, maxilla extending to pectoral base. Lower jaw prominent. Barbel present or absent. Teeth in intermaxilla and mandible unequal, widely set, and a few of them fanglike; maxillary teeth curved, erect or obliquely directed backwards; vomer edentulous; palatines and tongue toothed. Pectorals low. Pelvics before dorsal. Adipose dorsal and ventral fins. Anal below dorsal or behind last dorsal ray. Caudal forked. No lateral line. Photophores in 2 continuous series; suborbital conspicuous or non-conspicuous. Gill rakers minute. Teeth on gill arches few, short or numerous, long and slender; ceratohyal with or without teeth. No air bladder. No pseudobranchiae. Branchiostegals 18—23.

The family ASTRONESTHIDAE is represented by 2 genera in the Indian region.

Key to genera of family ASTRONESTHIDAE

1. A well developed mental barbel;
a conspicuous suborbital organ **Astronesthes**
2. No mental barbel ; no conspicuous
suborbital organ **Bathylychnus**

98. Genus **Astronesthes** Richardson

1844. *Astronesthes* Richardson, *Ichth. Voy. "Sulphur"*, p. 97 (type, *A. niger* Rich., orthotypic).
1850. *Phaenodon* Lowe, *Proc. zool. Soc. Lond.*, 18, p. 250 (type., *P. ringens* Lowe, orthotypic).
1938. *Borostomias* Regan, *Trans. Linn. Soc. Lond.*, 12, p. 217 (type, *B. braueri* Reg., orthotypic).

Body elongate, compressed, scaleless; with photophores. Head short. Snout compressed. Eyes moderate. Gape of mouth wide, oblique. Teeth in the intermaxilla and mandible unequal, widely set and a few of them fanglike; maxillary teeth obliquely directed backwards; vomer edentulous; palatine and tongue with a series of small pointed teeth. Chin with a well developed, fleshy barbel. Gill openings wide; gill rakers minute; no teeth on ceratohyal. Pseudobranchiae absent. Gills 4. Branchiostegals 18—23. Dorsal fin with 11—16 rays, placed nearer to snout end than to caudal end ; origin in advance of anal fin. Pelvics inserted near middle of body; origin shortly before or opposite to dorsal fin. Anal fin with 14—22 rays, near caudal base. Dorsal and ventral adipose fins present. Caudal forked. No air bladder.

Distribution.—Atlantic Ocean : North Atlantic : Gulf of Guinea, 2000 m.; West Africa (Sierre Leone), 4571 m., West Africa, 2225, Cape Verde Is., East Coast of North America, 548m., South Atlantic, 2500m., West Indies, 3826 m., Indian Ocean: Red Sea; between Zanzibar and Seychelles, 3000 m., between Sri Lanka and Maldives, 2000 m., South of Sri Lanka, 2000 m., Off Travancore coast, 409—529 m., Pacific Ocean: Sandwich Is., 469—1857 m; Timor Sea; Near Hawaii, 470—2232m.

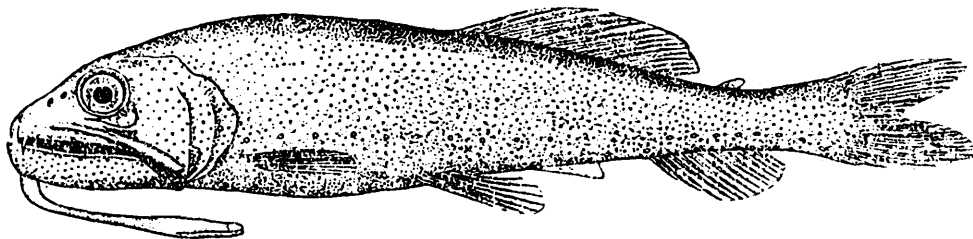
Key to species of genus Astronesthes Richardson

1. Dorsal fin terminating in advance of anal origin *A. martensii*
2. Dorsal fin not terminating in advance of anal origin *A. indicus*

230. *Astronesthes indicus* Brauer

(Pl. VI; Text-fig. 71)

1899. *Astronesthes* sp., Alcock, *Cat. Ind. Deep Sea Fish.*, p. 211 (off the Travancore coast, 8° 37' N., 75° 37' 30" E., 224—284 fms., 122° C).
1900. *Astronesthes* sp., Alcock, *Ill. Zool. Investig. Fish.*, pl. 35, fig. 3 (dorsal and ventral adipose fins not shown).
1902. *Astronesthes indicus* Brauer, *Zool. Anz.*, **25**, p. 287 (type locality: east of Zanzibar, 3000 m.).
1906. *Astronesthes indicus* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 33, 373, pl. 2, fig. 3, text-fig. 5a-b.
1929. *Astronesthes indicus* Regan & Trewavas, "*Dana*" (1920-22), **2**, No. 5, p. 23, pl. 2, fig. 3 (10°—28° N., 20°—66° W., 80—6000 M.W.).
1931. *Astronesthes indicus* Norman, "*Discovery*" *Rep.*, **2**, p. 306 (0° 56' S., 14° 8' 30" W., TYF, 250 (-0) m.).
1949. *Astronesthes indicus* Misra, *Rec. Indian Mus.*, **45**, p. 419.
1953. *Astronesthes indicus* Misra, *Rec. Indian Mus.*, **50**, p. 405.



TEXT-FIG. 71.—Lateral view of *Astronesthes indicus* Br. (After A. Brauer)

B. 18—19; D. 15—16/O; D. 7—8; V. 7; A.O/14—16.

Body naked, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile gradiently convex, ventral straight. Head naked, 4.2, depth 5.2—6.1 in total length (3.7—3.9 and 4.5—5.8 in standard length). Eyes 3.8—5.0 in head, equal to snout. Cleft of mouth wide; maxilla extending to preopercular angle. Lower jaw prominent. Teeth on intermaxilla and mandible

*Tholasilingam, Venkataraman and Kartha (1964, *J. mar. biol. Ass. India*, **6** (2), p. 269) have reported *Astronesthes lucifer* Gilbert off the Kerala coast.

unequal, widely set, a few of them long, curved canines; those on maxilla much smaller; close-set, directed backwards; palatine teeth 8—12 on each side, directed backwards forming close series. A barbel on mandibular symphysis, about $1/2$ head length in large specimens, tapering to the tip and ending in a minute, wide bulb with a pigmented stripe on each side meeting over the tip. A single rayed dorsal; base 1.8 times anal base; origin behind middle of standard length, about an eye diameter behind pelvic origin and ending above 2nd—4th anal ray. A small adipose dorsal just behind rayed dorsal, above 8—10th anal ray. Pectorals low, not reaching pelvics, 1.6—1.8 in head. Pelvics 1.5—1.7 in head. almost reaching or not reaching preanal adipose; origin about an eye diameter before rayed dorsal. A small preanal adipose below 7th—9th dorsal ray. Anal about an eye diameter behind preanal adipose; origin 13th—14th rayed dorsal. Caudal deeply forked, with rudimentary rays at its base, 1.4—1.6 in head. No lateral line. No scales. Luminous organs : an antorbital; a suborbital; a luminous plate on opercle, with 2 operculars; 18 branchiostegals; 5—6 on isthmus; in the ventral series, 2 between isthmus and pectoral, 5—6 between pectoral and pelvic, 5—9 between pelvics and origin of rayed anal, 7—9 between rayed anal origin and caudal base; in the lateral series, 5—6 between operculum and pelvic origin, 6—8 between pelvic origin and rayed anal origin, with none beyond. Besides these, numerous, inconspicuous photophores along the longitudinal series of scales and scattered all over the body.

Bronze colour with large patches of luminous tissue on sides of body in definite positions near dorsal and pelvic ends, opercle, behind and a little above pectoral base, one in front of pelvic fin, and 2, a lateral and a dorsal, above it.

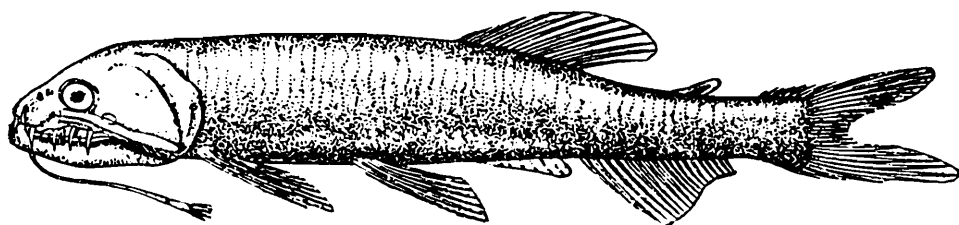
It attains 103mm. in length and has been found at a depth of 409—3000m.; abyssal.

Distribution.—India : off the Travancore Coast, $8^{\circ}37' N.$, $75^{\circ}37' 30'' E.$, 409—529m., $12.2^{\circ} C.$ —East of Zanzibar, $50^{\circ}12' 5'' S.$, $46^{\circ}32' 3'' E.$, 3000 m.; Caribbean Sea., $17^{\circ}58' 5'' N.$, $64^{\circ}41' W.$; in the mean annual isotherm of $20^{\circ} C.$ with the latitudinal and longitudinal range of $8^{\circ} N.$ — $5^{\circ} S.$, 46° — 75° — $E.$ in the Indian Ocean and $0^{\circ}56' S.$ — $28^{\circ} N.$, 14° — $66'' W.$ in the Atlantic Ocean.

231. *Astronesthes martensi* Klunzinger

(Text-fig. 72)

1871. *Astronesthes martensii* Klunzinger, *Verh. Zool-bot. Ges. Wien*, **21**, p. 594 (type locality : Red Sea).
 1906. *Astronesthes martensi* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 32, 372, pl. 2, fig. 4 (South of Ceylon, 4°56' N., 78° 15' 3" E., 2000 m.).
 1929. *Astronesthes martensii* Regan & Trewavas, *Ocean. Rep. Danish "Dana" Rep.* (1920-22). **2**, 5, (p.) 17, fig. 7 (Red Sea).
 1949. *Astronesthes martensii* Misra, *Rec. Indian Mus.*, **45**, p. 419.
 1953. *Astronesthes martensii* Misra, *Rec. Indian Mus.*, **50**, p. 405.



TEXT-FIG. 72.—Lateral view of *Astronesthes martensi* Klunz. (After A. Brauer)

B. 23; D. 11—12/O; P. 6—8; V. 7; A. O/18—22.

Body naked, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile gradiently convex, ventral profile straight. Head naked, 4.8—5.0, depth 7.1—8.0 in total length (4.3—4.4 and 6.4—7.4 in standard length). Eyes 4.5—5.0 in head, equal to snout. Cleft of mouth wide; maxilla extending to preopercular angle. Lower jaw prominent. Dentition as in the previous species, with 11—12 palatine teeth on each side. A barbel at mandibular symphysis, 1.3 times of head, slender, pigmented, ending in a small, white bulb, with or without appendages. A single rayed dorsal base nearly equal to anal base, entirely before anal origin; origin behind middle of standard length, about 1 or 2 eye diameters behind middle of standard length, about 1 or 2 eye diameters behind pelvic origin. A small adipose dorsal nearly midway between last dorsal ray and rudimentary caudal rays, above 10th—14th anal ray. Pectorals low, almost reaching pelvic base or not, 1.1—1.8 in head. Pelvics reaching preanal adipose or not, 1.1—1.7 in head; origin 1 or 2 eye diameters before rayed dorsal. Preanal adipose small or well developed, clearly behind rayed dorsal or below it. Anal base equal to dorsal base;

origin just behind or about 2 eye diameters behind last dorsal ray. Caudal forked, with rudimentary rays at its base, 1.1—1.4 in head. No lateral line. No scales. Luminous organs : an antorbital; a large suborbital; 2 small operculars; 2 branchiostegals; 8 on isthmus; in the ventral series, 2 between isthmus and pectoral base, 17—18 between pectoral and pelvic, 18—20 between pelvic and rayed anal, 12—14 between anal origin and caudal base, the last 5—6 being beyond the last anal ray; in the lateral series, 11—17 between operculum and pelvic origin, 17—20 between pelvic and anal origins, 3—4 between anal origin and caudal base. Besides these, numerous, inconspicuous photophores along the longitudinal series of scales and scattered all over body.

Bronze grey, fins lighter.

It attains 150mm. in length and has been obtained at a depth of 2,000 m.; bathypelagic.

Distribution.—Sri Lanka: South of Sri Lanka, 4°56' N., 78°15' 3"E., 2000m.—Cape Verde Is., 17° N., 22° W.; Red Sea, 20° N., 39° E., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 4°—20° N., 39°—78°E., in the Indian Ocean and 17°N. 22° W. in the Atlantic Ocean.

99. Genus *Bathilychnus* Brauer

1902. *Bathilychnus* Brauer, *Zool. Anz.*, **25**, p. 289 (type, *B. cyaneus* Br., orthotypic).

This genus differs from genus *Astronesthes* Rich. in having no mental barbel and conspicuous sub-orbital organ.

Distribution.—Between Sri Lanka and Maldives (2000m.).

232. *Bathilychnus cyaneus* Brauer

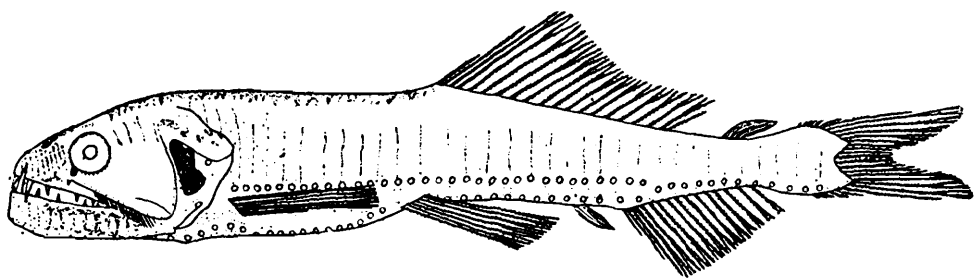
(Text-fig. 73)

1902. *Bathilychnus cyaneus* Brauer, *Zool. Anz.*, **25**, p. 289 (type locality : south of Ceylon, 4° 56' N., 78° 15' 3"E., 2000 m.).

1906. *Bathilychnus cyaneus* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 35, 373, pl. 2, fig. 5, text-fig. 6a-b.

1927. *Bathilychnus cyaneus* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 2, p. 37.

1929. *Astronesthes cyaneus* Regan & Trewavas, "Dana" Rept. (1920-22), 2, No. 5, pp. 14, 21, text-fig. 14 (9°—26°N., 20°—83° W., 19—3000 M. W.).
1930. *Astronesthes cyaneus*, Norman, "Discovery" Rep., 2, p. 306. (Atlantic ; 6° 55' N., 15° 54' W. ; N 200, 800 (-0) m. ; Caribbean Sea).
1949. *Astronesthes cyaneus* Misra, Rec. Indian Mus., 45, p. 419.
1953. *Astronesthes cyaneus* Misra, Rec. Indian Mus., 50 p. 405, text-fig. 20 b.



TEXT-FIG. 73.—Lateral view of *Bathilychnus cyaneus* Br. (After A. Brauer)

B. 18; D. 18—21; P. 7—8; V. 7; A. 0/14—15.

Body scaleless, elongate, compressed; abdomen non-keeled, non-serrated. Dorsal profile gradiently convex, ventral profile straight. Head scaleless, compressed, 4.4—4.5, depth 5.6—6.6 in total length (3.8 and 5.0—5.7 in standard length). Eyes 4.2 in head, nearly equal to snout. Cleft of mouth wide; maxilla extending to preopercular angle. Lower jaw prominent. Teeth in intermaxilla and mandible unequal, widely set, a few of them long, curved canines; those on maxilla much smaller, close-set, directed backwards; vomer edentulous; a series of small, pointed teeth on palatines and tongue. A single rayed dorsal fin; base twice as long as anal base; origin in the middle of standard length, behind pelvic origin and ending above 6th to 10th anal ray. A small adipose dorsal, close behind dorsal, above 13th—15th anal ray. Pectorals low, long, 1.1 in head. Pelvics long, 1.1 in head; origin about an eye diameter before dorsal origin. A small preanal adipose nearly below 12th dorsal ray. Anal close behind preanal adipose; origin nearly below 14th dorsal ray. Caudal deeply forked, with rudimentary rays at its base, 1.2 in head. No lateral line. No scales. Luminous organs : an antorbital organ; a suborbital; a luminous plate on opercle with 2 small operculars; 18 branchiostegals; 7 on isthmus; in the ventral series, 3

between isthmus and pectoral, 12—15 between pectoral and pelvics, 11—15 between pelvics and rayed anal origin, 12—14 between anal origin and caudal, the last 3 or 4 being behind last anal ray; in the lateral series 13—14 between opercle and pelvic; 2—3 beyond anal origin. Besides these, numerous, small, inconspicuous photophores between the longitudinal series of scales and scattered all over the body.

Sides of head and body with metallic steel or bronze—like lustre showing blue iridescence; white or yellowish patches of glandular tissue often present on head and very characteristically on lower part of opercle.

It attains 76mm. in length and has been obtained at a depth of 3000m.; abyssal.

Distribution.—Sri Lanka: South of Sri Lanka; 4°56' N., 78°15' 3"E., 2000m.—Atlantic; 6°55'N., 15°54'W., N 200, 800 (—0)m; Caribbean Sea.; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 4°56' N., 78°15'3" E. in the Indian Ocean and 6°—26°N., 15°—83°W. in the Atlantic Ocean.

XXXVI. Family MELANOSTOMIATIDAE

Body elongate, compressed, naked; abdomen non-keeled, non-serrated. Head long or short, scaleless, not much compressed. Cleft of mouth very wide, oblique, maxilla extending to pectoral base. Lower jaw prominent, not projecting over upper jaw. Barbel present or absent, unequal. Pointed teeth in jaws, vomer, palatines and tongue. Gill openings very wide. A single rayed dorsal fin, placed far behind, near caudal, opposite and similar to anal. No adipose fin. Pectorals low, reduced. Pelvics well developed, before dorsal and behind middle of body. Caudal small, forked. No lateral line. Photophores generally in 2 conspicuous main lateral series, or the two main series too much reduced to be clearly discernible. Gill rakers rudimentary or absent. Branchiostegals 8—12.

The family MELANOSTOMIATIDAE is represented by 2 genera in the Indian region.

Key to genera of family MELANOSTOMIATIDAE

1. Chin with barbel ; distance between pelvic and anal origins about 3 times in the distance between pelvic and pectoral **Melanostomias**
2. Chin without barbel : distance between pelvic and anal origins about $1\frac{1}{2}$ times in the distance between pelvic and pectoral **Malacosteus**

100. Genus **Melanostomias** Brauer

1902. *Melanostomias* Brauer, *Zool. Anz.*, **25**, p. 284 (type, *M. melanops* Br., orthotypic).
1905. *Leptostomias* Gilbert, *Bull. U.S. Fish. Comm.* (1903), p. 606 (type, *L. macronema* Gilb., orthotypic).
1911. *Nematostomias* Zugmayer, *Res. Camp. Sci. Monaco, Fasc.*, **35**, p. 76 (type, *N. gladiator* Zugmayer, orthotypic).

Body elongate, compressed, scaleless ; with photophores. Eyes moderate. Gape of mouth wide, oblique. Intermaxilla and mandible with large, bicuspid, depressible teeth; maxilla anteriorly with large and posteriorly with small teeth; vomer, palatines and tongue toothed. Chin with a well developed fleshy barbel. Branchiostegals 11—12. Gill openings wide. Pseudobranchiae absent. Opercle little developed. Dorsal and anal fins placed far behind near the caudal. Dorsal fin with 13—16 rays and anal fin with 16—20 rays are opposite to each other with their bases equal in length. Pectorals short. Pelvic origin before dorsal fin and well behind middle of body. Adipose fin absent. Caudal forked.

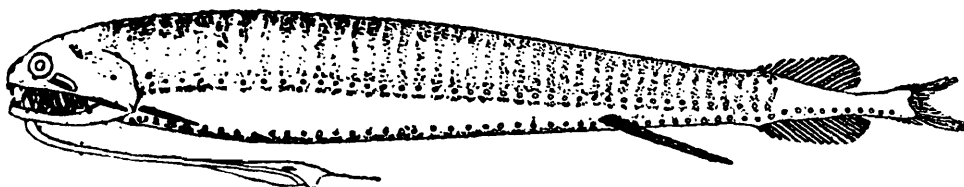
Distribution.—North and West coast of Sumatra, 615—1024m.; Sandwich Is., 581—825m.

233. **Melanostomias melanops** Brauer

(Text-fig 74)

1902. *Melanostomias melanops* Brauer, *Zool. Anz.*, **25**, p. 284 (type-locality : West coast of Sumatra, 5° 23' 2" N., 94° 48' 1" E., 1024m., 5·6° C.).
1906. *Melanostomias melanops* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 53, 371, pl. 3, figs. 4, 5, text-fig. 15 (west coast of Sumatra).
1913. *Melanostomias melanops* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 114, fig. 41.
1927. *Melanostomias melanops* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 2, pp. 41, 42, fig. 24.

1930. *Melanostomias melanops* Regan & Trewavas, "Dcna" Rept. (1920—22), 2, (6), pp. 111, 114, fig. 110 B Caribbean Sea, 14° 38' N., 61° 16' W., 1000 M. W.).
 1949. *Melanostomias melanops* Misra, *Rec. Indian Mus.*, 45, 419.
 1953. *Melanostomias melanops* Misra, *Rec. Indian Mus.*, 50, p. 405, text-fig. 19 c



TEXT-FIG. 74.—Lateral view of *Melanostomias melanops* Br. (After A. Brauer)

B. 12; D. 14; P. 5; V. 8; A. 17.

Body elongate, compressed, naked, smooth; abdomen non-keeled, non-serrated; dorsal and ventral profiles smoothly tapering backwards. Head not so much compressed, 7.3 in total length (6.8 in standard length); depth 7.4 in total length (6.9 in standard length). Eyes 5.5 in head, nearly equal to or slightly less than snout. Cleft of mouth very wide, maxilla extending 3 eye diameters behind postorbit. Barbel thick, 3 times of head, with the distal part lamellated, ending in a thin filament. A group of 5 teeth in maxilla, equal to large intermaxillary teeth, behind them about 24 small, close-set, backwardly directed teeth; intermaxillary with 8 teeth, first and third the smallest, fifth the largest; mandibular teeth 11, first and fourth the smallest, third the largest and the rest in two groups, their height increasing posteriorly; all large teeth bicuspid, depressible; vomer with a pair of teeth, palatines with 4, tongue with 2 teeth. A single rayed dorsal close to caudal, equal, similar and opposite to anal. No adipose dorsal. Pectorals small, 2.0 in head. Pelvics well developed, slightly longer than head, much nearer to anal origin than to pectoral origin. Anal origin nearer to caudal origin than to pelvic origin. Caudal forked, 1.5 in head. No lateral line. Scaleless. Luminous organs: a large postorbital nearly equal to an eye diameter; one opercular; 13 branchiostegals; in the lateral series 28 between gill-opening and pelvic origin and 12 between pelvic and anal origins; in the ventral series 2 before pectoral base, 29 between pectoral and pelvic origins, 11 between pelvic and anal origins and 12 between anal and caudal origins.

Skin smooth, covered with tiny spots. Velvety black; eye black; base of barbel black, otherwise yellowish grey.

It attains 242 mm. in length and is found at a depth of 1,024m.

Distribution.—Northwest Coast of Sumatra 1024m. —Caribbean Sea.; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 5° 23' 2" N., 94°48' 1"E. in the Indian Ocean and 14°38' N. 61°16' W. in the Atlantic Ocean.

101. Genus *Malacosteus* Ayres

1849. *Malacosteus* Ayres, *J. Bost. Soc. Nat. Hist.*, 6, p. 53 (type, *M. niger* Ayres, orthotypic).

Body elongate, compressed, tapering behind compressed; head scaleless; with photophores. Eyes moderate. Gape of mouth extremely wide, oblique. Unequal, pointed teeth in a single series in both jaws and in pairs on tongue. Barbel absent. Gill openings wide; gill-rakers absent. Branchiostegals 8. Dorsal fin with 16—18 rays and anal fin with 18—23 rays, situated in the last one third of body and opposite to each other. Pectoral rather long, and narrow. Pelvic origin before dorsal origin and a little behind middle of body. Adipose fin absent. Caudal small, forked.

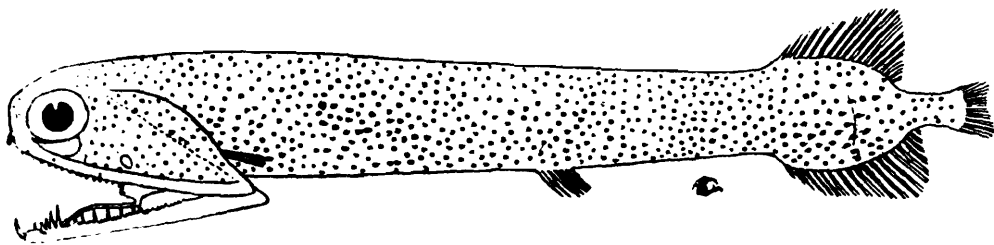
Distribution.—Atlantic Ocean: Barbados, 630 m., East Coast of North America, 989—1950m., Morocco, 1400—2220m.; Azores, 1400—2220m.; West Coast of S. Africa, 2000m.; Indian Ocean: Chagos Is., 1900—2500m.; Gulf of Aden, 1061—1080 m.; Arabian Sea, N. 200, 2500m; Bay of Bengal, 2500m.; North of Cocos Is., 1000—2500m.; Andaman Sea, 1188 m.; Pacific Ocean: Celebes Sea, South of Philippines, 914m.

234. *Malacosteus niger* Ayres

(Pl XI, fig. 4; Text-fig. 75)

- 1849 *Malacosteus niger* Ayres, *Boston J. nat. Hist.*, 6, 53, pl. 5 (type locality: Gulf stream, 42° N., 60°W.).
 1888. *Melacosteus choristodactylus* Vaillant, "*T ravailleu*r" et. "*Talimn*" *Poiss.*, p. 108, pl. 8, fig. 4 (type locality : Morocco ; Azores).
 1889. *Melacosteus indicus* (nec. Gthr.) Alcock, *Ann. Mag. nat. Hist.* (6) 4, p. 452 (Andaman Sea, off Cinque Is. 650 fms.).
 1896. *Malacosteus indicus* (nec. Gthr.) Alcock, *J. As. Soc. Benga* 65, p. 334 (Andaman Sea, 650 fms.).

1899. *Malacosteus* sp. Alcock, *Cat. Ind. Deep. Sea Fish.*, p. 149 (Andaman Sea, 650 fms.).
1900. *Malacosteus* sp. Alcock, *Ill. Zool. Investig. Fish.*, pl. 33, fig. 4.
1906. *Malacosteus indicus* (nec. Gthr.) Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 65, pl. 4, fig. 1, text-fig. 23-25 (Bay of Bengal, 7°1' 2" N., 85° 56' 5" E., 2500 m.).
1906. *Malacosteus niger* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 372.
1906. *Malacosteus choristodactylus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 372 (Morocco, Azores, 1400—2220 m.).
1913. *Malacosteus indicus* (nec Gthr.) Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 118, fig. 43.
1927. *Malacosteus niger* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 2, p. 99 (circum-aequatorial).
1930. *Malacosteus niger* Norman, *Discovery Rep.*, 2, p. 317 (33° 07' 40" S., 4° 30' 20" E., 2000 (-0) m., 2·7° C.; 33° S.—13° N., 15° E.—21° W., 800—1000 (-0) m.).
1930. *Malacosteus niger* Regan & Trewaves, "*Dana*" *Rept.* (1920-22), 2 (6), p. 142 (Atlantic, 8°—34° N., 20°—70° W., 200—5000 M.).
1939. *Malacosteus niger* Norman, *Sci. Rep. John. Murray Exped.*, 7, p. 23 (Arabian Sea, 1°39' 06" S., 61° 13' 48" E. to 2°07' 30" S., 61°21' 12" E., N 200, 2500 (—0) Om., Gulf of Aden AT, 1061—1080 m.).
1949. *Malacosteus indicus* (nec Gthr.) Misra, *Rec. Indian Mus.*, 45, p. 420.
1953. *Malacosteus indicus* (nec Gthr.) Misra, *Rec. Indian Mus.*, 50, p. 406, text-fig. 17 c.



TEXT-FIG. 75.—Lateral view of *Malacosteus niger* Ayres (After A. Alcock)

D. 16—18; P. 3—5; V. 6; A. 19—23.

Body elongate, compressed, naked, smooth; abdomen non-keeled, non-serrated; dorsals and ventral profiles gradiently tapering backwards. Head not so much compressed, 3·6—4·0 in total length (3·4 in standard length) Eyes 4·0—5·0 in head, 0·3 in snout. Cleft of mouth

very wide, ends of jaws extending beyond pectoral base. Length of jaws and cleft of mouth more than a third of the distance between tip of snout and the origin of anal fin. Jaws $3\frac{4}{5}$ —4 in standard length. Teeth in intermaxilla small, in 4 widely-set groups, first group with one, second group with 3, third with 9 and fourth with 8 teeth; about 20 minute teeth on maxilla. A pair of curved outstanding fangs at the fore end of mandible or symphysis of the lateral mandibular teeth, 2 exceeding the others in size, the anterior one being not very far from the mandibular symphysis, the posterior one being a good way back. No mandibular barbel. Gill cleft so wide and neck so narrow that the head can be turned completely upside down over the back. A single rayed dorsal close to caudal; equal, similar and opposite to anal. No adipose dorsal. Pectorals rudimentary, with 3—5 rays. Pelvics well developed; origin nearer to anal origin than to pectoral origin and nearer to caudal origin than to postorbital margin or equidistant between the two. Anal origin nearer to caudal origin than to pelvic origin. Caudal small, longer than eye, bilobed or forked, lower lobe slightly longer than the upper. No lateral line. No scales. Skin smooth, soft, black, covered with tiny white dots. Luminous organs; a large petal-shaped suborbital more than twice as long as deep; a smaller oval postocular on the cheek near the middle of upper jaw; 2 main lateral series to much reduced to be clearly discernible. Velvety black.

It attains 145 mm. in length and has been found at a depth of 630—2500 m.; abyssal.

Distribution.—India : Bay of Bengal; $7^{\circ}1'2''$ N., $85^{\circ}56'5''$ E., 2500 m., off Cinque Is., Andaman Sea, 1188 m.—Barbados, $13^{\circ}10'$ N., $59^{\circ}30'$ W., 630m., East Coast of North America, 989—1950m.; West Coast of South Africa, $31^{\circ}4''$ S., 8° E., 2000m.; Chagos Is., $6^{\circ}19'3''$ S., $73^{\circ}18'9''$ E., 1900—2500 m.; Gulf of Aden, 13° N., 46° E., AT, 1061—1080 m.; Arabian Sea; $1^{\circ}39'6''$ S., $61^{\circ}13'48''$ E., $2^{\circ}7'30''$ S., $61^{\circ}21'12''$ E., N. 200, 2500 (—0)m., North of Cocos Is. $10^{\circ}8'2''$ S., $97^{\circ}14'9''$ E., 1000—2500 m., in the mean annual isotherms of 20° C., 12° C. and 6° C. with the latitudinal and longitudinal range of 13° N.— 10° S., 46° — 97° E. in the Indian Ocean and 42° N.— 33° S., 15° E.— 70° W. in the Atlantic Ocean.

XXXVII. Family IDIACANTHIDAE

Body elongate, slender, compressed, naked. Head small, naked, compressed. Eyes on long stalk in larval forms, normal in adult. Snout short. Mouth very wide. A mental barbel. Intermaxillary and mandibular teeth large, bicuspid, depressible arranged in groups, vomerine, palatine and lingual teeth a few in number. Gill membrane free from isthmus; gill rakers and pseudobranchiae absent. Dorsal very long, low. Adipose fin absent. A spine on either side of dorsal and anal bases. Pectorals absent. Pelvics present. Anal moderate low. Caudal small, forked, non-confluent with dorsal and anal fins. Photophores in 2 continuous series. Lateral line absent. Branchiostegals 15—16.

The family IDIACANTHIDAE is represented by single genus in the Indian region.

102. Genus *Idiacanthus* Peters

1876. *Idiacanthus* Peters, *Monatsb. Akad. Wiss. Berlin*, 246 (type, *I. fasciola* Ptr., orthotypic).
 1902. *Stylophthalmus* Brauer, *Zool. Anz.*, 25, p. 298 (type, *S. paradoxus* Br., orthotypic).

Body elongate, slender, compressed, scaleless. Head naked, compressed, small. Snout short. Eyes moderate. Mouth very wide. A long mental barbel with a swollen end. Intermaxillary and mandibular teeth large, bicuspid, quadrangular, depressible, arranged in groups; vomerine, palatine and lingual teeth few. Four gills. Pseudobranchiae and gill rakers absent. Gill membranes free from isthmus. A long, low dorsal; origin above or before pelvics. No pectorals. Vent on papilla after middle of body. Anal moderate, low immediately behind vent. A short curved spine-like process on either side of dorsal and anal bases. No adipose fin. Dorsal and anal rays simple. Caudal small, non-confluent with vertical fins. Branchiostegals 15—16. Photophores : arevolving post-orbital; lateral and ventral series of luminous organs.

Distribution.—Atlantic Ocean : 35° 29'N., 50° 53' W., 3028m., 6°40'—40°7'N., 7°26'—84°58' W., 0—5000 m., off Bermuda 32° 12'N., 64°36'W.,

260—1000m., 78°—87° 30' W., 24°—28° N.; West Coast of S. Africa, 2000m., Indian Ocean: South of Cape Town, between Seychelles and Chagos Archipelago, West of Chagos Is.; West Coast of Sumatra, Halmahera Sea, N. W. Australia, New Guinea; Pacific Ocean: Gulf of Panama, 9° N., 79° 35' W., 2196—3350m; Antarctic Ocean, 56° 31' S., 14° 29' 2" E.

235. *Idiacanthus fasciola* Peters

(Pl. XI, figs. 5, 6)

1876. *Idiacanthus fasciola* Peters, *Monatsb. Akad. Wiss. Berlin*; p. 847 (type locality: between Sumba and N.W. Australia, N. New Guinea, 117° E.; 1° 4' N., 130° E; type is in the Berlin Museum).
1878. *Bathygophis ferox* Günther, *Ann. Mag. nat. Hist.*, **2**, p. 181.
1887. *Idiacanthus ferox* Günther, "Challenger" *Deep Sea Fish.*, p. 216, pl. 52, fig. D.
1902. *Stylophthalmus paradoxus* Brauer, *Zool. Anz.*, **25**, p. 298 (type locality: South of Cape Town, 36° 23' 4" S., 17° 38' 1" E., 4170 m., Indian Ocean; Antarctic Ocean).
1906. *Idiacanthus fasciola* Brauer, 'Valdivia' *Tiefsee Fische*, **15**, p. 60 (Sumatra, 0° 30' 5" N., 98° 14' 2" E., 594 mm. between Chagos Archipelago and Seychelles, 2° 38' 7" S., 65° 59' 2" E., 2500m., W. Chagos Is., 4° 5' 8" S., 70° 1' 9", 2000 m., North Australia, N. New Guinea).
1906. *Stylophthalmus paradoxus* Brauer, 'Valdivia' *Tiefsee Fische*, **15**, pp. 67, 372, pl. 5, fig 1-7 (between Maldive Is. and Ceylon, 4° 56' N., 78° 15' 8" E., 2000 m., 2° 29' 9" N., 76° 47' E., 2500 m., Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m., off Bouvet I., 56° 31' S., 14° 29' 2" E.).
1906. *Idiacanthus ferox* Brauer, *Valdivia, Tiefsee Fische.*, **15**, p. 372 (North Atlantic Ocean, 35° 29' N., 50° 53' W., 5028 m.).
1913. *Idiacanthus fasciola* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 108. fig. 37 (Halmahera Sea, 1600m., between Australia and Sumba, Om., North of Geelvink Bay, Om. New Guinea, Om., West of Sumatra, 594m).
1916. *Idiacanthus aurora* Waite, *Austral. Antarctic Exped. Fish.*, p. 53, pl. 5, fig. 1.
1930. *Idiacanthus fasciola* Regan & Trewavas, 'Dana' *Exped.* 1920-22, No. 6, p. 129, fig. 125, 6° 40'—40° 7' N., 7° 26'—84° 58' W., 0—5000 metres of wire out Atlantic Ocean).

1934. *Stylophthalmus paradoxus* Beebe, *Zoologica*, 16, (4), p. 155 (early postlarva of *Idiacanthus fasciola*) ; pp. 156, 157 (129 specimens. April to October 1929—1931 ; 100—100 fms. from a cylinder of water 8 miles in diameter, (5—1 miles S. of Nonsuch I., Bermuda, the centre of which is at 32° 12' N., 64° 36' W., standard length of specimens 16—270 mm.).
1949. *Stylophthalmus paradoxus* Misra, *Rec. Indian Mus.*, 45, p. 420.
1953. *Stylophthalmus paradoxus* Misra, *Rec. Indian Mus.*, 50, p. 406, fig. 21 a, b.
1955. *Idiacanthus fasciola* Grey, *Fieldiana Zool.*, 37, p. 283 (off Bermuda, 4 specimens, 140 (135) to 190 (184) mm., 1 specimen taken in day haul, ca, 1000 m., and 3 specimens taken at night in 260—550m.).
1958. *Idiacanthus faciola* Briggs, *Bull. Florida State Mus. Biol. Sci.*, 2, 8 p. (76°—87° 30' W., 24°—28° N. Worldwide in tropical waters ; in Western Atlantic from New Jersey to the southern Gulf of Mexico : bathypelagic).
1960. *Idiacanthus faciola* Briggs, *Copeia*, 3, p. 174 (a circum-tropical distribution for *I. fasciola* Peters is indicated by Smith (1949 : 437) but Dr. Carl L. Hubbs (personal communication) writes that it has not been taken in the Eastern Pacific).

B. 15—16; D. 63—74, V. 6; A. 40—47.

Body elongate, slender, compressed, scaleless. Depth 19—27 in standard length. Head scaleless, compressed 15—18 in standard length. Eyes 5.0—7.0 in head. Snout short, 0.9—1.0 in eye. Interorbital with 2 diverging crests. Mental barbel fleshy with a prominent swelling, 2.0—2.5 times head. 13-15 unequal teeth on intermaxillary arranged in 3 groups followed by 3 or 4 smaller ones; 2 large teeth on vomer, palatine and lingual teeth smaller. Gill membranes free from isthmus; gill rakers and pseudobranchiae absent. Dorsal very long, low; origin 3 head lengths from tip of snout, one head length before pelvic origin and nearly equidistant between snout end and anal origin, predorsal length 2.5—3.0 in total length and equal to the distance between anal and caudal origin. Pectorals absent. Pelvics 1.4 in head; origin below 1st to 8th dorsal ray, a head length behind dorsal origin, about 3 head lengths before anal origin, much nearer to tip of snout than caudal end. Anal moderate, long base about half of dorsal base, origin immediately be-

hind vent about 3 head lengths behind pelvic origin; distance between anal and pelvic origins nearly 0.5—1.5 in predorsal length. Caudal small, non-confluent with dorsal and anal fins, 1.7 in head, lower lobe the longer. Photophores: a small revolving post orbital, ventral series :33—36 between isthmus and pelvics ; 30—36 between pelvics and anal origins; 14—18 between anal and caudal origins; lateral series 21—25 between gill opening and pelvic origin; 30—36 between pelvic and anal origins: Velvety black; fins translucent; barbel black with a subterminal photophore. Specimen measuring up to 270 mm. in length has been obtained; abyssal.

Distribution.—Bay of Bengal, 7°1' 2"N., 85° 56'5"E., 2500 m., Sri Lanka, 4° 56'N., 78° 15' 8"E., 2000 m., 2° 29' 9" N., 76° 47'E., 2500 m.—South of Cape Town, 36° 23' 4"S., 17° 38' 1"E., 4170 m., between Seychelles and Chagos Archipelago, 2° 28' 7" S., 65° 59' 2" E., 2500m., W. Chagoes Is., 4° 5' 8" S., 70° 1' 9"E., 2000 m., Sumatra, 0° 30' 5" N., 98° 14' 2" E., 594m., Halmahera Sea, 1600 m., between Australia and Somba, 117° E., N. of New Guinea, 1° 4' N., 130°E., Atlantic Ocean; 35° 29' N., 50° 53' W., 5028 m., 6°40'—40° 7' N., 7° 26'—84° 58' W., 5000 m., off Bermuda, 32° 12'N., 64° 36' W., 260—1000 m., 78°—87° 30'W., 24°—28° N., Off Bouvet I., 56° 31'S., 14° 29' 2" E., in the mean annual isotherms of 20° C., 12°C. and beyond 6° C in the Antarctic zone with the latitudinal and longitudinal range of 7° 1' 2" N.,—36° 23' 4" S., 17° 38' 1"—130° E., in the Indian Ocean, 6° 40'—40° 7'N., 7°26'—87°30' W., in the Atlantic Ocean, 56° 31' S., 14° 29' 2" E., in the Antarctic Ocean.

ix. Suborder *NOTOPTEROIDEI*

No gular plate. No photophores. Air bladder. No barbels. No adipose fin. Parietals separating supraoccipital from frontals. Orbitosphenoid, opisthotic and basisphenoid. Bones of head cavernous. No supramaxillary. Symplectic and entopterygoid. Lateral cranial foramen present or absent. Subopercular present or absent. Hyomandibular with single or double head. Single or two hypohyals. Palatine fused or not fused with ectopterygoid. Dorsal reduced or absent. Pelvics reduced or absent. Pectorals. Head and body scaly. Anal long, confluent with caudal.

The suborder *NOTOPTEROIDEI* is represented by a single family in the Indian region.

XXXVIII. Family NOTOPTERIDAE

Body scaly, strongly compressed. Caudal region very long, tapering; abdomen non-keeled, non-serrated. Head scaly, compressed, cavernous. Upper jaw formed by maxillaries and premaxillaries. Mouth large or moderate. Cleft of mouth lateral. No barbel. No subopercular. No pseudobranchiae. Palatine fused with ectopterygoid. Hyomandibular with one head. One hypohyal. A large cranial foramen. Dorsal present or absent. Pelvics present or absent. Pectorals depressed. No adipose fin. Anal long, confluent with caudal. Small teeth on premaxillaries, maxillaries, vomer, palatines, pterygoids and tongue. No pharyngeal teeth. Gill membranes partly united. Branchiostegals 6—9. Pyloric caeca 2. Lateral line.

The family NOTOPTERIDAE is represented by a single genus in the Indian region.

103. Genus *Notopterus* Lacépède

1800. *Notopterus* Lacépède, *Hist. nat. Poiss.*, 20, p. 189 (type, *Gymnotus notopterus* Pallas, virtually tautotypic).

1934. *Chitala* Fowler, *Proc. Acad. nat. Sci. Philad.*, 85, p. 244 (type, *Mystus chitala* Ham., orthotypic).

Body oblong, compressed, deep, caudal region long and tapering with minute scales, without photophores. A double series of 28—64 spines along the abdomen. Eyes moderate. Head scaled. Cleft of mouth moderate, lateral. Small teeth on premaxillary, maxillary, vomer, palatine, pterygoid and tongue. Pharyngeal teeth absent. Gill membranes united with each other at their bases and free from isthmus. Branchiostegals 7—9. Gill rakers a few and stout. Dorsal fin when present with 8—10 rays, situated in the caudal region; origin far behind anal origin. Pelvics thoracic, rudimentary, united at their base, close before anal; origin in advance of dorsal origin. Anal fin with 100—135 rays, very long, confluent with caudal fin. Adipose fin absent. Caudal not forked.

Distribution.—India, Pakistan, Burma, Malay, Peninsula, Indonesia, Thailand, China, and Indo-china.

Key to species of genus Notopterus Lacépède

1. Opercular scales much larger than those on body ; maxilla not extending beyond hind edge of orbit *N. notopterus*
2. Opercular scales not larger than those on body ; maxilla extending for beyond hind edge of orbit *N. chitala*

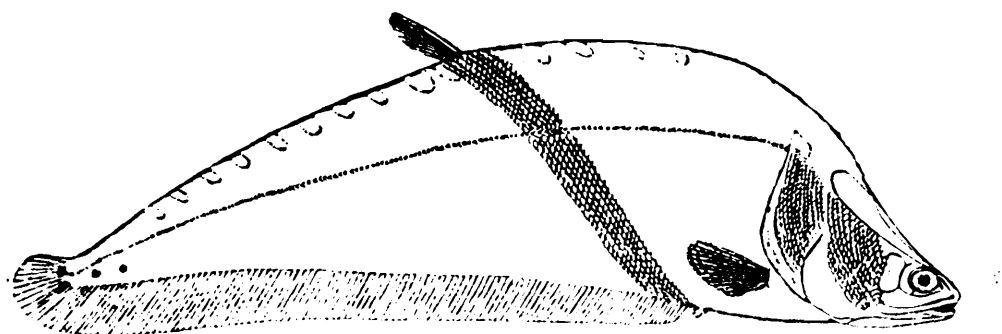
236. *Notopterus chitala* (Hamilton)

(Pl. VII, fig. 4; Text-fig. 76)

1822. *Mystus chitala* Hamilton, *Fish Ganges*, pp. 236, 382 (type locality : larger freshwater rivers of Bengal and Bihar).
1831. *Notopterus ornatus* Gray, *Zool. Misc.*, p. 16 (type locality: Indian Seas.)
1834. *Notopterus maculatus* Valenciennes, *Voy. Ind. Orient. Belanger, Zool.*, p. 396, pl. 5, fig. 2 (type locality : India).
1845. *Notopterus lopis* Bleeker, *Nat. Gen. Arch. Ned. Ind.*, 2, p. 510 (type locality : Batavia).
1848. *Notopterus buchanani* Valenciennes, *Hist. nat. Poiss.*, 21, p. 148 (type locality : Calcutta).
1852. *Notopterus hypselonotus* Bleeker, *Verh. Bat. Gen.*, 24, p. 27 (type locality : Mussi River, Palembang, Sumatra).
1868. *Notopterus chitala* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 479 (East India).
1878. *Notopterus chitala* Day, *Fish. India*, p. 654, pl. 159, fig. 5 (fresh waters of Sind, Lower Bengal, Orissa, Assam, Burma and Siam to the Malay Archipelago).
1889. *Notopterus chitala* Day, *Fauna Brit. India, Fish.*, 1, p. 407.
1913. *Notopterus chitala* Weber & de Beaufort, *Fish. Indo-Austral. Archipel*, 2, p. 10, fig. 6 (Java ; Batavia ; Samarang ; Sumatra ; Borneo).
1919. *Notopterus chitala* Southwell & Prashad, *Rec. Indian Mus.*, 16, p. 217 (Buxar).
1926. *Notopterus chitala* Chabanaud, *Ser. Oceangr. Peches Indo-china*, 1 note, p. 7 (Cambodia ; Cochinchina).
1936. *Notopterus chitala* Hardenberg, *Treubia*, 15, livr. 3, p. 226 (Pontianak ; middle course of Kapuas R., Borneo).
1936. *Notopterus chitala* Suvatti, *Index Fish. Siam*, p. 18 (Siam).

1937. *Notopterus chitala* Shaw & Shebbeare, *J. roy. As. Soc. Bengal Sci.*, 3, p. 15 (Northern Bengal).
 1938. *Notopterus chitala* Fowler, *List. Fish. Malaya*, pl 23 (Kuala Lipis).
 1941. *Notopterus chitala* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 544.
 1945. *Notopterus chitala* Smith, *Bull. U.S. nat. Mus.*, 188, p. 57, fig 1 (Siam).
 1949. *Notopterus chitala* Misra, *Rec. Indian Mus.*, 45, p. 421.
 1953. *Notopterus chitala* Misra, *Rec. Indian Mus.*, 50, p. 407, fig. 22 b.

Vernacular names.—INDIA : *Seetul*, Assam ; *Chitala*, Bengali ; *Mohi*, Bihar ; *Chitul*, Oriya ; Standardised name : *Chitala*. PAKISTAN *Gundun*, Sind. BANGLADESH : *Chitala*.



TEXT-FIG. 76.—Lateral view of *Notopterus chitala* (Ham.)

B. 8—9; D. 9—10; A. 110—125 (135); C. 12—14; L. tr. 75; L. 1. 180.

Body oblong, much compressed, scaly, abdomen non-keeled, serrated. Dorsal profile more convex than ventral profile. Head compressed, scaly, 4.6 in total length (4.2 in standard length). Depth 3.5—4 in total (3.6 in standard length). Eyes 4.5—5.0 in head, 0.5 in snout. Preorbital entire. Cleft of mouth lateral, deep, extending beyond hind margin of eye. Teeth in premaxillaries, maxillaries, vomer, palatines, pterygoids and tongue. A single rayed dorsal fin; origin nearer to caudal end than to snout end. Pelvics very small, nearer to anal origin than to pectoral origin. Pectorals moderate, more or less equal to dorsal, 1.1 in head, reaching to anal origin. Anal very long, confluent with caudal, 1.3 in total length. Lateral line more or less arched. Scales small on opercles, not larger than those on head. Preopercle with 10—22 transverse scales. Preventral scutes 37—45.

Coppery brown above with about 15 transverse, silvery bars over the back; sides silvery; fins stained with greyish spots.

It attains at 1219 mm. in length, freshwater.

Distribution.—India, Pakistan, Burma,—Malaya, Indonesia, Thailand, Cochin-China; with the latitudinal and longitudinal range of 25° N.—7° S., 70°—115° E.—(19°—25° N., 70°—92° E., in the “Indian region”+12° N.—7° S., 100°—115° E. beyond Indian region).

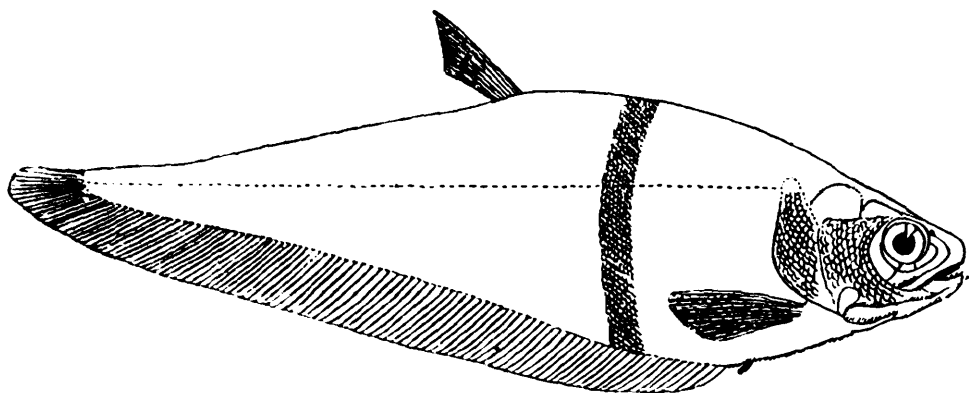
237. *Notopterus notopterus* (Pallas)

(Pl. VII, fig. 3; Text-fig. 77)

1769. *Gymnotus notopterus* Pallas, *Spicil. Zool.*, 7, pl. 6. fig. 2 (type locality : Indian Ocean).
1801. *Clupea synura* Schneider, *Syst. Ichth. Bloch*, p. 426 (type locality : Malabar, China).
1822. *Mystus kapirot* Hamilton, *Fish. Ganges*, pp. 235, 382 (ponds and rivers of fresh water in Bengal).
1834. *Notopterus kapirot* Valenciennes, *Voy. Ind. Orient. Belanger*, *Zool.*, p. 39, pl. 5. fig. 1 (tanks of Bengal).
1838. *Mystus badgee* Sykes, *Trans. zool. Soc. Lond.*, 2, p. 376, pl. 67, fig. 2. (type locality : Mota Mola river at Poona).
1848. *Notopterus pallasii* Valenciennes, *Hist. nat. Poiss.*, 21, p. 130 (type locality: India).
1848. *Notopterus bontianus* Valenciennes, *Hist. nat. Poiss.*, 21, p. 147 (Irrawaddi, Java).
1868. *Notopterus kapirot* Günther, *Cat. Fish. Brit. Mus.*, 7, p. 480 (Loodianah, Assam, Bengal, Madras, Dekkan).
1878. *Notopterus kapirot* Day, *Fish. India*, p. 653. pl. 159 fig. 4 (fresh and brackish waters of India to the Malay Archipelago).
1889. ²*Notopterus kapirot* Day, *Fauna. Brit. India*, Fish., 1, p. 406.
1890. *Notopterus kapirot* Vinciguerra, *Ann. Mus. Civ. Stor. nat. Genova*, (2) 9, p. 355 (Rangoon, Mandalay).
1907. *Notopterus kapirot* Lloyd, *Rec. Indian Mus.*, 1, p. 222 (Akyab).
1910. *Notopterus kapirot* Jenkins, *Rec. Indian Mus.*, 1, p. 134 (Chilka Lake).
1913. *Notopterus notopterus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 9 (Java, Sumatra).
1916. *Notopterus notopterus* Raj, *Rec. Indian Mus.*, 12, p. 253 (Madras).
1918. *Notopterus notopterus* Annandale, *Rec. Indian Mus.*, 14, p. 53 (Inle Lake, Burma).

1926. *Notopterus notopterus* Chabanaud, *Ser. Oceanogr. Peches Indo-China*, 1^e note, p. 7 (Cambodia ; Cochin-china).
1929. *Notopterus notopterus* Prashad & Mukerji, *Rec. Indian Mus.*, 31, p. 209 (Indawgyi Lake, Burma).
1931. *Notopterus kapirot* Chu, *Biol. Bull. St. John's Univ.*, 1, p. 18 (Seas of India & China ; Yunnan).
1936. *Notopterus notopterus* Hora & Mukerji, *Rec. Indian Mus.*, 38, p. 18 (Rangoon).
1936. *Notopterus notopterus* Suvatti, *Index Fish. Siam*, p. 18 (Siam).
1936. *Notopterus osmani* Rahimullah & Das, *Bull. Soc. Port. nat.*, 12, (18), p. 136. pl. 23 (type locality : rivers of Hyderabad, Deccan).
1937. *Notopterus notopterus* Shaw & Shebbeare, *J. roy. As. Soc. Bengal, Sci.*, 3, p. 16 (clear streams of the Terai and Duars).
1938. *Notopterus notopterus* Hora & Misra, *J. Bombay nat. Hist. Soc.*, 40, p. 21 (Deolali).
1938. *Notopterus notopterus* Fowler, *List Fish. Malaya*, p. 23 (Kuala Semantan).
1941. *Notopterus notopterus* Fowler, *Bull. U.S. nat. Mus.*, (100) 13, p. 546.
1942. *Notopterus notopterus* Hora & Misra, *J. Bombay nat. Hist. Soc.*, 43, p. 219 (Poona).
1945. *Notopterus notopterus* Smith, *Bull. U.S. nat. Mus.*, 188, p. 59 (Java, Sumatra, India, Burma, Malaya and Thailand).
1949. *Notopterus notopterus* Misra, *Rec. Indian Mus.*, 45, p. 421.
1953. *Notopterus notopterus* Misra, *Rec. Indian Mus.*, 50, p. 407.

Vernacular names.—INDIA : *Kan-doo-lee*, Assam ; *Phulo*, Bengal ; *Pholi*, Bihar, *Chalat*, *Chamboree*, Marathi ; *Wallak-cattah*, Mysore ; *Pulli*, Oriya ; *Moh. But*, *Purri*, Punjab ; *Ambatan wahlah*, *Chota wahlah*, Tamil ; *Moh.*, U.P., Standardised name : *Pholi*. PAKISTAN : *Moh*, *But*, *Purri*. BURMA : *Nga-phe*.



TEXT-FIG. 77.—Lateral view of *Notopterus notopterus* (Pallas)

B. 8; D. 7—8; V. 5—6; A. 100—110; C. 19; Ltr 225; Vert. 15/54.

Body oblong, much compressed, scaly, abdomen non-keeled, serrated, dorsal; profile more convex than ventral; depth 3.5—4.0 in total length (3.2 in standard length). Head compressed, scaly, 4.8—5.5 in total length (4.5 in standard length). Eyes 3.5—5.0 in head, 0.7 in snout. Preorbital serrated. Cleft of mouth lateral, moderate, maxilla extending to midorbit. Teeth on premaxillaries, vomer, palatines, pterygoids and tongue. A single rayed dorsal fin; origin nearer to snout end than to caudal end. Pelvics very small, nearer to anal origin than pectoral origin. Pectorals moderate, larger than dorsal, 1.3 in head, reaching beyond anal origin. Anal very long, confluent with caudal, 1.4 in total length. Lateral line almost straight. Scales minute, on opercle much larger than on body; 8—10 transverse rows of scales on preopercle. 28 preventral scutes.

Greyish silvery, back darker.

It attains 2 feet (609 mm.) in length; freshwater, euryhaline.

Distribution.—India, Pakistan, Burma, Malaya, Thailand, Indo-China, Indonesia, with the latitudinal and longitudinal range of 30°N.—7° S., 73°—115° E. in the Indo-Pacific=(5°—30°N., 73°—96° E. in the Indian region+12°N.—7°S., 100°—115°E. beyond Indian region).

VIII. Order BATHYCLUPEIFORMES

Physostomus. Abdomen neither keeled nor serrated. Large mucous cavities on skull. Soft tissues fragile, bones thin. Maxillaries and premaxillaries bordering mouth. Thin supermaxillary. Orbitosphenoid present or absent. No gular plate. Scales cycloid, deciduous, except on lateral lines. Pelvics subjugular. A single spineless dorsal. Anal long with a spine. No adipose dorsal. No photophores. Bathypelagic.

Order BATHYCLUPEIFORMES contains a single family and genus.

XXXIX. Family BATHYCLUPEIDAE

Head and body compressed, head naked, body and nape scaly. Cleft of mouth wide, nearly vertical; maxilla

extending below orbit; lower jaw prominent. No photophores. Minute villiform teeth in jaws, palatines and vomer. Branchiostegals 7. Gill cleft very wide, gill membranes free. Opercular bones well developed. A single spineless dorsal in posterior half of body. Pelvics small, subjugular. Pectorals well developed. Anal moderately long. Caudal forked. Lateral line. Scales large, deciduous.

104. Genus **Bathyclupea** Alcock

1891. *Bathyclupea* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 130 (type, *B. hoskynii* Alc., orthotypic).

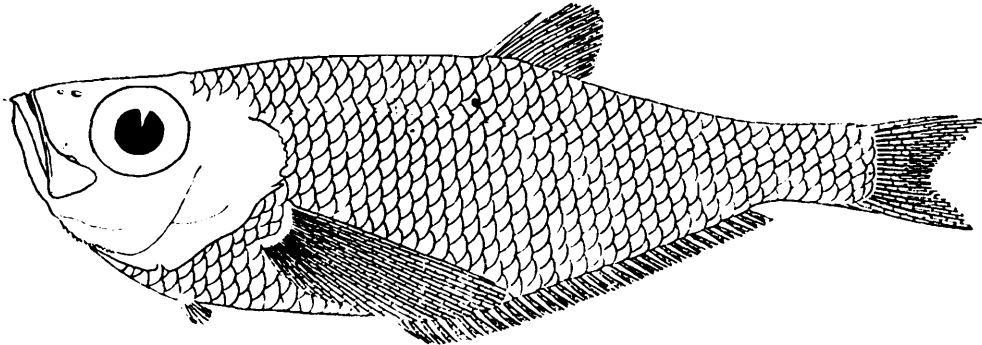
Body oblong, compressed, scales cycloid, large, deciduous; without photophores. Head with mucous cavities well developed. Abdomen smooth, rounded. Eyes large, about third in head length. Cleft of mouth very oblique; lower jaw prominent. Minute villiform teeth in jaws, palatine and vomer. Branchiostegals 7. Dorsal fin with 10 rays, often with a spine, placed in the posterior half of body; origin behind anal origin. Pelvics small, subjugular. Pectorals large, extending beyond anal origin. Anal fin with 33 rays, and a spine. Adipose fin absent. Caudal forked. Air bladder with a pneumatic duct. Pyloric caeca in moderate number.

Distribution.—Andaman Sea, 343—766 m., off Madras coast, 272—457 m.

238. ***Bathyclupea hoskynii*** Alcock

(Pl. IX, fig. 2; Text-fig. 78)

1891. *Bathyclupea hoskynii* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 131, fig. 4 (type locality : Andaman Sea, 11° 31' 40" N., 92° 46' 6" E., 188—220 fms., 13·3 C., type in the Zoological Survey of India).
1899. *Bathyclupea hoskynii* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 140 (Andaman Sea, 189 fms., 188—220 fms., 14° 13' N., 93° 40' E., 370—419 fms., off Madras, 13°51' 12" N., 80° 28' 12" E., 149—250 fms.).
1900. *Bathyclupea hoskynii* Alcock, *Ill. Zool. Investig. Fish.*, pl. 28, fig. 2.
1941. *Bathyclupea hoskynii* Herre, *Mem. Indian Mus.*, 13, p. 334 (Andamans).
1949. *Bathyclupea hoskynii* Misra, *Rec. Indian Mus.*, 45, p. 422.
1953. *Bathyclupea hoskynii* Misra, *Rec. Indian Mus.*, 50, p. 407, fig. 22 c.



TEXT-FIG. 78.—Lateral view of *Bathyclupea hoskynii* Alc. (After A. Alcock)

B. 7; D. 10; P. 29; V. 6; A. 33; L. 1. *ca* 38; Vert. 9+22.

Body oblong, compressed, scaly; abdomen neither keeled nor serrated; dorsal profile horizontal, ventral concave; depth 3.5 in total length (3.1 in standard length). Head compressed, naked, 3.3 in total length (3.0 in standard length). Eyes lateral, circular, 2.9 in head, 0.8 in rectangular snout. Interorbital flat, half eye diameter. Nostrils small, superior. Cleft of mouth wide, nearly vertical; maxilla extending to below one third of eye. Teeth villiform, in narrow bands in premaxillaries, mandibles and palatines; inconspicuous V-shaped patch on vomer. Tongue large, bilobed. Gill cleft very wide; 4 gills; gill membranes entirely free. Opercular bones well developed. Preopercle partly serrated in the horizontal part. Pseudobranchiae large. A single rayed dorsal fin, nearly equal to snout; origin nearly in the middle of total length and about a snout length behind anal origin. Pectorals long, 1.1 in head extending beyond anal origin. Pelvics small, subjugular, close together, 2.1 in eye diameter. Anal long; origin nearer to pectoral base than to caudal origin; base 2.6 in total length. Caudal forked, 1.9 in head. Lateral line distinct, almost straight. Scales large, cycloid, deciduous, except on lateral line; each lateral line scale with a deep pocket on its inner side opening externally by numerous fine pores. Pyloric appendages large. Middle gill rakers on outside of first gill arch much elongated.

Silvery grey becoming black along back.

Distribution.—India; Andaman Sea, 14° 13' N., 93° 40' E., 676—766 m., 11° 31' 40" N., 92° 46' 6" E.,

348—402 m., 13.3°C.; off Madras Coast, 13° 51' 12" N., 80° 28' 12" E., 272—457 m., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 11°—14° N., 80°—93° E. in the Bay of Bengal.

IX. Order GALAXIIFORMES

Physostomous. Abdomen smooth, non-keeled. Maxillaries and premaxillaries bordering mouth. No meso-coracoid. No orbitosphenoid. No gular plate. Post-temporal simple. Last vertebrae not upturned, normal. Entopterygoid toothed. Maxillary toothless, to some extent bordering mouth. Parietals apposed together separating the frontals from supraoccipital. Bones without bone cells. Ribs inserted on strong antogenous parapophyses. Basis cranii simple. Epipleurals and epineurals. Postclavicle. A single rayed dorsal fin in the posterior part of body. No adipose fin. Pectorals low. Pelvics present or absent. Caudal forked or emarginate. Scaleless.

This order consists of a single family GALAXIIDAE and a genus in the Indian region.

XL. Family GALAXIIDAE

Body elongate, low, scaleless. Head naked. No photophores. Abdomen rounded, smooth. Cleft of mouth small; maxilla extending to midorbit. Small conical teeth in both jaws, vomer and palatines; large teeth on tongue. A single dorsal in the posterior part of body. Pelvics present or absent. Pectorals low. Anal more or less opposite dorsal. Caudal forked or emarginate. Lateral line, scaleless.

105. Genus *Galaxias* Cuvier

1817. *Galaxias* Cuvier, *Règne Animal.*, 2, ed. 1, p. 183 (type, *Esox truttaceus* Cuvier).

Body elongate, low, scaleless ; without photophores. Abdomen smooth, rounded. Eyes moderate. Cleft of mouth moderate; upper jaw prominent. Small, conical teeth in both jaws, vomer and palatine; large teeth on tongue. Dorsal fin with 13 rays placed in the posterior

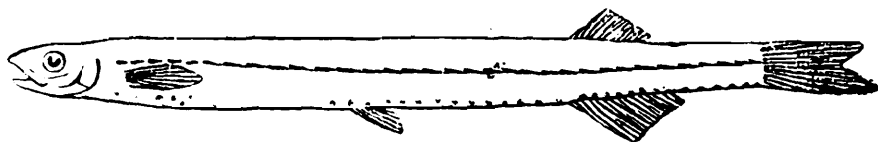
third of body; origin opposite to anal origin. Pelvic with 7-8 rays ; origin far in advance of dorsal origin and nearer to pectoral base than to caudal base. Anal fin with 18 rays. Adipose fin absent. Caudal forked.

Distribution.—India, Bangladesh.

239. *Galaxias indicus* Day*

(Text-fig. 79)

1888. *Galaxias indicus* Day, *Fish. India.*, p. 806, fig. (type locality : littoral districts of Bengal and Madras).
 1889. *Galaxias indicus* Day, *Fauna Brit. India*, Fish., 1, p. 405, fig. 128.
 1949. *Galaxias indicus* Misra, *Rec. Indian Mus.*, 45, p. 422.
 1953. *Galaxias indicus* Misra, *Rec. Indian Mus.*, 50, p. 408, fig. 25 a.
 1956. *Galaxias indicus* Whitley, *Austral. Mus. Mag.*, 12 (1), p. 34.



TEXT-FIG. 79.—Lateral view of *Galaxias indicus* Day (After F. Day)

B. 9; D. 13; P. 10; V. 8; A. 18; C. 15.

Body elongate, flattened, naked; abdomen rounded, smooth, non-keeled; dorsal or ventral profiles almost horizontal. Depth 11.0 in total length (10.5 in standard length). Head naked, 9.5 in total length (8.5 in standard length). Eyes 3.5 in head, 1.2 times snout. Cleft of mouth small; maxilla extending to mid orbit. Teeth small, conical in both jaws, vomer and palatines; large on tongue. A single rayed dorsal fin opposite anal in about the commencement of the last third of the total length. Pectorals low, long, nearly equal to head. Pelvics well developed or rarely absent; origin midway between the third border of eye to the posterior extremity on the anal base. Anal long, slightly longer than dorsal base. No adipose fin. Caudal forked, origin opposite to dorsal origin, 1.2 times

* a nomen dubium vide MC Dowell (1973, *J. Royal Soc. New Zealand*, 3 (2), p. 191)

head. Lateral line. Scaleless. A row of black spots along abdominal edge.

It attains 50·8 mm. in length, euryhaline, freshwater.

Distribution.—India: Littoral districts of Bengal and Madras. Bangladesh. Littoral districts with the latitudinal and longitudinal range of 13°—23° N., 80°—91° E. in the Indian region.

X. Order SCOPELIFORMES

Physostomous. Abdomen neither keeled nor serrated. Premaxillaries only bordering mouth superiorly. Orbitosphenoid present or absent. No gular plate. Pelvics abdominal or thoracic. Pelvic bones not united with pectoral arch. Mesocoracoid absent. Supraoccipital in contact with frontals. Anterior vertebrae co-ossified. No Weberian ossicles. Pectoral arch attached to skull by forked post-temporal. Bones without bone cells. Pelvic bone and pectoral radials ossified. Adipose fin present or absent. Photophores present or absent. Oviducts.

Upper Cretaceous to recent.

The order SCOPELIFORMES is represented by 5 families in the Indian region.

Key to families of order SCOPELIFORMES

1. Photophores present	MYCTOPHIDAE (except <i>Scopelengys</i>)
2. Photophores absent	3
3. Body totally naked (inclusive of lateral line)	EVERMANNELLIDAE
4. Body not totally naked	5
5. Eye telescopic	SCOPELARCHIDAE
6. Eye normal	7
7. Cleft of mouth very oblique and wide, extending up to operculum; teeth prominent; eye moderate	SYNODIDAE
8. Cleft of mouth neither oblique nor very wide (except in genus <i>Bathypterois</i> where the cleft of mouth is horizontal); teeth not prominent; eye large (except in genus <i>Bathypterois</i> where eye is poorly developed)	SUDIDAE

XLI. Family SYNODIDAE

Body elongate, somewhat compressed or rounded, scaly. Head scaly. No photophores. Abdomen rounded. Cleft of mouth oblique, wide, extending to operculum. Teeth prominent. Snout pointed or blunt. A single rayed dorsal. Adipose dorsal present. Pectorals moderate or very long. Pelvics well developed with inner rays much longer than or equal to outer ones. Vent nearer to caudal or nearer to pelvic base. Anal below adipose dorsal. Caudal forked, bilobed or trilobed. Lateral line.

Miocene to recent.

The family SYNODIDAE is represented by 4 genera in the Indian region.

Key to genera of family SYNODIDAE

1. Caudal fin trilobed ; pelvic origin almost opposite to dorsal origin	Harpodon
2. Caudal fin bilobed ; pelvic origin clearly in front of dorsal origin	3
3. Inner rays of pelvics much longer than outer ones; a single band of teeth on each side of palate	5
4. Inner rays of pelvics not much longer than outer ones; a double band of teeth on each side of palate	Saurida
5. Snout pointed, longer than eye diameter ; vent nearer to base of caudal than to base of pelvics	.. Synodus
6. Snout blunt, shorter than eye diameter ; vent a little nearer to base of pelvics than to base of caudal	Trachinocephalus

106. Genus **Harpodon** Le Sueur

1825. *Harpodon* Le Sueur, *J. Acad. nat. Philad.*, 5, p. 48 (type, *Salmo* (*Harpodon*) *microps* Le Sueur = *Osmerus nehereus* Ham., orthotypic : spelt *Harpodon* by later authors).

Body elongate, somewhat compressed, scales deciduous; without photophores. Head thick, short with rounded short snout. Eyes small, with adipose lid. Cleft of mouth very wide. Unequal, partly curved teeth in a band on jaws; teeth in one or two rows on vomer, palatine, pterygoid and tongue. Gill openings very wide. Pseudobranchiae present. Branchiostegal membranes free extending beyond operculum. Branchiostegals 17-26. Dorsal fin with 12—14 rays, placed nearly in middle of body length; origin far in advance of anal origin. Pectorals long, inserted above middle of height. Pelvics very long reaching beyond anal origin, origin almost opposite to dorsal origin. Anal fin with 13—15 rays, originating much nearer to caudal base than to pelvic base. Adipose dorsal present. Caudal fin trilobed.

Distribution.—Zanzibar. India (439—504 m.), Pakistan, Burma, Malaya, Indonesia, China, Korea.

Key to species of genus Harpodon Le Sueur

1. Pectorals long, reaching to below middle of dorsal fin; pelvics long, reaching anal fin *H. nehereus*
2. Pectorals short, not reaching to below dorsal origin; pelvics short not reaching anal fin *H. squamous*

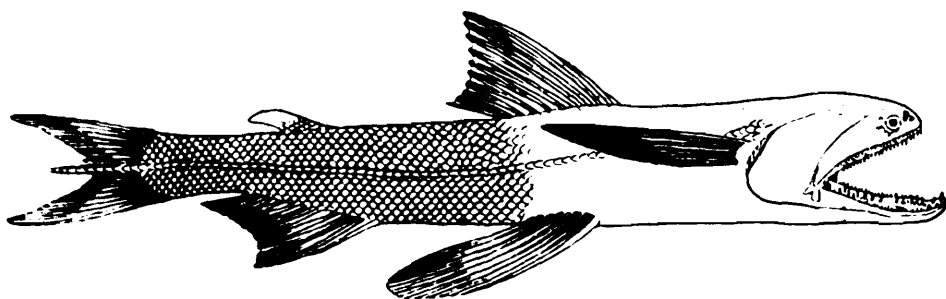
240. *Harpodon nehereus* (Hamilton)

(Pl. VIII, fig. 2; Text-fig. 80)

1822. ?*Osmerus nehereus* Hamilton, *Fish. Ganges*, pp. 209, 380 (type locality: mouths of the Ganges).
1825. *Salmo (Harpodon) microps* Le Sueur, *J. Philad. Acad.*, 5, p. 48.
1849. *Saurus ophiodon* Valenciennes, *Hist. nat. Poiss.*, 22, p. 490 (Coromandel, Malabar).
1865. *Harpodon nehereus* Day, *Fish. Malabar*, p. 201 (Malabar).
1877. *Harpodon nehereus* Day, *Fish. India*, p. 505, pl. 118, fig. 1 (from Zanzibar to China, Seas and estuaries of India, most common at Bombay but decreasing in number down the Malabar coast. It is not very common at Madras and estuaries of Bengal and Burma).
1889. *Harpodon nehereus* Day, *Fauna Brit. India*, Fish., 1, p. 412.
1907. *Harpodon nehereus* Lloyd, *Rec. Indian Mus.*, 1, p. 223 (Akyab).
1910. *Harpodon nehereus* De, *Rep. Fish. Eastern Bengal & Assam*, p. 26 (Chittagong, Noakhali).

1911. *Harpodon nehereus* Gupta, *Coll. Papers Fish. Surv. Bengal*, pp. 2, 6 (Sandheads).
1912. *Harpodon nehereus* Jenkins, *Rec. Indian Mus.*, 7, p. 58 (Arakan coast).
1913. *Harpodon nehereus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 151, fig. 57 (Java; Madura; Sumatra; Singapore; Banka; Borneo; Pinang; Malacca ; China; India; Westward to Zanzibar coast).
1915. *Harpodon nehereus* Southwell, *Rec. Indian Mus.*, 11, p. 311 (Diamond Harbour).
1916. *Harpodon nehereus* Govindan, *Madras Fish. Bull.*, 9, p. 115 (East Coast).
1917. *Harpodon nehereus* Kemp, *Rec. Indian Mus.*, 13, p. 234 (Matlah river).
1922. *Harpodon nehereus* Moses, *Madras Fish. Bull.*, 15, p. 161 (Madras).
1923. *Harpodon nehereus* Hefford, *Rep. "William-Carrick"*, p. 31 (Bombay).
1931. *Harpodon nehereus* Chu, *Biol. Bull. St. John's Univ.*, No. 1, p. 84 (Chusan; Woosung; Amoy; Canton; Ningpo; New chwang; Swatow).
1932. *Harpodon nehereus* Setna, *J. Bombay nat. Hist. Soc.*, 35, p. 867 (Bombay).
1933. *Harpodon nehereus* Sorely, *Marine Fish. Bombay Presidency* p. 161 (Bombay).
1934. *Harpodon nehereus* Hora, *J. Bombay nat. Hist. Soc.*, 37, p. 640.
1937. *Harpodon nehereus* Awati & Pinto, *J. Bombay. Univ.*, 5, p. 74 (Bombay).
1949. *Harpodon nehereus* Misra, *Rec. Indian Mus.*, 45, p. 422.
1952. *Harpodon nehereus* Mori, *Mem. Hyogo Univ. Agric.*, 1 (3), p. 42 (Chinnampo, Korea).
1953. *Harpodon nehereus* Misra, *Rec. Indian Mus.*, 50, p. 409, text-fig. 23 a.
1955. *Harpodon nehereus* Anonymous, *Mar Fish. Karachi, Sind & Makran*, p. 19 (coasts of Sind and Makran).

Vernacular names.—INDIA : *Bombil*, Marathi; *Bummaloh*, *Cucah Sawahri*, *Cocomottah*, *Wanah monah*, Telegu; Standardised name : *Bombil*. BANGLADESH : *Luttia muchec*, Chittagong. BURMA : *Bareya*, Arracan; *Nga i'uat*, Burmese.



TEXT-FIG. 80.—Lateral view of *Harpodon nehereus* (Ham.)

B. 23—26; D. 12—14/0; P. 11—12; V. 9; A. 13—15;
C. 19; L. 1. ca 40—41.

Body elongate, somewhat compressed, scaly; addomen rounded, smooth, non-keeled. Depth 7.5 in total length (6.5 in standard length). Head scaly, 4.7 in total length (4.0 in standard length). Eyes with adipose lid, 12—16 in head, 2.0 in snout, 4.0 in interorbital. Lower jaw longer than upper, maxilla extending to gill opening. Opercular pieces diaphanous, more or less blended together. A single dorsal fin; origin nearer to the snout end than to caudal base, almost between snoutend and adipose origin and before pelvic origin. Adiposedorsal opposite the posterior third of anal. Pectorals very long, a little longer than head, reaching beyond pelvic origin. Pelvics extending to middle of anal, longer than head; origin behind dorsal origin, nearer to pectoral base than to anal origin. Anal moderate, midway between pelvic and caudal origins. Caudal trilobed, 1.3 in head. Lateral line slightly keeled. Scales deciduous.

Head back and sides semitransparent like gelatine, light greyish with minute black or brownish dots; anterior part of abdomen pale silvery bluish; rest greyish white; fins transparent, closely dotted, in some specimens black; iris gold.

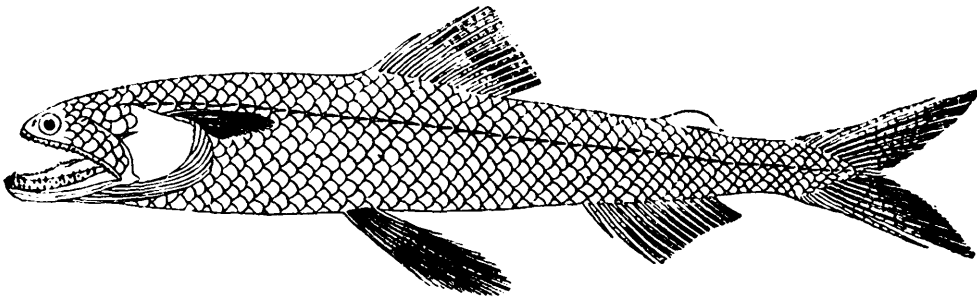
It attains 254—406 mm. in length; marine, rarely ascending estuaries.

Distribution.—India, Pakistan, Burma.—Zanzibar, Malaya, Indonesia, China, Korea; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 34° N.—70° S., 38°—130° E. in the Indo-Pacific= (25° N.—5° S., 38°—100° E. in the Indian Ocean + 34° N.—7° S., 103°—130° E. in the Pacific Ocean).

241. *Harpodon squamosus* Alcock

(Pl. IX, fig. 3; Text-fig. 81)

1891. *Harpodon squamosus* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 127 (type locality : Bay of Bengal, 15° 56' 50" N., 81° 30' 30" E., 240—276 fms., 11.1°C.; type in the Zoological Survey of India).
1899. *Harpodon squamosus* Alcock, *Cat. Ind. Deep. Sea Fish.*, p. 154 (Bay of Bengal).
1900. *Harpodon squamosus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 30, fig. 1.
1906. *Harpodon squamosus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 379 (Bay of Bengal).
1949. *Harpodon squamosus* Misra, *Rec. Indian Mus.*, 45, p. 423.
1953. *Harpodon squamosus* Misra, *Rec. Indian Mus.*, 50, p. 410, text-fig. 23 b.



TEXT-FIG. 81.—Lateral view of *Harpodon squamosus* Alc. (After A. Alcock)

B. 17; D. 12—14/0; P. 10; V. 9; A. 13—15.

Body elongate, somewhat compressed, scaly; abdomen rounded, smooth, non-keeled. Depth 6.8 in total length (5.8 in standard length). Head scaly, 4.7 in total length (3.8 in standard length); vertex of head with minute numerous pores. Snout broad, depressed, nearly equal to eye. Eyes 8.5—9.0 in head, 2.0 in the flat interorbital. Lower jaw projecting, maxilla extending to gill opening. Opercular pieces diaphanous, more or less blended together. A single dorsal fin; origin nearer to snout end than to caudal origin, and nearly midway between hind border of eye and adipose dorsal origin. The adipose dorsal above the posterior half of anal. Pectorals narrow, fragile, 1.8 in head, as long as the postorbital part of head, not reaching the dorsal fin. Pelvics slightly shorter than head, the

longest middle rays reaching to within two eye lengths of the vent in the adult. Anal arises about an eye length behind the vent. Vent twice as far from gill-opening as far from the caudal base. Caudal deeply forked, 1.1 in head, with an inconspicuous median lobe. Lateral line. Deciduous cycloid scales. 18 large pyloric caeca in a pectinate arrangement.

Hyaline grey, paired fins and caudal black, visceral peritoneum black, buccal and branchial cavities partially and slightly pigmented.

Females attain 228—266 mm. and males from 190—215 mm. in length.

Distribution.—India: Bay of Bengal, 15° 56' 50" N., 81° 31' 30" E., 439—504 m., in the mean annual isotherm of 20°C.

107. Genus *Saurida* Valenciennes

1849. *Saurida* Valenciennes, *Hist. nat. Poiss.*, 22, p. 499 (type, *Salmo tumbil* Bl., logotypic).

Body elongate, more or less rounded, scales cycloid, deciduous; without photophores. Snout obtusely pointed, rather short. Eyes moderate with anterior and posterior adipose lids. Cleft of mouth very wide. Teeth in jaws in several series; a double band of teeth on each side of palate; vomer and tongue with teeth. Gill-openings wide. Gill membranes free. Branchiostegals 12—16. Pseudobranchiae present. Dorsal fin with 10—13 rays, situated nearly in middle of length; origin far in advance of anal origin. Pectorals rather short, inserted above middle of height. Pelvics anterior, with the inner rays not much longer than outer ones, origin in front of dorsal origin. Anal with 9—12 rays, origin nearer to caudal base than to ventral base; anal base widely separated from caudal. Adipose dorsal present. Caudal bilobed.

Distribution.—Red sea, East and South coasts of Africa, Madagascar, Mauritius, Zanzibar, Gulf of Oman, Maldives, India, Andamans, Pakistan, Sri Lanka, Singapore, Indonesia, Thailand, Philippines, Formosa, China, Japan, Australia, Sandwich Islands, Micronesia, Polynesia, Hawaii.

Key to species of genus Saurida Valenciennes

1. Pectoral rays 12-13 ; axillary scale short, broad ; back and sides mottled and blotched	<i>S. gracilis</i>
2. Pectoral rays 14—16 ; axillary scale long, pointed ; back and sides of uniform colouration or with rather indistinct darker marking	3
3. Outer bands of palatine teeth in 3 rows anteriorly	<i>S. tumbil</i>
4. Outer bands of palatine teeth in 2 rows anteriorly.	<i>S. undosquamis</i>

242. *Saurida gracilis* (Quoy & Gaimard)

1824. *Saurus gracilis* Quoy & Gaimard, *Voy "Uranie" Zool.*, p. 224 (type locality : Hawaiian Is., Mauritius).
1842. *Saurus ferox* Eydoux & Souleyet, in Vaillant, *Voy. "Bonite" Zool.*, 1, 1842, *Poiss.*, p. 197, pl. 7, fig. 3 (type locality : not known).
1849. *Saurida nebulosa* Valenciennes, *Hist. nat. Poiss.*, 22, p. 374 (504), pl. 648 (type locality : Mauritius; New Guinea; Timor; Tahiti).
1877. *Saurida nebulosa* Day, *Fish. India*, p. 505 (from the Red Sea, Madagascar and the coasts of Zanzibar, to the Mauritius, through the seas of India to the Malay Archipelago and beyond).
1889. *Saurida nebulosa* Day, *Fauna Brit. India*, Fish., 1, p. 411, fig. 131.
1900. *Synodus sharpi* Fowler, *Proc. Acad. nat. Sci. Philad.*, p. 497, pl. 19, fig. 2 (Hawaiian Is.)
1913. *Saurida gracilis* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 143, fig. 53 (Singapore, Flores, Solor Timor, Celebes, Buru, Ceram, Ambon, Aru Is., Halmahera).
1931. *Saurida nebulosa* Chu, *Biol. Bull. St. John's Univ.*, No. 1, p. 84 (China).
1935. *Saurida gracilis* Norman, *Proc. zool. Soc. Lond.*, p. 127 (Andamans; Maldives).
1936. *Saurida gracilis* Suvatti, *Index Fish. Siam*, p. 88 (Siam).
1941. *Saurida gracilis* Herre, *Mem. Indian Mus.*, 13, p. 340 (Andamans).
1949. *Saurida gracilis* Misra, *Rec. Indian Mus.*, 45, p. 423.
1953. *Saurida gracilis* Misra, *Rec. Indian Mus.*, 50, p. 410.

1953. *Saurida gracilis* Herre, *Check List Philippine Fish.*, p. 138 (Philippines).
1953. *Saurida gracilis* Smith, *Sea Fish. South. Africa*, p. 113 (as far as Natal).
1955. *Saurida gracilis* Munro, *Mar. Freshwater Fish. Ceylon*, p. 36 (coastal waters).
- B. 12—13; D. 11/0; P. 12—13; V. 9; A. 9—10; L. 1. 50—52; L. tr. $3\frac{1}{2}/6$.

Body elongate, somewhat compressed, scaly; abdomen rounded, smooth, non-keeled. Depth 6.5—7.5 in total length (5.6—6.6 in standard length). Head scaly, 5.5 in total length (4.7 in standard length). Eyes with adipose lids, 5.0—6.0 in head, slightly shorter than interorbital, about $\frac{3}{4}$ or equal to broadly depressed snout. Cleft of mouth oblique, very wide, extending 2.5 eye diameters behind orbit. Teeth in upper jaw slightly prominent. Teeth in jaws depressible unequal, inner series the longest on each side of palate; 2 bands of teeth on tongue; gill arches with fine teeth. Opercular pieces diaphanous more or less, blended together. A single dorsal fin; origin nearer to snout than to caudal origin and nearly midway between snout end and adipose dorsal origin. Adipose dorsal above middle of anal. Pectorals short, about equal to postorbital length of head, highly placed. Pelvics as long as head; origin nearer to pectoral base than to anal origin and before dorsal origin. Anal moderate; origin much nearer to caudal origin than to pelvic origin. Caudal bilobed, 1.1 times in head. Lateral line; scales deciduous.

Brownish above, silvery white below; a series of bars or blotches along middle of the sides; fins barred.

It attains 300 mm. in length; littoral.

Distribution.—India, Pakistan, Burma, Sri Lanka.—Red Sea, East and South coasts of Africa, Madagascar, Mauritius, Zanzibar, Indonesia, Thailand, China, Philippines, Micronesia, Polynesia, Tahiti, Hawaii; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 25° N.—29° C., 30° E.—149° W., in the Indo-Pacific=(25° N.—29° S., 30°—125° E. in the Indian ocean+22° N.—18° S., 101° E.—149° W. in the Pacific Ocean).

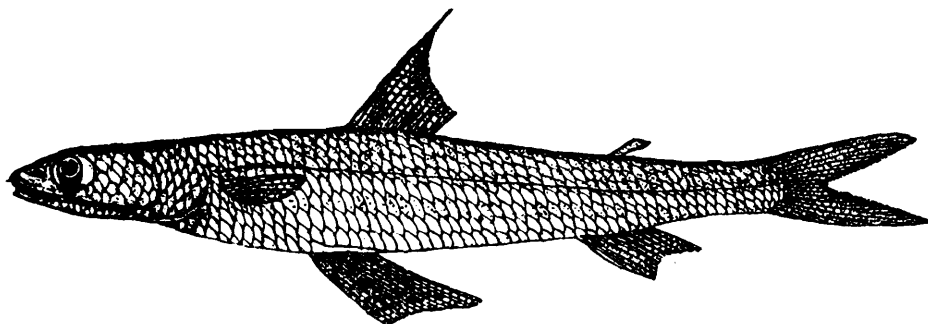
243. *Saurida tumbil* (Bloch)

(Text-fig. 82)

1795. *Salmo tumbil* Bloch, *Ausland. Fische*, 9, p. 112, pl. 430 (type locality : Malabar).
1829. *Saurus badi* Cuvier, *Règne Animal.*, ed. 2, 2, p. 314 on *Badi-mottah* Russell, *Fish. Coromandel*, 2, pl. 172, 1803 (type locality : Vizagapatam).
- 1837-38. *Saurus badimottah* Rüppell, *Neue Wirbelth. Fische*, p. 77 (on *Badi-mottah* Russell, 1803, *Fish. Coromandel*, pl. 172 (type locality : Vizagapatam)).
1870. *Saurida tumbil* Day, *Proc. zool. Soc. Lond.*, p. 699 (Andamans).
1877. *Saurida tumbil* Day, *Fish. India*, p. 504, pl. 117, fig. 6 (from the Red Sea through the Seas of India to the Malay Archipelago, China and Japan).
1889. *Saurida tumbil* Day, *Fauna Brit. India, Fish.*, 1, p. 410, fig. 131.
1913. *Saurida tumbil* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 142 (Java, Bali, Sumatra, Padang, Pinang, Singapore, Bintang, Banka, Borneo Celebes).
1922. *Saurida tumbil* Moses, *Madras Fish. Bull.*, 15, p. 159 (Madras).
1923. *Saurida tumbil* Hefford, *Rep. "William Carrick"*, p. 31 (Bombay).
1928. *Saurida tumbil* Fowler, *Mem. Bishop. Mus.*, 10, p. 66.
1929. *Saurida tumbil* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 77 (Western Australia, Queensland).
1933. *Saurida tumbil* Deraniyagala, *Ceylon J. Sci.*, (C) 5, p. 89 (Ceylon).
1933. *Saurida tumbil* Soreley, *Marine Fish. Bombay Presidency*, p. 161 (Bombay).
1935. *Saurida tumbil* Norman, *Proc. zool. Soc. Lond.*, p. 129 (Karachi, Madras).
1936. *Saurida tumbil* Suvatti, *Index Fish. Siam*, p. 88 (Siam).
1939. *Saurida tumbil* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 23 (Gulf of Aden, OT, 18—22 m.).
1941. *Saurida tumbil* Herre, *Mem. Indian Mus.*, 13, p. 341 (Andamans).
1949. *Saurida tumbil* Misra, *Rec. Indian Mus.*, 45, p. 424.
1952. *Saurida tumbil* Mori, *Mem. Hyogo Univ. Agric.*, 1, 3, p. 41 (Chinnampo, Korea).
1953. *Saurida tumbil* Misra, *Rec. Indian Mus.*, 50, p. 411, fig. 24 a
1953. *Saurida tumbil* Herre, *Check List Philippine Fish.*, p. 139 (Philippines).
1953. *Saurida tumbil* Smith, *Sea Fish. South. Africa*, p. 113 (Natal).
1955. *Saurida tumbil* Anonymous, *Mar. Fish. Karachi, Sind & Makran*, p. 19 (coasts of Sind and Makran).

1955. *Saurida tumbil* Munro, *Mar. Freshwater Fish. Ceylon*, p. 37 (coastal waters; Gulf of Manaar).

Vernacular names.—INDIA : *Arranna*, Malayalam; *Chorbo-mbil*, Marathi; *Oolooway*, *Nai meen Puna*, *Cul-nahmacunda*, Tamil; *Bedi mottah*, Telegu; Standardised name : *Tambil*. Sri Lanka : *Mudhu Balla*, Singhalese.



TEXT-FIG. 82.—Lateral view of *Saurida tumbil* (Bl.) (After F. Day)

B. 14—16; D. 11/0; P. 14—15; V. 9; A. 10—11; L. 1. 50—63; L. tr. $4\frac{1}{2}/7$.

Body elongate, more or less subcylindrical anteriorly, depressed, scaly; abdomen rounded, smooth, non-keeled. Depth 7.0 in total length (5.8 in standard length). Head scaly, 4.5 in total length (3.8 in standard length). Eyes with adipose lids, 4.7—5.0 in head, nearly equal to broad conical snout and the interorbital. Cleft of mouth very wide, oblique; jaws subequal, maxilla extending to about an eye diameter behind orbit. Pointed unequal teeth partly depressible in several rows in jaws; similar teeth in 2 narrow bands on each side of palate; tongue and gill arches with fine teeth. Opercular pieces diaphanous. A single dorsal; origin nearer to snout end than to caudal origin and adipose dorsal. Adipose dorsal above middle of anal; origin nearer to caudal origin than to dorsal origin. Pectorals short, highly placed, 2.0 in head. Pelvics 1.1 times in head; origin much nearer to pectoral base than to anal origin and before dorsal origin. Anal moderate; origin much nearer to caudal origin than to pelvic origin. Caudal 1.2 times in head. Lateral line. Scales deciduous.

Brownish grey along back, white below with yellow reflections; upper half of caudal barred with spots; middle of pectoral and pelvic often almost black.

It attains 420 mm. in length; littoral.

Distribution.—India, Pakistan, Sri Lanka.—Red Sea, Gulf of Aden, OT, 18—22 m., Natal, Madagascar, Zanzibar, Indonesia, Thailand, China, Japan, Korea, Philippines, Queensland, W. Australia, Sandwich Is., Vanicolo; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 34° N.—29° S., 30°—167° E. in the Indo-Pacific=(25° N.—29° S., 30°—140° E. in the Indian Ocean+34° N.—16° S., 101°—167° E. in the Pacific Ocean).

244. *Saurida undosquamis* (Richardson)

1848. *Saurus undosquamis* Richardson, *Zool. "Erabus" and "Terror", Fish.*, p. 138, pl. 51, figs. 1—6 (type locality : N. W. Australia; type in the British Museum).
1864. *Saurida grandisquamis* Günther, *Cat. Fish. Brit. Mus.*, 5, p. 400 (type locality : Louisiade Is.).
1913. *Saurida grandisquamis* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 141 (Arafura sea, Aru Is.).
1935. *Saurida undosquamis* Norman, *Proc. zool. Soc. Lond.*, p. 131 (Maldives : River Hooghly).
1938. *Saurida grandisquamis* Fowler, *List Fish. Malaya*, p. 70 (Kuala Lumpur).
1939. *Saurida undosquamis* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 23 (Gulf of Oman, 73 m.; Red Sea, OT, 65-68 m.; Zanzibar area, 183—194 m.; Gulf of Aden, 220 m.).
1949. *Saurida undosquamis* Misra, *Rec. Indian Mus.*, 45, p. 424.
1952. *Saurida undosquamis* Mori, *Mem. Hyogo Univ. Agric.*, 1 (3), p. 41 (Fusan; Chemulpo; Quelpart I.).
1953. *Saurida undosquamis* Misra, *Rec. Indian Mus.*, 50, p. 411.
1953. *Saurida undosquamis* Herre, *Check List Philippine Fish.*, p. 139 (Philippines).
1953. *Saurida undosquamis* Smith, *Sea Fish. South. Africa*, p. 113, fig. 176 (reaches as far south as Knysna).

D. 11—12/0; P. 14—15; V 9; A. 10—12; L. 1.45—52.

Body elongate, more or less subcylindrical, scaly ; abdomen rounded, smooth, non-keeled. Depth 6.0—8.0 in total length (5.5—6.5 in standard length). Head scaly, 5.1 in total length (4.4 in standard length). Eyes with adipose lids, 4.1 in head, nearly equal to snout. Cleft of mouth oblique, very wide, maxilla extending to about an eye diameter behind orbit. A single dorsal fin; origin nearer to snout end than to caudal origin and midway

between snout end and adipose dorsal origin. Adipose dorsal behind middle of anal base. Pectorals short, 1.5 in head. Pelvics moderate, 1.2 in head; origin much nearer to pectoral base than to anal origin and about an eye diameter before dorsal origin. Anal moderate; origin much nearer to caudal origin than to pelvic origin. Caudal bilobed, 1.2 in head. Lateral line: Scales deciduous.

Brownish grey above, lighter below.

It attains 457 mm. in length; littoral.

Distribution.—India, Pakistan, Sri Lanka.—Red Sea, OT. 65—68 m.; Gulf of Aden, 220 m.; Gulf of Oman, 73 m.; Zanzibar area, 183—194 m.; East and South coasts of Africa, Singapore; Indonesia, China, Japan, Philippines, N. W. Australia; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 34°N.—33°S., 28°—135°E. in the Indo-Pacific=(25°N.—33°S., 28°—120°E. in the Indian Ocean+34°N.—10°S., 103°—135°E., in the Pacific Ocean).

108. Genus *Synodus* Scopoli

1763. *Synodus* Gronow, *Zooph.*, 1, p. 112 (type, *Esox synodus* L., genotypic; inadmissible, according to opinion 89 of the International Commission of Zoological Nomenclature).
 1777. *Synodus* Scopoli, *Introd. nat. Hist.*, p. 447 (type, *Esox synodus* L., genotypic).
 1817. *Saurus* Cuvier, *Regne Animal.*, 2, ed. 1, p. 169 (type *Salmo saurus* L., tautotypic).

Body elongate, more or less rounded, scales cycloid deciduous; without photophores. Snout more or less pointed, triangular. Eyes moderate with anterior and posterior adipose lids. Cleft of mouth wide, more or less oblique. Upper jaw with one or two series of unequal teeth; a band of similar teeth in lower jaw; a single band of teeth on each side of palate; teeth on tongue. Gill openings wide. Gill membranes slightly connected. Branchiostegals 12—16. Pseudobranchiae present. Dorsal fin with 10—15 rays, placed nearly in middle of length, origin far in advance of anal origin. Pectoral rather short, inserted above middle of height. Pelvics anterior, with the long inner rays much longer than the outer ones; origin in front of dorsal origin. Anal fin with 8—15 rays, origin much nearer to caudal base than to pelvic

base ; anal base widely separated from caudal. Adipose dorsal present. Caudal bilobed.

Distribution.—South and East coasts of Africa, Zanzibar, Madagascar, Mauritius, Arabia, Gulf of Aden, Maldives, Andamans, Indonesia, Hongkong, China, Japan, Philippines, Australia, Bismarck Archipelago, Hawaii.

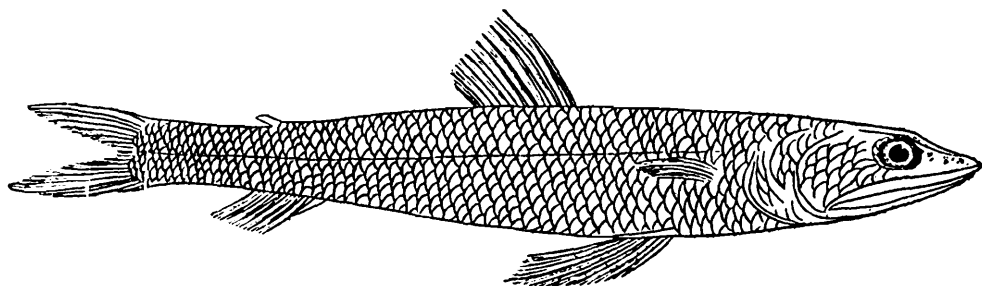
Key to species of genus Synodus Scopoli

1. Lateral line scales 58-64 ; scales between middle of dorsal fin and lateral line $5\frac{1}{2}$ — $6\frac{1}{2}$ (rarely $4\frac{1}{2}$) *S. japonicus*
2. Lateral line scales 55-57 ; scales between middle of dorsal fin and lateral line $3\frac{1}{2}$ *S. indicus*

245. *Synodus indicus* (Day)

(Pl. VIII, fig. 4; Text-fig. 83)

1873. *Saurus indicus* Day, *J. Linn. Soc. (zool.)* **11**, p. 526 (type locality: Madras; lectotype is in the Zoological Survey of India).
1877. *Saurus indicus* Day, *Fish. India*, p. 503, pl. 117, fig. 4 (Madras).
1889. *Saurus indicus* Day, *Fauna Brit. India*, Fish., **1**, p. 409 (Madras).
1935. *Synodus indicus* Norman, *Proc. zool. Soc. Lond.*, p. 114 (Madras).
1939. *Synodus indicus* Norman, *Sci. Rep. John Murray Exped.*, **7**, p. 23 (Gulf of Aden, OT, 37-91 m.)
1949. *Synodus indicus* Misra, *Rec. Indian Mus.*, **45**, p. 424.
1953. *Synodus indicus* Misra, *Rec. Indian Mus.*, **50**, p. 412, text-fig. 24 b.
1953. *Synodus indicus* Smith, *Sea Fish. South. Africa*, p. 112 (Na^tal, Mossel Bay).



TEXT-FIG. 83.—Lateral view of *Synodus indicus* (Day) (After F. Day)

B. 15; D. 13/0; P. 14; V. 8; A. 9; L. 1. 55—57; L. tr. $3\frac{1}{2}$ /7.

Body elongate, subcylindrical, scaly; abdomen rounded, smooth, non-keeled. Depth 7.2—8.0 in total length (6.2 in standard length). Head scaly, 4.0—4.5 in total length (3.4 in standard length). Eyes 5.0—5.6 in head, a little more than one eye diameter from snout end nearly 1.0 in concave interorbital. Cleft of mouth very wide, maxilla reaching one eye diameter behind orbit. Upper jaw slightly longer. Inner row of teeth in jaws the longest: some in the mandible barbed; rows of large teeth on tongue; a simple band on palatine of which the inner row the largest. Opercular pieces diaphanous. A single dorsal; origin nearer to tip of snout than to caudal origin and nearer to adipose dorsal. Adipose dorsal above middle of anal; origin nearer to caudal origin than to dorsal origin. Pectorals highly placed, short, 2.2 in head. Pelvics with inner rays the longest, 1.2 in head; origin much nearer to pectoral base than to anal origin, about 2 eye diameters before dorsal origin. Anal moderate; origin much nearer to caudal base than to pelvic origin. Caudal forked, 1.5 times in head. Lateral line. Scales deciduous.

Brownish above, dirty white below; numerous bluish irregular spots or blotches along back and sides, in places nearly forming horizontal bands; dorsal and caudal white with greyish spots forming irregular horizontal bands.

It attains 178 mm. in length; littoral.

Distribution.—India, Madras.—South Africa, Gulf of Aden, OT 37—91 m., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 11 N.—34°S., 22°—80°E. in the Indian Ocean.

246. *Synodus japonicus* (Houttuyn)

- 1782. *Cobitis japonicus* Houttuyn, *Verh. Holl. Maat. Haarlem*, 20, p. 450 (type locality; Nagasaki 32° 47' N., 129° 52' E.).
- 1803. *Salmo variegatus* Lacépède, *Hist. nat. Poiss.*, 5, p. 157, pl. 3, fig. 3 (type locality : Ile de France, Mauritius).
- 1803. *Salmo varius* Lacepede, *Hist. nat. Poiss.*, 5, p. 224, (type locality : Ile de France, Mauritius).
- 1846. *Saurus lucius* Schlegel, *Fauna Japonicus, Pisces*, p. 232, pl. 106, fig. 1 (type locality : Shimabara near Nagasaki).
- 1907. *Saurida japonica* Jordan & Seale, *Bull. U.S. Bur. Fish.*, 26, p. 5 (type locality : Cavite, Cavite Province).

1912. *Synodus dermatogenys* Fowler, *Proc. Acad. nat. Sci. Philad.*, p. 566, fig. 3 (type locality; Hawaiian Is.).
1913. *Saurus variegatus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 147 (Java, Padang; Singapore, Celebes, Sula Archipelago, Ambon, Bali, Flores Sea).
1929. *Synodus japonicus* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 78 (Queensland).
1931. *Synodus variegatus* Chu, *Biol. Bull. St. John's Univ.*, 1, p. 83 (Hongkong).
1931. *Synodus japonicus* Tanaka, *J. Faculty Sci. Tokyo*, 3, pt. 1, p. 17 (Southern Japan).
1935. *Synodus variegatus* Norman, *Proc. zool. Soc. Lond.*, p. 106 (Maldives; Andamans).
1939. *Synodus variegatus* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 23 (Gulf of Aden, 12° N. 45° E., OT, 37—91 m.).
1949. *Synodus variegatus* Misra, *Rec. Indian Mus.*, 45, p. 424.
1952. *Synodus variegatus* Mori, *Mem. Hyogo Univ. Agric.*, 1 (3), p. 41 (Quelpart I.).
1953. *Synodus variegatus* Misra, *Rec. Indian Mus.*, 50, p. 412.
1953. *Synodus variegatus* Herre, *Check List Philippine Fish.*, p. 140 (Philippines).
1953. *Synodus variegatus* Smith, *Sea Fish. South. Africa*, p. 112 (not seen S. of Durban).

B. 15—16; D. 12/0; P. 12—13; V. 8; A. 8—9; L. 1. 60—64; L. tr. 5—6/10—11.

Body elongate, subcylindrical, scaly; abdomen rounded, smooth, non-keeled. Depth 7·0—7·4 in total length (6·0—6·4 in standard length). Head scaly, 4·0 in total length (3·5 in standard length). Eyes with adipose lid, 5·0—7 in head, nearly 1·5 in snout, 1·0 in concave interorbital. Cleft of mouth wide, maxillary reaching an eye diameter behind orbit. Jaws subequal. Teeth in intermaxillary pointed; in outer series of smaller fixed ones and in inner series of longer depressible ones; similar teeth but more numerous and with 2 outer series in lower jaw; a long narrow band on vomer and palatine; large ones on tongue, smaller on basibranchia. Opercular pieces diaphanous. A single dorsal fin; origin nearer to snout end than to caudal origin and almost nearer to adipose dorsal. Adipose dorsal above anterior half of anal, nearer to caudal origin than to dorsal origin. Pectorals short,

2.5 in head. Pelvics with the inner rays elongated, 1 1 in head; origin nearer to pectoral base than to anal origin, about 2 eye diameters before dorsal origin. Anal moderate; origin much nearer to caudal base than to pelvic origin. Caudal forked, 2.0 in head. Lateral line. Scales deciduous.

Dusky above and yellowish below; cross bands on back and sides; fins with more or less conspicuous series of black spots forming bands.

It attains 240 mm. in length; littoral.

Distribution.—India, Sri Lanka.—Red Sea, Gulf of Aden, OT, 37—91 m. Arabia, East and South coasts of Africa, Zanzibar, Madagascar, Mauritius, Indonesia, Hongkong, China, Japan, Philippines, Australia, Bismarck Archipelago, Hawaii; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 32° N.—29°S., 30°E.—155°W. in the Indo-Pacific=(20°N.—29°S., 30°—140°E., in the Indian Ocean+32°N.—8°S., 103°E.—155°W. in the Pacific Ocean).

109. Genus *Trachinocephalus* Gill

1861. *Trachinocephalus* Gill, *Proc. Acad. nat. Sci. Philad. Suppl.*, p. 53 (type, *Salmo myops* Schn., genotypic).

1897. *Goodella* Ogilby, *Proc. Linn. Soc. N.S. Wales*, 22, p. 249 (type, *G. hypozona* Ogilby, genotypic).

Body elongate, more or less laterally compressed, scales cycloid, deciduous; without photophores. Snout blunt, short. Eyes moderate, with adipose lid. Cleft of mouth wide, oblique. Jaws and tongue with small, closely set teeth; a similar single band of teeth on each side of palate. Gill-openings wide. Pseudobranchiae present. Branchiostegals 16. Dorsal fin with 11—13 rays; origin a little nearer to end of snout than to adipose fin and in advance of anal origin. Pectorals short, inserted above middle of height. Pelvics anterior, with long inner rays much longer than the outer ones, origin in front of dorsal origin. Anal fin of 15—16 rays; origin approximately between pelvic and caudal bases. Adipose dorsal present. Caudal bilobed.

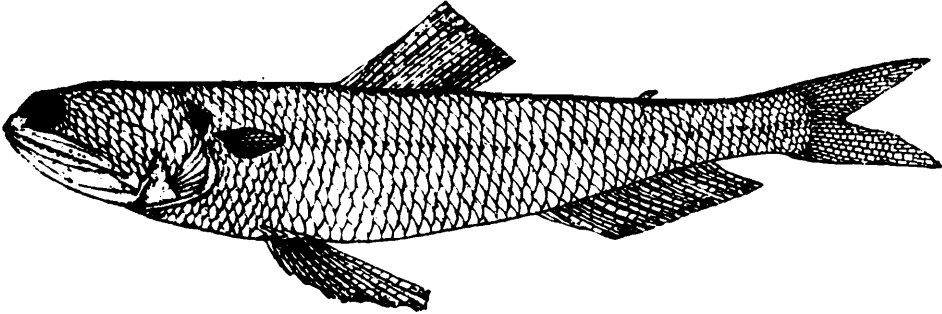
Distribution.—Natal, India, Pakistan, Sri Lanka, Malaya, Indonesia, Philippines, Formosa, Hongkong, China, Japan, Australia, Oceania, Hawaii.

247. *Trachinocephalus myops* (Schneider)

(Pl. VII, fig. 1; Text-fig. 84)

1801. *Salmo myops* Schneider, *Syst. Ichth. Bloch*, p. 421 (type locality : St. Helena, 16° N., 5° W.).
1803. *Osmerus lemniscatus* Lacépède, *Hist. nat. Poiss.*, 5, p. 236, pl. 6, fig. 1 (type locality : Martinique, 14° 48' N., 61° 10' W.).
1841. *Saurus limbatus* Eydoux & Souleyet, *Voy. "Bonite" Poiss.*, 1, p. 199, pl. 7, fig. 3 (type locality : Unknown, may be Hawaii).
1846. *Saurus trachinus* Schlegel, *Fauna Japonica Pisces*, p. 231, pl. 106, fig. 2 (type locality : Nagasaki).
1877. *Saurus myops* Day, *Fish. India*, p. 504, pl. 117, fig. 5 (Seas of India to the Malay Archipelago and the tropical of the Atlantic and Pacific Oceans).
1889. *Saurus myops* Day, *Fauna Brit. India*, Fish., 1, p. 409, fig. 130.
1913. *Saurus myops* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 145 (Sumatra, Banka Bali, Celebes, Ambon, Ceram, Ternate).
1928. *Trachinocephalus myops* Fowler, *Mem. Bishop Mus.*, 10, p. 64 (7 Hawaiian specimens in the U.S. National Museum).
1929. *Saurus myops* Pillay, *J. Bombay nat. Hist. Soc.*, 33, p. 360 (Travancore).
1929. *Trachinocephalus limbatus* Mc Culloch, *Mem. Austral. Mus.*, 5, p. 79 (W. Australia; Queensland).
1931. *Trachinocephalus myops* Chu, *Biol. Bull. St. John's Univ.*, 1, p. 83 (Hongkong; China Sea; Swatow).
1931. *Trachinocephalus myops* Tanaka, *J. Faculty Sci. Tokyo*, 3, pt. 1, p. 17 (Southern Japan area).
1935. *Trachinocephalus myops* Norman, *Proc. zool. Soc. Lond.*, p. 122 (Indian Seas).
1938. *Trachinocephalus myops* Fowler. *List. Fish. Malaya*, p. 70 (Penang).
1949. *Trachinocephalus myops* Misra, *Rec. Indian Mus.*, 45, p. 425.
1952. *Trachinocephalus myops* Mori, *Mem. Hyogo Univ. Agric.*, 1 (3), p. 42 (Fusan, 35° 7' N., 129° 2' E., Quelpart I.).
1953. *Trachinocephalus myops* Misra, *Rec. Indian Mus.*, 50, p. 412, fig. 22 a.
1953. *Trachinocephalus myops* Herre, *Check List Philippine Fish.*, p. 137 (Philippines).
1953. *Trachinocephalus myops* Smith, *Sea Fish. South. Africa*, p. 113 (from Knysna to Natal).
1955. *Saurus myops* Anonymous, *Mar. Fish Karachi, Sind & Makran*, p. 18 (coasts of Sind and Makran).

1955. *Trachinocephalus myops* Munro, *Mar. Freshwater Fish. Ceylon*, p. 36 (coastal waters and Gulf of Manaar).
 1958. *Trachinocephalus myops* Briggs, *Bull. Florida State Mus., Biol. Sci.*, 2 (8), p. 257 (Florida, 24°—30° N., 78°—87° W).



TEXT-FIG. 84.—Lateral view of *Trachinocephalus myops* (Schn.)
 (After F. Day)

B. 16; D. 12—13/0; P. 12—13; A. 15—16; L. 1. 54—58.

Body elongate, subcylindrical scaly, abdomen smooth, rounded, non-keeled. Depth 5.8—6.0 in total length (5.5—4.5 in standard length). Head scaly, 4.2—4.3 in total length (3.5—4.0 in standard length). Eyes with adipose lid, 4.5—6.5 in head, situated very much forward and high., longer than obtuse snout, 0.5—0.7 in interorbital. Cleft of mouth very wide, maxilla reaching $\frac{2}{3}$ eye diameters behind orbit. Teeth pointed, 2 rows in upper jaw, 3 in lower, the innermost the largest; a single 2-rowed band on palate; tongue like-wise toothed. Opercular pieces diaphanous. A single dorsal fin, origin nearer to snout end than to caudal origin and nearer to adipose dorsal. Adipose dorsal slightly behind middle of anal, origin nearer to caudal origin than to dorsal origin. Pectorals highly placed, about 2.8 in head. Pelvics with inner rays elongated, 1.2 in head; origin much nearer to pectoral base than to anal origin, about 1.5 eye diameter before dorsal origin. Anal longer than dorsal, origin about midway between pelvic and caudal origins; about 3.5 eye diameters before adipose dorsal. Caudal forked, with lower lobe slightly longer. Lateral line slightly raised in single tubes with a small elevation on either side. Scales deciduous.

Golden above with 4 longitudinal blue lines having black edges and nearly as wide as the ground colour; yellowish silvery white below with a black shoulder spot; 3 rows of yellow spots on dorsal; a yellow band along middle of pectoral, outer half of anal yellow.

It attains 406 mm. in length; littoral.

Distribution.—India, Pakistan, Sri Lanka.—Martinique, Natal, Malaya, Indonesia, Philippines, Formosa, Hongkong, China, Queensland, Japan, Australia, Oceania, Hawaii, in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 35° N.—33° S., 28° E.—155° W. in the Indo-Pacific Ocean=(25° N.—33° S., 28°—140° E. in the Indian Ocean+35° N.—8° S., 103° E.—155° W. in the Pacific Ocean), and 14°—30° N. 5°—87° 30' W. in the tropical Atlantic.

XLII. Family SCOPELARCHIDAE

Body elongate, compressed, scaly. Head scaleless. No photophores. Abdomen rounded. Cleft of mouth wide, oblique, extending beyond orbit. A single row of teeth in premaxilla; a double row in mandible and palatines; tongue toothed. A single rayed dorsal. Adipose dorsal. Pectorals large. Pelvics. Anal much longer than dorsal, below adipose dorsal. Caudal forked. Lateral line.

The family SCOPELARCHIDAE is represented by a single genus in the Indian region.

110. Genus *Scopelarchus* Alcock

1896. *Scopelarchus* Alcock, *J. As. Soc. Bengal*, **65**, p. 306 (type, *S. guentheri* Alc., orthotypic).

1902. *Dissomma* Brauer, *Zool. Anz.*, **25**, p. 278 (type, *D. anale* Br., orthotypic).

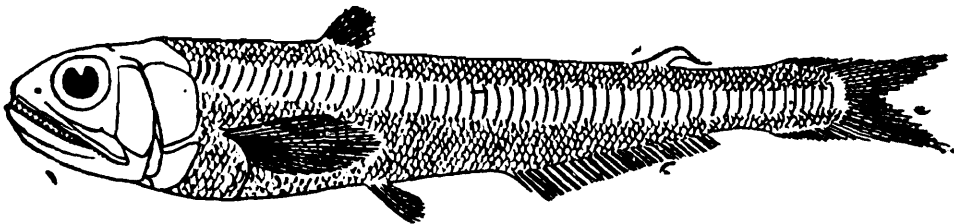
Body elongate, compressed, scales deciduous; lateral line scales much enlarged, non-deciduous, with the vertical diameter greater than the antero-posterior diameter; without photophores. Eyes large. Cleft of mouth wide. A single row of small teeth in the premaxilla; a double row of teeth in mandible and palatine; tongue also toothed. Gill openings wide. Pseudobranchiae large. Gill membranes free. Branchiostegals 9. Dorsal fin with 9 rays, in the anterior third of total length with its base lying between pectorals and pelvics and its origin far in advance of anal origin. Pectorals large. Pelvic origin behind dorsal origin. Anal with 26 rays, much longer than dorsal, occupying the greater part of tail. Adipose dorsal present. Caudal forked.

Distribution.—Off Pakistan, 1731 m.

248. *Scopelarchus guentheri* Alcock

(Pl. IX, fig. 4; Text-fig. 85)

1896. *Scopelarchus guentheri* Alcock, *J. As. Soc. Bengal*, 65, p. 307 (type locality : off the Indus Delta, 22° 14' 25" N., 67° 8' 55" E., 947 fms., 4·7° C.; type in the Zoological Survey of India).
1897. *Scopelarchus guentheri* Alcock, *Ill. Zool. Investig. Fish.*, pl. 17, fig. 7.
1899. *Scopelarchus guntheri* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 153
1906. *Scopelarchus guntheri* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 379.
1928. *Scopelarchus guentheri* Parr, *Bull. Bingham Oceanogr. coll.*, 3, art. 3, p. 159.
1949. *Scopelarchus guentheri* Misra, *Rec. Indian Mus.*, 45, p. 425.
1953. *Scopelarchus guentheri* Misra, *Rec. Indian Mus.*, 50, p. 413, fig. 25 c.



TEXT-FIG. 85.—Lateral view of *Scopelarchus guentheri* Alc. (After A. Alcock)

B. 9; D. 9/0; P. 19; V 8; A. 26; L. 1. ca 50.

Body elongate, compressed, scaly; abdomen rounded, smooth non-keeled. Depth 6·0 in total length (5·1 in standard length). Head scaleless, 4·8 in total length (4·1 in standard length). Eyes large, 3·0 in head, separated from the one another by a mere linear space with their visual axis rather more superior than lateral. Cleft of mouth oblique, very wide, maxilla extending about 1/2 eye diameter behind orbit. Jaws subequal. A single row of teeth in premaxilla; a double row in the mandible, the inner large, depressible and barbed at tip; incompletely double series of similarly enlarged teeth on either palatine and a long row of similar ones on tongue and hyoid. A single dorsal; origin about an eye diameter behind pectoral base, much nearer to snout end than to caudal origin and midway between it and adipose dorsal. Adipose dorsal above last third of anal; origin nearer to caudal origin than to dorsal origin. Pectorals low, broad, falciform, reaching beyond pelvic base, 1 1 in head. Pelvics moderate, 2·2

in head; origin just below last dorsal ray or behind dorsal, nearly midway between anal origin and pectoral base. Anal long; origin much nearer to pelvic origin than to caudal origin. Caudal forked, 1.0 in head. Lateral line with enlarged scales, their vertical diameter being much greater than the antero-posterior diameter; each scale chambered, the chamber opening dorsally and ventrally. Scales deciduous, except on lateral line.

In spirit white; occiput and caudal peduncle black.

It attains 127 mm. in length; bathypelagic.

Distribution.—Pakistan: Off the Indus Delta 22° 14' 25" N., 67° 8' 55" E., 1731 m., 4.7° C., in the mean annual isotherm of 20°C.

XLIII. Family EVERMANNELLIDAE

Body moderately elongate, compressed, naked. Head naked, compressed. Snout short. Cleft of mouth very wide, oblique, maxilla extending about half an eye diameter behind orbit. A series of small teeth in premaxilla; lower jaw, vomer and palatines with a few depressible fangs of enormous size. A single dorsal fin. Adipose dorsal. Pectorals low, inserted near the ventral profile in the same plane with pelvics. Anal longer than dorsal, below adipose dorsal. Caudal forked. Lateral line.

The family EVERMANNELLIDAE is represented by a single genus in the Indian region.

111. Genus *Evermannella* Fowler

1838. *Odontostomus* (nec. Beck, 1837) Cocco, *Ann. Sci. nat. Bologna*, 2, p. 192, as *Odontostomus* on p. 194, (type, *O. hyalinus* Cocco, orthotypic).

1901. *Evermannella* Fowler, *Proc. Acad. nat. Sci. Philad.*, p. 211 (type, *Odontostomus hyalinus* Cocco, orthotypic).

Body moderately elongate, compressed, totally naked, without photophores. Snout short, eyes large, orbit of great vertical depth and with a broad transparent membranous lateral fold or wall. Cleft of mouth very wide. Premaxilla with a series of small teeth of equal size; lower jaw, vomer and palatine with a few depressible fangs of enormous size. Gill openings wide; gill rakers absent. Branchiostegals 8. Pseudobranchiae well developed. Dorsal fin with 11 rays, in the anterior half of body; origin in

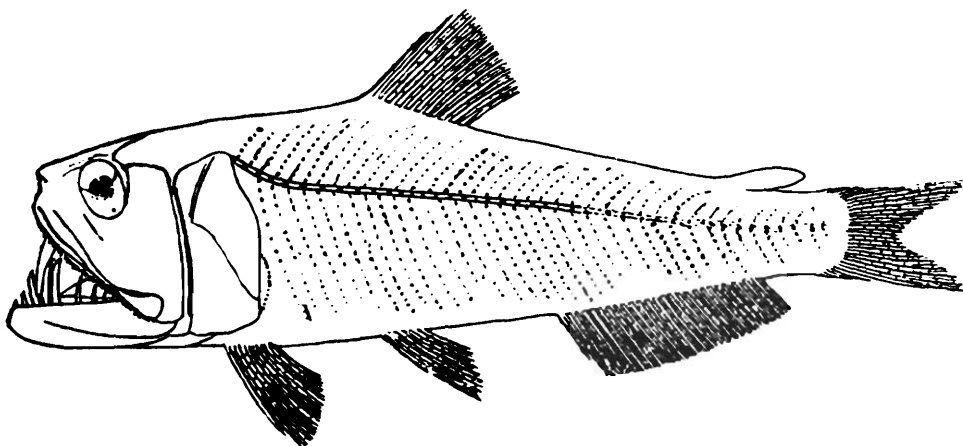
advance of anal origin. Pectorals low, inserted near the ventral profile. Pelvic origin slightly behind dorsal origin and nearly between pectoral base and anal origin. Anal fin with 26 rays, much longer than dorsal, occupying greater part of tail. Adipose dorsal present. Caudal forked.

Distribution.—Atlantic Ocean: Mediterranean; Indian Ocean: Seychelles, 1500—2400 m., Zanzibar, 1500—2400 m., Chagos Archipelago, 2000 m., Bay of Bengal, 1048 m., Andaman Sea, 676—766 m., North of Cocco Is., 1500—2200 m.

249. *Evermannella atratus* (Alcock)

(Pl. IX, fig. 5; Text-fig. 86)

1893. *Odontostomus atratus* Alcock, *J. As. Soc. Bengal*, **62**, p. 182, pl. 9, fig. 4 (type locality: Bay of Bengal, $14^{\circ} 13' 8''$ N., $80^{\circ} 24' 2''$ E., 573 fms., 7.4 C., type in the Zoological Survey of India).
1896. *Odontostomus atratus* Alcock, *J. As. Soc. Bengal*, **65**, p. 333 (Bay of Bengal, 573 fms.).
1899. *Odontostomus atratus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 167 (Bay of Bengal, 573 fms.; Andaman Sea, $14^{\circ} 13'$ N., $93^{\circ} 40'$ E., 370—419 fms.).
1900. *Odontostomus atratus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 33, fig. 3.
1906. *Evermannella atratus* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 136, 380, pl. 10, figs. 3, 4.
1928. *Evermannella atrata* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 3, pp. 163, 166.
1949. *Evermannella atratus* Misra, *Rec. Indian Mus.*, **45**, p. 425.
1953. *Evermannella atratus* Misra, *Rec. Indian Mus.*, **50**, p. 414, fig. 25 b.



TEXT-FIG. 86.—Lateral view of *Evermannella atratus* Alc. (After A. Alcock)

B. 8; D. 11; P. 12; V. 8; A. 26.

Body moderately elongate, compressed, naked; abdomen smooth, non-keeled. Depth 3·8 in total length (3·2 in standard length). Head naked, 3·7 in total length (3·2 in standard length). Eyes 5 1 in head, one diameter apart, near top of head, their major diameter obliquely vertical and with a broad transparent, membranous lateral fold. Snout in the form of a pointed wart beyond which the upper jaw slightly projects; lower jaw again projecting a little beyond the upper. Cleft of mouth very wide, maxilla extending about half an eye diameter behind orbit. Pre-maxilla with a series of close-set, uniform teeth, mostly pointing forwards; a sabre-shaped, depressible fang half as long as head on vomer; palatines with exactly similar fangs succeeded by a row of close-set teeth; a distinct series of similar fangs of unequal size on each side of mandible. A single dorsal; origin nearer to snout end than to adipose dorsal or caudal origin, altogether in the anterior half of body. Adipose dorsal above last third of anal origin much nearer to caudal origin than to dorsal origin. Pectorals moderate, 1·8 in head, situated near the ventral profile, in the same level with pelvics. Pelvics moderate, 2·1 in head; origin slightly behind dorsal origin, nearer to pectoral base than to anal origin. Anal longer than dorsal; origin nearer to pelvic origin than to caudal origin. Caudal forked, 1·5 in head. Lateral line as a white streak in spirit. Skin glandular, scaleless. Rows of white dots (luminous organs) along the free border of preopercle and inner border of mandible.

It attains 88 mm. in length; bathypelagic.

Distribution.—India: Bay of Bengal, 14° 13' 8" N., 80° 24' 2" E., 1048 m., 7·4° C.; Andaman Sea, 14° 13' N., 93° 40' E., 676—766 m.—Off Chagos Archipelago, 4° 5' 8" S., 73° 24' 8" E., 2000 m., in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 14° N.—4° S., 73°—93° E. in the Indian Ocean.

XLIV Family SUDIDAE

Body elongate or moderately elongate, subcylindrical or moderately or shortly compressed, naked or scaly, depressed or compressed. Head scaleless. No photophores. Abdomen smooth, non-keeled or keeled. Snout bluntly or sharply pointed or bill-like. Eyes large or small or entirely reduced. Cleft of mouth moderate or

very wide, oblique or horizontal. Teeth villiform, in narrow bands in jaws; vomerine and palatine teeth present or absent. A single dorsal in the anterior or posterior half of total length. Adipose dorsal present or absent. Pectorals well developed, with upper rays isolated or prolonged or pelvics with outer rays normal or produced. Anal short. Lateral line. Caudal forked, lowermost rays prolonged or normal.

Upper Cretaceous to recent.

The family SUDIDAE is represented by 3 subfamilies in the Indian region.

Key to subfamilies of family SUDIDAE

1. Eyes well developed ; pelvic, pectoral and caudal rays normal; head compressed 3
2. Eyes vestigial or absent ; some of pelvic pectoral and caudal rays unusually prolonged *BATHYPTEROINI*
3. Tail (measured from vent to hypural) shorter than trunk ; dorsal and pelvic origins, nearer to caudal end than to snout end; adipose dorsal present; anal longer than dorsal. *PARALEPIDINI*
4. Tail not shorter than trunk (equal to trunk when measured in total length) ; dorsal and pelvic origins much nearer to snout end than to caudal end ; adipose dorsal present; anal slightly shorter than dorsal *CHLOROPHTHALMINI*

xi. Subfamily *CHLOROPHTHALMINI*

Body moderately elongate, scaly. Head naked, compressed. Eyes large, well developed. Dorsal and pelvic origins much before middle of total length. Anal not longer than dorsal. Pectorals and pelvics normal. Tail (measured from vent to hypural) about 2.4—3.0 in total length (2.0 in standard length).

Upper Cretaceous to recent.

The subfamily *CHLOROPHTHALMINI* is represented by a single genus in the Indian region.

112. Genus *Chlorophthalmus* Bonaparte

1832-41. *Chlorophthalmus* Bonaparte, *Icongr. Fauna Ital.*, 3, fasc. 28, p. 144 (type, *C. agassizi* Bonaparte).

22—1341 ZSI/71

1880. *Hyphalonedrus* Goode, *Proc. U. S. nat. Mus.*, 11, p. 183 (type, *H. chalybeius* Goode).

1911. *Parasudis* Regan, *Ann. Mag. nat. Hist.* (8) 7, p. 127 (type, *Chlorophthalmus truculentus* G.B., orthotypic).

Body moderately elongate, subcylindrical, scaly. Scales cycloid, ctenoid or pectinated, without photophores. Tail about equal to trunk. Snout pointed. Eyes large. Cleft of mouth moderately wide. Teeth minute, in narrow bands on jaws, vomer and palatines. Gill-openings wide. Pseudobranchiae well developed. Gills 4. Gill-rakers numerous. Branchiostegals 8-10. Dorsal fin with 11 rays, in the anterior half of body; origin far in advance of anal origin. Pectorals large, inserted about middle of height. Pelvic origin slightly behind dorsal origin, nearer to pectoral base than to anal origin. Anal fin with 9-10 rays, in the posterior part of tail; origin behind dorsal origin. Adipose dorsal present. Caudal fin deeply forked.

Distribution.—Atlantic Ocean: East coast of North America between 28°—39°N., 70°—79° W., 291—497 m.; Middle and South Atlantic, 2011—2605 m.; North coast of Africa, 371—977 m.; Mediterranean; Indian Ocean: Zanzibar Area, 238—293 m.; South east Africa, 274—548 m.; Bay of Bengal, 48—457 m.; West coast of Sumatra, 371—977 m., Pacific Ocean: Madura Sea, 289 m., New Zealand, 2011—2605 m.; Fiji Is., 575 m.; Sandwich Is., 350—641 m.; Hawaii; Gulf of Panama, 383—522 m.

250. *Chlorophthalmus agassizi* Bonaparte*
(Text-fig. 87)

1832-41. *Chlorophthalmus agassizi* Bonaparte, *Icongr. Fauna Ital.*, 3, fasc., 28, p. 144 (type locality: Mediterranean).

1864. *Chlorophthalmus agassizii* Günther, *Cat. Fish. Brit. Mus.*, 5, p. 404 (Messina, 2—2½ inches in length).

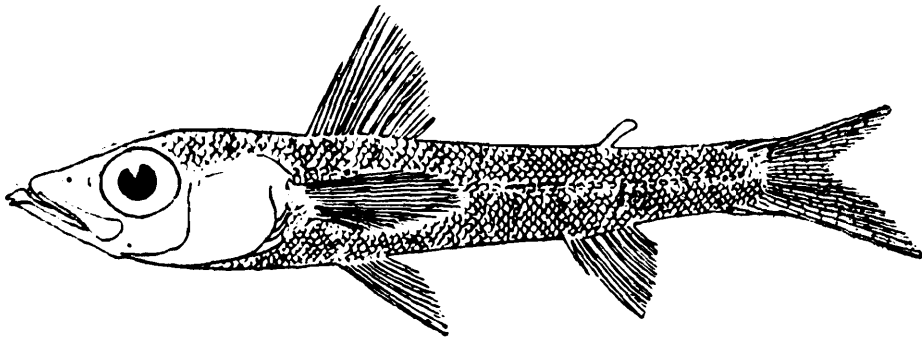
1887. *Chlorophthalmus productus* Günther, "*Challenger*" *Rep.*, 22, p. 193 (type locality: Pacific off Matuku, Fiji Is.).

1894. *Chlorophthalmus corniger* Alcock, *J. As. Soc. Bengal*, 63 (2), p. 133, pl. 6, fig. 5 (type locality: Bay of Bengal; 11½ miles S. 83° W., off Colombo Lt., 26½—250 fms.; type in the Zoological Survey of India).

1895. *Chlorophthalmus corniger* Alcock, *Ill. Zool. Investig. Fish.*, pl. 15, fig. 8.

*Tolasilingam, Venkataraman and Kartha (1964, *J.mar. biol. India* 6 (1), p.272) have reported *Chlorophthalmus bicornis* Norman off the Kerala coast besides the above species.

1896. *Chlorophthalmus corniger* Alcock, *J. As. Soc. Bengal*, 65, p. 333 (Bay of Bengal, 13° 51' 12" N., 80° 28' 12" E., 10° C., 145—250 fms.).
1899. *Chlorophthalmus corniger* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 155 (Bay of Bengal, off Madras coast, 145—250 fms.).
1904. *Chlorophthalmus punctatus* Gilchrist, *Mar. Investing. S. Africa*, 3, p. 1 (type locality : South Africa).
1906. *Chlorophthalmus corniger* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 145, 380.
1906. *Chlorophthalmus productus* Brauer, "Valdivia" *Tiefsee Fische*, 15, p. 379.
1906. *Chlorophthalmus agassizi* Brauer, "Valdivia" *Tiefsee Fische*, 15, p. 379.
1906. *Chlorophthalmus corniger* Brauer, "Valdivia" *Tiefsee Fische*, 15, p. 380 (W. coast of Sumatra, 371—977 fms., 11°—8°C.).
1913. *Chlorophthalmus productus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 177, fig. 69 (Madura Sea, 289 m.).
1913. *Chlorophthalmus corniger* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 178 (West coast of Sumatra, 371 m.).
1928. *Chlorophthalmus agassizi* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 3, p. 19.
1939. *Chlorophthalmus agassizi* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 24 (Zanzibar area, AT, 238—293 m.)
1949. *Chlorophthalmus agassizi* Misra, *Rec. Indian Mus.*, 45, p. 426.
1953. *Chlorophthalmus agassizi* Misra, *Rec. Indian Mus.*, 50, p. 415, fig. 26 b.
1953. *Chlorophthalmus agassizi* Smith, *Sea Fish. South. Africa*, p. 115 (in 150—300 fms. from Cape to Delagoa Bay).



TEXT-FIG. 87.—Lateral view of *Chlorophthalmus agassizi* Benap.
(After A. Alcock)

B. 8; D. 11; P. 14-16; V. 9; A. 9-10; L. I. ca 55-59;
L. tr. 8-9.

Body moderately elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 7.5 in total length (6.1 in standard length), about 2.2 in head. Head compressed, naked, 3.2 in total length (2.5—2.7 in standard length). Eyes large, 3.0 in head, 3.0 in interorbital, 0.7 in pointed snout. Cleft of mouth oblique, maxilla reaching beyond front border of eye (to the edge of the pupil). Lower jaw prominent forming a projecting, transverse, horizontal plate the anterior margin of which strongly denticulated and superiorly covered by small teeth. Teeth minute, in narrow bands in jaws; minute teeth on vomer and palatines. A single rayed dorsal; origin in the anterior half of total length, nearer to snout end than to caudal origin and about midway between snout end and adipose dorsal origin, slightly before pelvic origin. Adipose dorsal above the last third of anal. Pectorals 1.0—1.5 in head, almost reaching tips of pelvics or slightly beyond. Pelvics moderate, 1.8—2.0 in head; origin slightly behind dorsal origin and about half eye diameter behind pectoral base, nearer to anal origin than to snout end. Anal slightly shorter than dorsal; origin nearer to caudal origin than to pelvic origin. Caudal forked, 1.4—1.5 in head. Lateral line. 7 large pyloric caeca. 17—18 long, slender, finely denticulated gill rakers, the longest larger than filaments.

In spirit silvery grey; many broad, ill defined, dusky, cross bands; fins hyaline; top of caudal and base and top of dorsal black; numerous parallel oblique rows, very conspicuous on thorax and belly of tiny black specks with a silvery centre resembling incipient luminous spots. Fresh specimens brownish yellow with a faint silvery line, and indistinct brownish blotches decending from above to below; fins dusky.

It attains 200 mm. in length; bathypelagic.

Distribution.—India: Off Madras coast, 13° 51' 12" N., 80° 28' 12" E., 265-457 m., 10° C., Sri Lanka: Off Colombo Lt., 48—457 m.—East coast of North America between 28°—39° N., 70°—79° W., 2914—97 m., East North; Coast of Africa, 0° 29' 3" S., 42° 47' 6" E., 977 m.; Messina, Mediterranean; Zanzibar area, 5° S., 39° E., AT 238-293m., Cape of Good Hope to Delagoa Bay, 274—548 m.; West Coast of Sumatra, 0° 43' 12" S., 98° 33' 8" E., 371—977m.; 11°—8° C., Madura Sea, 289 m., Fiji Is., 575 m., Hawai; in the mean annual isotherm of 20° C. with the latitudinal

and longitudinal range of 20° N.—35° S., 18° E.,—155° W. in the Indo-Pacific = (13° N.—35° S., 18°—98° E., in the Indian Ocean + 20° N.—16° S., 113° E.—155° W. in the Pacific Ocean) and 38° 13' N., 15° 13' E. in the Mediterranean.

xii. Subfamily *PARALEPIDINI*

Body very elongate or moderately short and deep, with deciduous scales or naked skin. Head naked, compressed, moderately large. Eyes moderate or large. A pair of large nostrils before or behind end of maxillary. Large circular foramen at the anterior process of premaxillary. Teeth in mandible slender, non-serrate, rarely absent in adult, short or long. Teeth on each gill raker in one to 3 rows; a single or 2 separate patches on pharyngobranchials on either side; palatine teeth in one or two rows; vomer edentulous. Dorsal with 8-14 rays, origin behind middle of total length. An adipose dorsal above last third or fourth of anal fin. Pectorals well developed. Pelvics small, outer rays distinctly shorter than inner rays; origin behind middle of total length. Anal fin long. Caudal forked. Lateral line with scales or with membrane modified into large scale-like structures.

The subfamily *PARALEPIDINI* is represented by two genera in the Indian region.

*Key to genera of subfamily PARALEPIDINI **

1. Teeth on each gill-raker in single row; nostrils distinctly behind hind end of maxillary; body very elongate; a single patch of teeth on pharyngobranchials	Stemonosudis
2. Teeth on each gill-raker in 2 or 3 rows; nostrils distinctly before hind end of maxillary; body not very elongate; two separate large patches of teeth on pharyngobranchials	Paralepis

113. Genus *Paralepis* Cuvier

1817. *Paralepis* Cuvier, *Règne Animal*, 2, ed. 1, p. 289 [type, *Paralepis coregonoides* (Risso)].
1928. *Bathysudis* Parr, *Bull. Bingham Oceanogr. Coll.* 3, art. 3, pp. 41, 42 (type, *Lestidium (Bathysudis) speciosum* Bellotti, orthotypic).

*The genus *Lestidium* Gilbert has also been reported from Indian waters with the following three species, *Lestidium ruigers* (Jordon & Gilbert), *Lestidium japonicum* Tanaka and *Lestidium blanci* Kartha (vide Talwar, 1972, *Curr. Sci.*, 42 (2), p. 64),

Body moderately short and deep, compressed, with deciduous scales. Head large, snout short, broad. Nostrils considerably before posterior end of maxillary. Eyes large. Cleft of mouth very wide, upper jaw extending slightly beyond anterior margin of eye ; tip of lower jaw elevated; supermaxillary curved, rod-shaped, larger than maxillary in adult. Anterior process of supermaxillary with a wide circular foramen. Teeth on mandible non-serrate, slender, short, weak, sometimes absent in adult; palatine teeth short, in 2 irregular rows, anterior one depressible, posterior one of 15 short, fixed teeth. Tongue large. Teeth on each gill raker in 2 or 3 rows, unequal in size, arranged in bunch, anterior teeth long, extending over next raker, posterior ones short, needle-like. Two large separate tooth patches on pharyngobranchials on either side. Abdominal keel not well developed smooth. Dorsal short, in the posterior half of body. Pectorals with 12-20 rays, well developed. Pelvics small, far away from pectorals, opposite or behind dorsal, outer rays distinctly shorter than inner rays. Anal long, with 20-26 rays. A small adipose dorsal. Caudal emarginate. Lateral line; size of scales on lateral line equalling body scales. Branchiostegals 7-8. Vertebrae 67-74.

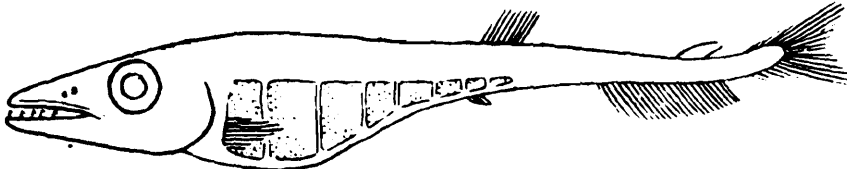
Distribution.—Bahamas ; off Cape Verde, West Africa; N. Atlantic ; Mediterranean; Indian Ocean.

251. *Paralepis elongatus* (Brauer)

(Text-fig. 88)

1906. *Omosudis elongatus* Brauer, "Valdivia" Tiefsee Fische, 15, pp. 140, 380, fig. 68 (type locality : Gulf of Guinea; Bay of Bengal, 70° 1' 12" N., 85° 56' 5" E., 2500 m., South of Ceylon, 4° 56' N., 78° 15' 3" E., 2000 m.
1949. *Omosudis elongatus* Misra, Rec. Indian Mus., 45, p. 428.
1953. *Lestidium (Bathysudis) speciosum* (nec Bellotti) Misra, Rec. Indian Mus., 50, p. 415.
1953. *Paralepis elongata* Harry, Pacific Sci., 7 (2), pp. 230, 231, 237 (Seychelles Is., Chagos Archipelago, S. Ceylon, Bay of Bengal, Cocos Is.).

1953. *Omosudis elongatus* Smith, *Sea Fish. South. Africa*, p. 115, fig. 186 (off Natal, 600 fms.).



TEXT-FIG. 88.—Lateral view of *Paralepis elongatus* (Br.) (After A. Brauer)

B. 8; D 8—10/O ; P. 12; A. 20-26.

Body moderately elongate, deep, compressed, with deciduous scales. Abdomen slightly keeled, smooth. Depth 5.9 in standard length. Head compressed, naked, 3.6—4.1 in standard length. Eyes large, 3.7—5.5 in head. Snout short, broad, 2.0—2.5 times eye diameter, 1.7—2.4 in head. Nostrils well before end of maxillary. Cleft of mouth wide, reaching a little beyond the anterior margin of eye. Teeth in lower jaw short, weak, often absent in adult; palatine teeth short, biserial anteriorly, first row depressible, second row of 15 short, fixed teeth; no teeth on vomer. Teeth in each gill raker in 2 or 3 rows; two large, separate, tooth patches on pharyngobranchials. A single rayed dorsal fin in the posterior half of body: origin close behind pelvic origin. A small adipose dorsal above last third of anal. Pectorals low. Pelvics small; origin opposite dorsal origin, nearer to anal origin than to pectoral base. Anal longer than dorsal; origin nearer to pelvic origin than to caudal origin. Caudal emarginate, nearly 2.0 in head. Lateral line with scales. Branchiostegals 8.

A postlarval specimen measuring 30 mm. has been obtained; abyssal.

Distribution.—India : Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m., South of Ceylon: 4° 56' N., 78° 15' 3" E., 2000 m. —off Natal, 29° S., 30° 30' E. 600 fms., Seychelles, 3° 34' 6" S., 58° 38' 1" E., 2008 m., Chagos archipelago, 6° 19' 35" S., 73° 18' 9" E., 1900 m., Gulf of Guinea, 2° 36' 5" N., 3° 27' 5" E., 1200 m., 0° 26' N; 7° E., 2000 m., 3° 55' 5" S., 7° 48' E., 3000 m., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 7° 1' 2" N—29° S., 30° 30'—85° 56' 5" E., in the Indian Ocean, 2° 36' 5" N., —30° 55' S., 3° 27' 5"—7° 48' 5" E. in the Atlantic Ocean.

114. Genus *Stemonosudis* Harry

1951. *Stemonosudis* Harry, *Zoologica*, 36, Pt. (1), p. 32 (type, *Stemonosudis intermedia* (Ege), orthotypic).

Body very elongate, low, slightly compressed, naked. Head long. Snout long, narrow. Nostrils behind posterior end of maxillary. Eye moderate. Cleft of mouth very wide; gape near tip of maxillary, upper jaw reaching nearly an eye diameter before anterior margin of eye; tip of lower jaw elevated or not elevated. Supramaxillary short, narrow, closely attached to maxillary. A foramen in the anterior portion of premaxillary. Teeth in upper jaw prominent, canine-like, antrose and retrose; teeth in mandible slender, canine-like retrose; no teeth on vomer; palatine teeth short, biserial anteriorly, first row depressible; posteriorly a few short uniserial teeth. Tongue small, far back in mouth. Teeth on gill-rakers uniserial, small, equalling in length a fourth of the breadth of the bone of gill arch; one patch of teeth on pharyngobranchials. Abdominal keel moderately developed. Dorsal short with 9—11 rays, in the posterior half of body. A small adipose dorsal. Pectorals short, 10—13 rays. Pelvics very small, far away from pectoral base, before dorsal. Anal very long, 37—50 rays. Caudal forked. Lateral line tubes very large. Membrane over lateral line tube modified into large scale-like structures pierced above and below by 2 pores on each segment.

Distribution.—Indian Ocean: Sri Lanka, Sumatra; Pacific Ocean: Straits of Macassar, Lord Howe Island; Atlantic Ocean; Caribbean Sea.

252. *Stemonosudis elongatus* (Ege)

1933. *Macroparalepis elongatus* Ege, *Dansk. Naturalist. For. Kjobenhayan. Vidensk. Medd.*, 94, p. 233 (type locality: South East of Ceylon, 4° 28'N., 82° 13'E., collected on 22. xi. 1929 by "Dana" in 1000 metres of wire out).
1953. *Stemonosudis elongata* Harry, *Pacific Sci.*, 7 (2), pp. 231, 241, 242 (Ceylon).
1955. *Stemonosudis elongatus* Munro, *Mar. Freshwater Fish. Ceylon*, p. 37 (S.E. of Ceylon, 500 fms.).

B. 8; D. 11; P. 13; V. 9; A. 50.

Body very elongate, low, slightly compressed, naked; abdomen moderately keeled. Depth 33.3 in standard length. Head long, scaleless, compressed, 6.6 in standard length. Eyes 5.2 in snout, interorbital 11.1 in head. Snout long, pointed, 1.8 in head. Cleft of mouth wide, maxilla extending an eye diameter before anterior margin of eye. Teeth in upper jaw well developed, canine-like, anterior ones directed inwards, posterior directed forwards; teeth in lower jaw slender, canine-like, directed inwards, larger teeth nearly 16.6 in snout length; vomer toothless; palatine teeth short, in 2 rows anteriorly, first row depressible and in single row posteriorly; teeth in gill rakers small, in single row; a single patch of teeth on pharyngobranchial. Dorsal short, in the posterior half of body; origin behind pelvic origin; predorsal length 1.6 in standard length. Pectorals small. An adipose dorsal near caudal end. Pelvics very small; origin before dorsal origin; distance between pelvic and dorsal origins about 10.0 in standard length. Anal very long; origin behind dorsal origin; preanal length in standard length. Vent before dorsal origin. Caudal small, forked. Lateral line tube large, membrane over lateral line tube modified into large scale-like structures.

Body pigmented with 31-32 peritoneal sections, pelvic origin being below the interval between the 6th and 7th pigmented segments counted from behind.

An adolescent specimen measuring 124 mm. in total length has been obtained; bathypelagic.

Distribution.— S. E. Sri Lanka, 4° 28' N., 82° 13' E. in the mean annual isotherm of 20° C.

xiii. Subfamily *BATHYPTEROINI*

Body elongate, scaly. Head naked, depressed. Eyes small or entirely absent. Dorsal and pelvic origins much before middle of total length. Anal not longer than dorsal. A few upper rays of pectorals, outer rays of pelvics and lower rays of caudal very much prolonged. Tail (measured from vent to hypural) 1.1 in a standard length.

The subfamily *BATHYPTEROINI* is represented by a single genus in the Indian region.

115. Genus **Bathypterois** Günther

1878. *Bathypterois* Günther, *Ann. Mag. nat. Hist.*, (5), 2, p. 183 (type, *B. longifilis* Gthr., orthotypic).
1895. *Synapteretmus* Goode & Bean, *Ocean. Ichth.*, p. 64 (type, *Bathypterois quadrifilis* Gthr., orthotypic.).
1911. *Hemipterois* Regan, *Ann. Mag. nat. Hist.*, (8) 7, p. 126 (type, *Bathypterois guentheri* Alc., orthotypic).
1916. *Belonopterois* Roule, *Bull. Inst. Oceanogr. Monaco.*, p. 13, (type, *B. viridensis* Ruole).

Body elongate, slightly compressed, with cycloid scales; without photophores. Tail longer than trunk. Snout, long, bill-like. Eyes very small or entirely reduced. Cleft of mouth very wide, horizontal. Villiform teeth in narrow bands on jaws; vomerine teeth present or absent; no teeth on palatine and tongue. Gill openings very wide; gill rakers long, numerous. Pseudobranchiae absent. Dorsal fin with 12—15 rays, in middle of back: origin in front of anal origin. Pectorals high on the shoulder remarkably developed, with the upper rays isolated and enormously prolonged. Pelvics abdominal with their outermost rays usually produced: origin in front of dorsal origin. Anal fin with 10—11 rays, in anterior part of tail origin behind dorsal origin. Adipose dorsal present or absent. Caudal fin well developed deeply forked, with its lowermost rays prolonged. Ventral outline of tail notched or not notched.

Distribution.—Atlantic Ocean: East coast of South America, 36°44' S., 46° W., 4844 m.; North coast of Africa, 1644 m.; Morocco coast, 834—1635 m.; Canary Is., 834—1635 m., Sudan coast, 834—1635 m., Brazil, 914 m., Azores, 1300—1384 m.; Indian Ocean: Arabian Sea, 1163—2084 m.; Bay of Bengal, 1026 m., Andaman Sea, 896—1026 m.; Pacific Ocean: Sandwich Is., 571—2401 m., New Zealand, 950—1151 m.; West coast of Central Americas, 1207—2068 m., South Pacific, 39° 41' S., 131° 23' W., 3761 m.

The genus **Bathypterois** is represented by 2 subgenera in the Indian region.

Key to the subgenera of genus Bathypterois Günther

1. Pectoral of 3 distinct portions;
an upper of 2 long, detached,
rigid filaments, the middle of 6
short, branched rays connected
together by stout inter-radial
membrane, and the lower of 5 free,
long, simple rays. *Hemipterois*
2. Pectoral 2 distinct portions; an
upper of 2 long, basally coherent
rays and a lower of 12—13 long,
free, rigid rays *Bathypterois*

x. Subgenus *Bathypterois* Günther

Pectoral of 2 distinct portions; an upper of 2 long,
basally coherent rays and a lower of 12—13 long, free,
rigid rays.

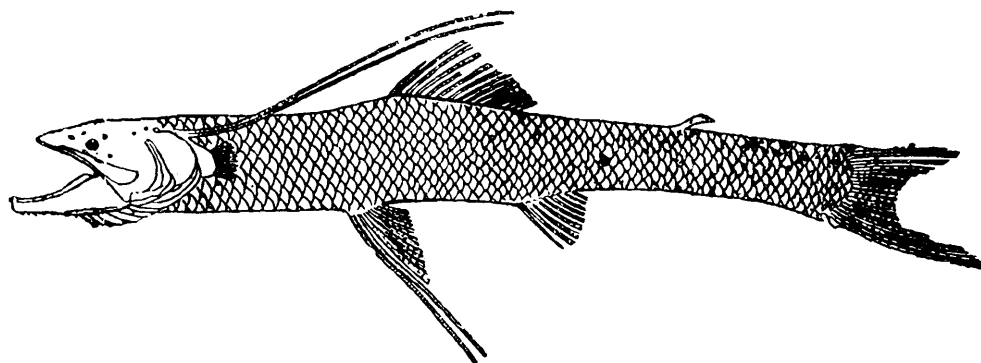
Key to species of subgenus Bathypterois Günther

1. Ventral outline of tail notched at
base of lower caudal rays *B. (B.) atricolor*
2. Ventral outline of tail not notched *B. (B.) insularum*

253. *Bathypterois* (*Bathypterois*) *atricolor* Alcock

(Pl. XI, fig. 1; Text-fig. 89)

1896. *Bathypterois atricolor* Alcock, *J. As. Soc. Bengal*, **65**, p. 306
(type-locality : Laccadive Sea, 13°47' N., 72° 34'45" E., 891
fms., 5°C. ; type in the Zoological Survey of India).
1897. *Bathypterois atricolor* Alcock, *Ill. Zool. Investig. Fish.*, pl. 17,
fig. 6.
1898. *Bathypterois atricolor* Alcock, *Ann. Mag. nat. Hist.*, (7) **2**, p.146
(off Laccadives, 891 fms.; off Maldives, 6°56'56" N.,
72°53'30" E., 459 fms.; off Cape Comorin, 7°40' N. 76°0'52"
E., 824 fms., 4·4°C.).
1899. *Bathypterois atricolor* Alcock, *Cat. Ind. Deep Sea Fish.*,
p. 159.
1906. *Bathypterois atricolor* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**
p. 380.
1928. *Bathypterois atricolor* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**,
art. 3, p. 30.
1949. *Bathypterois atricolor* Misra, *Rec. Indian Mus.*,
45, p. 426.
1953. *Bathypterois atricolor* Misra, *Rec. Indian Mus.*, **50**, p. 416,
fig. 29 a.



TEXT-FIG. 89.—Lateral view of *Bathypterois* (*Bathypterois*) *atricolor* Alc. (After A. Alcock)

B. 12; D. 15/0; P. 2/12; V. 9; A. 10; L. 1. 52; L. tr. 15.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 9.0 in total length (7.5—8.0 in standard length). Head depressed, naked, 6.0 in total length (5.0 in standard length). Eyes small, 5.0 in snout. Snout 3.3 in head, equal to interorbital. Cleft of mouth oblique, maxilla reaching 3 eye diameters behind eye. Lower jaw prominent. Villiform teeth in narrow band in jaws palatine edentulous. A single rayed dorsal; origin in the anterior half, of total length, nearer to snout end than to caudal origin, nearer to adipose dorsal origin than to snout end, about 3.2 eye diameters behind pelvic origin. Adipose dorsal far behind anal origin on the caudal peduncle, nearer to caudal origin than to dorsal origin and midway between last dorsal ray and the first caudal ray. Two upper pectoral rays prolonged, at least as far as the end of the caudal fin, coherent in basal part but not fused. Pelvic abdominal; origin 3 eye diameters before dorsal origin, nearer to pectoral base than to anal origin; 2 outer pelvic rays thickened, branched, prolonged as far as the 7th or 8th anal ray, not quite as long as head. Anal shorter than dorsal; origin just behind last dorsal ray, nearer to pelvic origin than to caudal origin and midway between adipose dorsal origin and pelvic origin. Caudal lobed, the lower lobe the longer, 1 1 in head. The ventral edge of caudal peduncle notched; length 3.2 in standard length; least height 4.0 in its length.

Uniform black except the pectoral filaments.

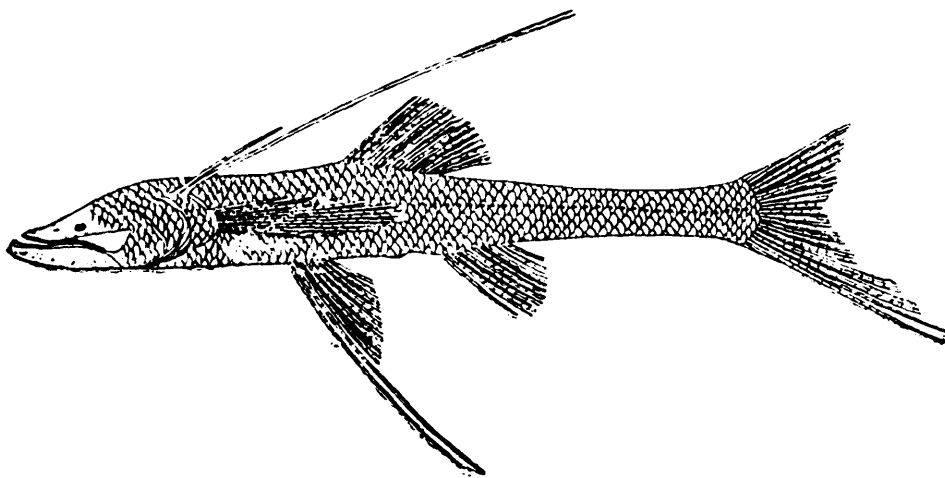
It attains 203 mm. in length; bathypelagic.

Distribution.—India: Laccadive Sea, 13°47' N., 72°34' 45" E., 1629 m., 5°C., Off Comorin, 7° 40' N., 76°0'52" E., 1506 m., 4.4°C., Off Maldives, 6°56' 56" N., 72° 53' 30" E., 830 m., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 6°—13° N., 72°—76° E. in the W. Arabian Sea.

254. *Bathypterois (Bathypterois) insularum* Alcock

(Pl. XI, fig. 2; Text-fig.90)

1892. *Bathypterois insularum* Alcock, *Ann. Mag. nat. Hist.*, (6) **10**, p. 356 (type-locality : Arabian Sea, 14°35' 15" N., 70°2'37" E., 1140 fms.; 3·1°C., type in the Zoological Survey of India).
1896. *Bathypterois insularum* Alcock, *J. As. Soc. Bengal*, **65**, p. 33 (Laccadive Sea, 1140 fms.).
1899. *Bathypterois insularum* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 158 (Arabian Sea, off Laccadive Is., 1140 fms.).
1900. *Bathypterois insularum* Alcock, *Ill. Zool. Investig. Fish.*, pl. 32, fig. 1.
1906. *Bathypterois insularum* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, p. 380.
1924. *Bathypterois capensis* Gilchrist & von Bonde, *Fish & Mar. biol. Surv. Rep.*, **3**, *Spec. Rep.* 7, p. (type locality : S. Africa).
1928. *Bathypterois insularum* Parr, *Bull. Bingham Ocean. Coll.*, **3**, art. 3, p. 27.
1949. *Bathypterois insularum* Misra, *Rec. Indian Mus.*, **45**, p. 427.
1953. *Bathypterois insularum* Misra, *Rec. Indian Mus.*, **50**, p. 416, fig. 26 a.



TEXT-FIG. 90.—Lateral view of *Bathypterois (Bathypterois) insularum* Alc., (After A. Alcock)

B. 13-14; D. 12-13/0 : P. 2/12-13; V 9; A. 10; L. 1.
48-51; L.tr. 13.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth a little more than half head length, 9·5 in total length (7·5 in standard length). Head depressed, naked, 5·4 in total length (4·0 in standard length). Eyes minute, 13·0 in head, about a snout length apart, 4·5 in snout. Snout spatulate, about 3·5 in head. Cleft of mouth

very wide, horizontal, maxilla extending 3.5 eye diameters behind orbit. Lower jaw prominent. Dentition as in *B. guentheri*. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, nearer to adipose dorsal origin than to snout end, about 5 eye diameters behind pelvic origin. Adipose dorsal far behind anal origin; origin nearer to caudal origin than to dorsal origin. Two uppermost rays of pectoral coherent in their basal half, reaching at least as far as the adipose dorsal; other pectoral rays slender, rigid, reaching at least as far as the vent. Pelvic large, abdominal; origin 5 eye diameters before dorsal origin, nearer to pectoral base than to anal origin; 2 outermost rays very stout, stiff, prolonged, about 1.6—2.0 times as long as head. Anal slightly shorter than dorsal; origin below last dorsal ray, much nearer to pelvic origin than to caudal origin and midway between pelvic and adipose dorsal origins. Caudal large, forked; 2 or 3 lower most rays of the lower lobe prolonged to a length at least 1/3 that of standard length. The ventral edge of caudal peduncle not notched, its length 3.0 in standard length; its least height 5.0 in its length.

Uniform black; fins hyaline grey.

It attains 139 mm. in length; abyssal.

Distribution.—India : Off the Laccadives, 14° 35' 15" N., 70° 2' 37" E., 2084 m., 3 1° C.—Coast of South Africa; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 14° N.—29° S., 30°—70° E., in the Indian Ocean.

xi. Subgenus *Hemipterois* Regan

Pectoral of 3 distinct portions; an upper of 2 long, detached, rigid filaments, the middle of 6 short, branched rays connected together by stout inter-radial membrane, and a lower of 5 free, long, simple rays.

The subgenus *Hemipterois* is represented by a single species, *Bathyptherois* (*Hemipterois*) *guentheri* Alcock, in the Indian region.

255. *Bathyptherois* (*Hemipterois*) *guentheri* Alcock (Pl. X)

1889. *Bathyptherois guentheri* Alcock, *Ann. Mag. nat. Hist.*, (6) 4, p. 450 (type locality : Andaman Sea, 7½ miles east of N. Cinque I., 13° 15' N., 48° 18' E., 490 fms., 12.8°C.; type in the Zoological Survey of India).

1891. *Bathypterois guentheri* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 129 (Bay of Bengal, 13°47'30" N., 92°36' E., 561 fms., 7.2°C.).
1892. *Bathypterois guentheri* [Alcock, *Ill. Zool. Investig. Fish.*, pl. 7, fig. 6.
1896. *Bathypterois guentheri* Alcock, *J. As. Soc. Bengal*, 65, p. 332 (off the coast of Andaman Is., 490-561 fms.).
1899. *Bathypterois guentheri* Alcock, *Cat. Ind. Deep. Sea Fish.*, p. 157 (Andaman Sea, 490 fms., Arabian Sea, off the Laccadives and Maldives, 636 & 719 fms., 7.6° C.).
1906. *Bathypterois guentheri* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 380.
1928. *Bathypterois guentheri* Parr, *Bull. Bingham Ocean. Coll.*, 3, art. 3, p. 25.
1949. *Bathypterois guentheri* Misra, *Rec. Indian Mus.*, 45, p. 426.
1953. *Bathypterois guentheri* Misra, *Rec. Indian Mus.*, 50, p. 416.

B. 12; D. 13/0; P. 2/6/5; V 7-8; A. 11; L.1. ca. 55.

Body elongate, compressed, scaly: abdomen smooth, non-keeled. Depth 8.7 in total length (6.0 in standard length). Head depressed, nearly as broad as deep, naked, 6.0 in total length (3.7 in standard length). Eyes minute, nearly in the middle of maxilla close to its edge, a snout length apart; orbital margins rounded, inflated. Interorbital flat from side to side. Nostrils small, superior, far in advance of eye. Cleft of mouth very wide, slightly oblique, more or less horizontal; maxilla reaching about a snout length behind orbit; maxilla dilated abruptly, truncated at hinder end, nearly 2/3rd head length. Lower jaw prominent. Villiform teeth in broad bands in the outer edges of the strong jaw bones; a minute patch on each side of expanded bone. A single rayed dorsal; origin before middle of total length, nearer to snout end than to caudal origin, about 4 eye diameters behind pelvic origin. Adipose dorsal far behind anal origin; origin nearer to caudal origin than to dorsal origin. Pectorals of 3 distinct portions, an upper portion of 2 detached rigid filaments, the first of which reaching to the tip of the upper caudal lobe; the middle portion of 6 comparatively short, branched rays decreasing in length from above downwards connected together by stout inter-radial membrane; the lower portion of 5 free, simple, elongated rays reaching at least half way along the tail. Pelvics abdominal; origin 4 eye diameters before dorsal origin, its

outermost ray forming a long curved rigid spatulate appendage nearly 2·2 in total length in the adult and much longer in the young. Anal shorter than dorsal; origin below 9th—10th dorsal ray, much nearer pelvic origin than to adipose dorsal and caudal origins. Caudal large, deeply forked; the lowermost ray rigid, prolonged, curved with spatulate tip about 2·4 in total length. Ventral edge of caudal peduncle not notched; length 2·8 in standard length, its least height 5·0 in its length. Gill rakers numerous, closely-set, long, bristle-like except on the 4th arch.

In spirit the head nearly black, the body dark brown with 2 broad, transverse, white bands, one in front of dorsal, the other near the middle of tail; caudal white, other fins black.

It attains 190 mm. in length excluding caudal rays; bathypelagic.

Distribution.—India: East of North Cinque I., 13°15' N., 48°18' E., 896 m., 12·8° C., Bay of Bengal, 13°47'30" N., 92°36' E., 1026 m., 7·2° C., off the Laccadives, 1163 m., 7° C.; Sri Lanka: off the Maldives, 1316 m., 6° C., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 4°—13° N., 72°—92° E. in the Indian Ocean.

XLV. Family MYCTOPHIDAE

Body moderately elongate, compressed, scaly or naked. With or without photophores, photophores when present restricted to definite and separate series or not infra and supracaudal luminous scales present or absent or only infra or supracaudal present. Head scaleless, more or less compressed. Eyes large or moderate. Cleft of mouth wide, oblique, maxilla extending to or behind hind border of eye. Jaws more or less subequal. Villiform teeth in band in jaws, palatines, pterygoid and often on tongue and vomer. Gill openings wide; gill rakers long, numerous. A single rayed dorsal fin. Adipose dorsal present or absent. Pectorals long or short, in the middle or below the middle of body. Pelvics moderate. Anal equal, longer or shorter than dorsal. Caudal forked. Branchiostegals 8—10.

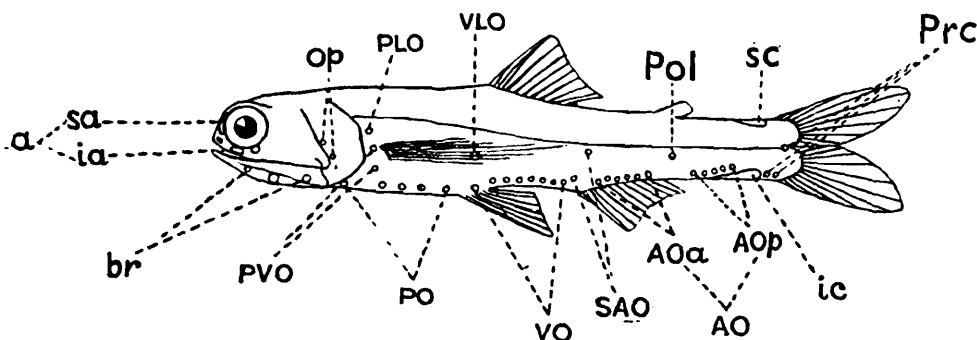
Miocene to recent.

Family MYCTOPHIDAE is represented by 3 subfamilies in the Indian region.

Key to subfamilies of family MYCTOPHIDAE

1. Photophores ; present ; supramaxillary present or absent 3
2. Photophores absent ; supramaxillary present *SCOPELENGINI*
3. Photophores restricted to definite and separate series ; supramaxillary absent *MYCTOPHINI*
4. Photophores not restricted to definite and separate series but one photophore to each scale on entire body or photophores only on the ventral part of body ; supramaxillary present *NEOSCOPELINI*

xiv. Subfamily *MYCTOPHINI*
(Text-fig. 91)



TEXT-FIG. 91.—A hypothetical myctophid fish showing the topography of photophores (terminology is after A. Brauer and A. Parr).

- a. antorbital; AO=anal; AOa=antero-anal; AOp—postero.anal; br=branchiostegal; ia=inferior or lower antorbital; ic=infracaudal luminous organ; op=opercular; PLO=suprapectoral; PO=pectoral; Pol=postero-lateral; Prc=precaudal; PVO=subpectoral; sa=superior or upper antorbital; SAO=supra-anal; sc=supracaudal luminous organ; VLO=supra-ventral; VO=ventral.

Supramaxillary absent. Maxilla extending to or beyond postorbit. Photophores restricted to definite and separate series. Antorbital normal or conspicuously enlarged. Photophores above or below the lateral line. 1 or 2 Pol, or Pol absent. Prc 2 or 3 or 4. Supra—and infracaudal luminous glands present or absent or only supra or infracaudal present. Anal base longer or equal to or shorter than dorsal origin; below dorsal base or behind last dorsal ray. Procurent caudal rays soft without luminous glands or stiff, spine-like with or without luminous glands.

Small shining fishes of deep water.

The subfamily *MYCTOPHINI* is represented by 8 genera in the Indian region.

*Key to genera of subfamily MYCTOPHINI*¹

1. Anal base longer than rayed dorsal base; 2 Prc.	3	
2. Anal base equal to or slightly shorter than rayed dorsal base (except genus <i>Lampanyctus</i> where slightly longer); Prc 2, 3 or 4	11	
3. PLO above pectoral base	5	
4. PLO not above pectoral base		Gonichthys
5. 2 Pol : VO level ; PVO oblique in a straight line with first PO : second Prc elevated		Hygophum
6. One Pol : second VO elevated or level ; PVO not in a straight line with first PO or PVO oblique in straight line with first PO	7	
7. Second VO elevated ; PVO horizontal : anal origin before last dorsal	9	
8. Second VO level ; PVO oblique ; anal origin opposite or behind last dorsal ray		Myctophum
9. Teeth cardiform; second Prc much elevated.		Benthoosema
10. Teeth flattened lanceolate ; second Prc level		Diogenichthys
11. Procurrent caudal rays spine-like ; superior (<i>sa</i>) antorbital absent ; inferior (<i>ia</i>) antorbital normal ; Prc 3 or 4.		Lampanyctus
12. Procurrent caudal rays soft ; superior (<i>sa</i>) antorbital well developed or not well developed ; inferior (<i>ia</i>) antorbital in 2 or 3 separate or confluent parts or absent ; 2 or 4 Prc ; fourth PO elevated or third and fourth PO much elevated ; lateral line prominent or obsolete ; photophores above or below lateral line	13	
13. Superior (<i>sa</i>) antorbital well developed inferior (<i>ia</i>) antorbital in 2 or 3 separate or confluent parts ; 4 Prc in ascending series ; lateral line prominent ; photophores below lateral line		Diaphus

¹The key is modified after A. Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1040.

14. Superior (*sa*) antorbital organ not well developed ; inferior (*ia*) antorbital absent ; 2 Prc in a vertical line ; lateral line obsolete ; photophores above lateral line

Notolychnus

116. Genus *Benthoosema* Goode & Bean

1895. *Benthoosema* Goode & Bean, *Bull. U. S. nat. Mus.*, 17 [1894], p. 75 (type, *Scopelus mulleri* Gmelin=*Scopelus glacialis* Reinhardt).

Body moderately elongate, compressed with scales and photophores. Photophores limited to definite and separate series; precaudal photophores two; antorbital photophores not enlarged; superior antorbital (*sa*); no inferior antorbital (*ia*); a small suborbital (SO) present or absent; suprapectoral (PLO) above pectoral base; subpectoral (PVO) horizontal; 5 PO; 4 VO, the second VO elevated; AOp entirely behind anal fin in the species of the Indian region; a single Pol; Prc 2, second elevated; a small supracaudal in male and an infracaudal in female. No pterotic spine. Snout short. Eyes large. Cleft of mouth wide, maxilla extending to or a little beyond postorbit. Teeth cardiform in bands on jaws and palatines; a small patch on vomer and a broad patch on entopterygoid. Gill openings wide; gill-rakers well developed. Pseudobranchiae well developed. Dorsal fin with 11-13 rays; origin nearly opposite or behind pelvic origin; adipose dorsal origin opposite or slightly behind last anal ray. Pectoral reaching or not reaching anal origin. Pelvics short not reaching anal origin, origin opposite or before dorsal origin. Anal with 17-19 rays, origin nearly below middle of dorsal base or opposite last dorsal ray; base longer than dorsal base. Caudal forked, procurrent caudal rays soft. Cycloid scales. Lateral line.

Distribution.—Atlantic Ocean : North and South Atlantic; Indian Ocean : off Cape Point; Arabian Sea; Gulf of Oman; Bay of Bengal; Pacific Ocean : Macassar strait; Philippines; Japan; Hawaii; Arctic Ocean.

Key to the species of genus Benthoosema Goode & Bean

1. PO level ; second Prc well below lateral line ; PLO nearer lateral line than to pectoral base *B. fibulatum*
2. Last PO elevated ; second Prc near lateral line; PLO midway between lateral line and pectoral base *B. pterotus*

256. *Benthosema fibulatum* (Gilbert & Cramer)

1897. *Myctophum fibulatum* Gilbert & Cramer, *Proc. U.S. nat. Mus.*, p. 411, pl. 38, fig. 3 (type locality : 12°13' N., 157°43'37" E., type in the United States National Museum).
1906. *Myctophum pterotum* Brauer (*partim*), "Valdivia" *Tiefsee Fische*, 15, p. 182, fig. 93.
1913. *Myctophum pterotum* Weber & de Beaufort. (*partim*), *Fish. Indo-Austral. Archipel.*, 2, p. 157 (Macassar Strait).
1928. *Myctophum fibulatum* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 3, pp. 61, 67, fig. 7 (Hawaiian Is.).
1930. *Myctophum fibulatum* Norman, "Discovery" *Rep.*, 2, p. 325 (35°01' S., 10°18' E., TYF, 250 (—0) m.).
1939. *Myctophum fibulatum* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 28 (Arabian Sea, 23°2' 48" N., 64° 31' 54" E., 23°2' 30" N., 64° 41' E., N 200, 2000 (—0) m., 3·18°C., N 100, 1500 (—0) m., 5·57°C.).
- 1948-49. *Benthosema fibulata* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1052.
1949. *Myctophum fibulatum* Misra, *Rec. Indian Mus.*, 45, p. 427.
1953. *Myctophum fibulatum* Misra. *Rec. Indian Mus.*, 50, p. 418.
1953. *Myctophum fibulatum* Herre, *Check List Philippine Fish.*, p. 143 (Philippines).

B. 8-10; D. 12/0; P. 16; V. 8; A. 19; L. 1. 27-28.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.8-5.0 in total length (4.0 in standard length); width about 2.0 in its depth. Head compressed, naked, 3.9 in total length (3.0—3.2 in standard length). Eyes large, 2.7—2.9 in head, its upper rim nearly entering profile. Interorbital flat, broad, 1.5 in eye. Snout steep, blunt, short, 2.0 in eye. Cleft of mouth oblique, maxilla extending to 1/4 or 1/5 of its length beyond the postorbit. Teeth very small, in narrow bands in jaws and palatines. Jaws subequal, lower jaw with a very small symphyseal base. A single rayed dorsal fin; origin nearly midway between snout end and caudal origin, nearer to adipose dorsal than to snout end. Adipose dorsal above last third of anal; origin nearer to caudal origin than to dorsal origin. Pectorals 1 1 in head, reaching beyond anal origin. Pelvics small, 2.5 in head, not reaching anal origin; origin nearer to pectoral base than to anal origin, about 1/2 eye diameter before dorsal origin. Anal longer than dorsal; origin below 9th or 10th dorsal ray, much nearer to pelvic origin than to caudal origin. Caudal forked,

1.2 in head. Least height of caudal peduncle 1.5 in its length. Lateral line. Cycloid deciduous scales. Photophores: no suborbital; one opercular; one suprapectoral (PLO) nearer lateral line than to pectoral base; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO) level; one supraventral (VLO), below lateral line; 5 ventrals (VO), second VO elevated; 3 supra-anals (SAO), first SAO lower than second SAO and such lower than VLO, third SAO elevated, on the lateral line; anals (AO) 6 + 5; one posterolateral (Pol); 2 precaudals (Prc), second elevated, well below lateral line; one supracaudal luminous scale in male.

In spirit dusky to blackish brown; scales silvery steel blue, iridescent; snout whitish, adipose dorsal white, black at base, peritoneum black.

It attains 101 mm. in length; bathypelagic.

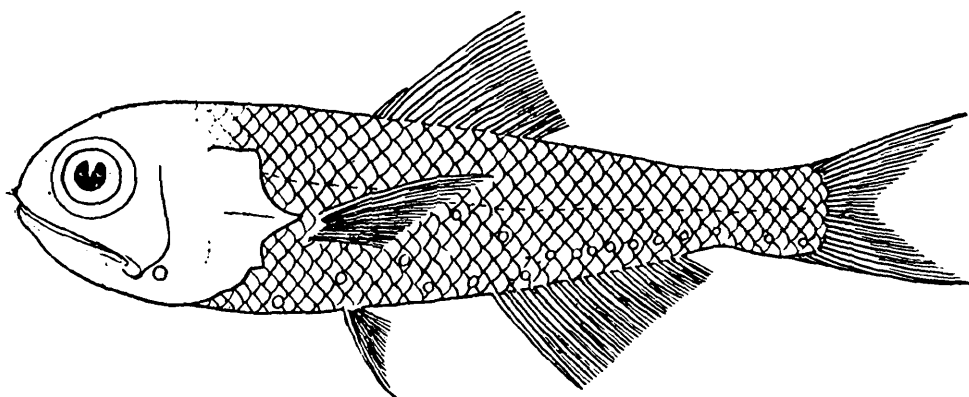
Distribution.—Arabian Sea, 23°2'48" N., 64°31'54" E., 23°2'36" N., 64°41' E., N. 200, 2000 (—0) m., 3.18° C., N 100, 1500 (—0) m., 5.57° C. —Macassar Straits; Philippines, 14° N., 123° E., Hawaii; South Atlantic Ocean, 35°1' S., 10°18' E., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 23° N.—5° S., 64° E.—155° W. in the Indo-Pacific = (23° N., 64° E. in the Indian Ocean + 20° N.—5° S., 119° E.—155° W. in the Pacific Ocean) and 35°1' S., 10°18' E. in the Atlantic Ocean.

257. *Eenthosema pterotus* (Alcock)

(Text-fig. 92)

- 1890. *Scopelus* (*Myctophum*) *pterotus* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 217 (type locality: Bay of Bengal, 18°30' N., 84°46' E., 98—102 fms.; type in the Zoological Survey of India).
- 1894. *Scopelus pterotus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 4, fig. 3.
- 1896. *Scopelus* (*Myctophum*) *pterotus* Alcock, *J. As. Soc. Bengal*, 65, p. 333 (off Madras coast, 98—102 fms.).
- 1899. *Scopelus pterotus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 162 (Bay of Bengal, 98—102 fms.; Andaman Sea, 14°13' N., 93°40' E., 370—419 fms.).
- 1906. *Myctophum* (*Myctophum*) *pterotum* Brauer (*partim*), "*Valdivia*" *Tiefsee Fische*, 15, pp. 182, 382, fig. 94, *nec.* fig. 93.
- 1913. *Myctophum pterotum* Weber & de Beaufort (*partim*), *Fish. Indo-Austral. Archipel.*, 2, p. 157 (Macassar Straits).

1928. *Myctophum pterotum* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 3, p. 60 (Indian and Pacific Oceans; occurrence in Atlantic very doubtful, the records being based upon an erroneous identification of this species with *M. fibulatum*).
1931. *Myctophum pterotum* Tanaka, *J. Faculty Sci. Tokyo*, 3, pt. 1, p. 19 (Southern Japan area).
1939. *Myctophum pterotum* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 28 (Arabian Sea, 23°2' 48" N., 64°31'54" E., 23°2'30" N., 64°41' E., N 200, 2000 (—0) m., 3·18° C., N 100, 1500 (—0) m., 5·57° C.; 19°21'18" N., 69°30'24" E., 19° 19' N., 69°30' 24" E., 549—640 m., 11·8° C.).
- 1948-49. *Benthoosema pterota* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1052.
1949. *Myctophum pterotus* Misra, *Rec. Indian Mus.*, 45, p. 428.
1953. *Myctophum pterotus* Misra, *Rec. Indian Mus.*, 50 p, 418, fig. 27 d.
1953. *Myctophum pterotum* Herre, *Check List Philippine Fish.*, p. 144 (near Romblon I., Philippines).
1953. *Myctophum pterotum* Smith. *Sea Fish. South. Africa*, p. 121, (off Cape Point).



TEXT-FIG. 92.—Lateral view of *Benthoosema pterotus* (Alc. (After A. Alcock)

B. 8—10; D. 11-13/0; P. 12-15; V. 8; A. 17-18; L. 1 30—34.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4·5—5·0 in total length (3·6—4·0 in standard length). Head compressed, naked, 3·7 in total length (2·9—3·0 in standard length). Eyes large, 3·0 in head, thrice obtuse snout. Cleft of mouth oblique, maxilla extending beyond orbit. Jaws subequal. No vomerine teeth. Opercle large; operculum produced into a membranous spur behind; vertical border of preopercle very oblique. A single rayed dorsal fin;

origin slightly nearer to caudal origin than to snout end, half eye diameter behind pelvic origin. Adipose dorsal above last fourth of anal; origin nearer to caudal origin than to dorsal origin. Pectorals long, reaching beyond anal origin, equal to head. Pelvics moderate, 2.2 in head, reaching vent and not reaching anal origin; origin half an eye diameter before dorsal origin. Anal longer than dorsal; origin below the 12-15th dorsal rays, much nearer to pelvic origin than to caudal origin. Caudal deeply forked, 1 1 in head. Least height of caudal peduncle 2.0 in its length. Lateral line. Photophores: one antorbital; no suborbital; one preopercular; 2 along edge of gill opening; one supra-pectoral (PLO) 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO) last elevated; 4 ventrals (VO), second VO more or less elevated; one supraventral (VLO); 3 supra-anals (SAO), first SAO on a level with second SAO and VLO, third SAO elevated from the two; anals (AO) 5+5; one postero-lateral (Pol) below lateral line; 2 pre-caudals (Prc.) second close to lateral line; 3 supracaudal luminous scales. (O).

Silvery.

It attains about 61 mm.; bathypelagic.

Distribution.—India : Bay of Bengal, 18°30' N., 84°46' E., 179—186 m.; Andaman Sea, 14°13' N., 93°40' E., 676—766 m.; Arabian Sea, 19°21'18" N., 69° 30'24" E., 19°19' N., 69°30'24" E., AT 549—640 m., 11.8° C., Pakistan : Arabian Sea; 23°2'48" N., 64°31'54" E., 23°2'30" N., 64°41' E., N 200, 2000 (—0) m., 3.18° C., N 100, 1500 (—0) m., 5.57° C.; Gulf of Oman; Off Cape Point; Macassar Strait 5°5' S., 119°30' E.; Philippines; Japan 34°N., 135° E.; in the mean annual isotherm of 20° C. with latitudinal and longitudinal range of 34° N.—35° S., 18°—135° E. in the Indo-Pacific=(23°N. —35° S., 18°—93° E. in the Indian Ocean + 32° N. — 5° S., 110°—135° E., in the Pacific Ocean).

117. Genus *Diogenichthys* Bolin

1939. *Diogenichthys* Bolin, *Stanford Ichth. Bull.*, 1, p. 119 (type *Myctophum laternatus* Garman, orthotypic).

Body elongate, compressed with scales and photophores. Photophores limited to definite and separate

series; precaudal photophores two; *sa Present no ia*; PLO well above pectoral base ; 5 pectorals (PO) level; 4 ventrals (VO), second (VO) elevated; AOP entirely behind anal end; a single Pol; Prc 2, the second not elevated; supracaudal luminous gland in male, infracaudal in female. Snout short. Eyes large. Maxillary extending to or beyond postorbit. Teeth lanceolate, flattened in single series in upper jaw; in 2 series in lower jaw; 2 or 3 cardiform teeth on each vomer; irregular series of cardiform teeth on palatines and entopterygoids. No pterotic spine. Gill openings wide; gill-rakers well developed. Pseudobranchiae well developed. Dorsal fin origin opposite or behind pelvic origin. Adipose dorsal above last portion of anal base. Pectorals reaching anal origin. Pelvics small, reaching or not reaching anal origin ; origin opposite or before dorsal origin. Anal origin nearly opposite or before last dorsal ray; base longer than dorsal base. Caudal forked; procurrent caudal rays soft. Scales. Lateral line.

Distribution.—Atlantic Ocean : Cape Verde; Sierre Leone; Gulf of Guinea, 2000—3000 m.; Indian Ocean : between Zanzibar and Seychelles, 2500 m., between Chagos Archipelago and Sri Lanka, 1900—2500 m., S. of Socotra, 1500—2000 m., Gulf of Aden, 1200 m., between New Amsterdam and Sumatra, 2200—2400 m., Arabian Sea, S.E. of Maldives, 2500 m., Pacific Ocean: Japan; Gulf of Panama; West coast of California, between 7° N. and 27° 39' N.

The genus **Diogenichthys** is represented by two species in the Indian region.

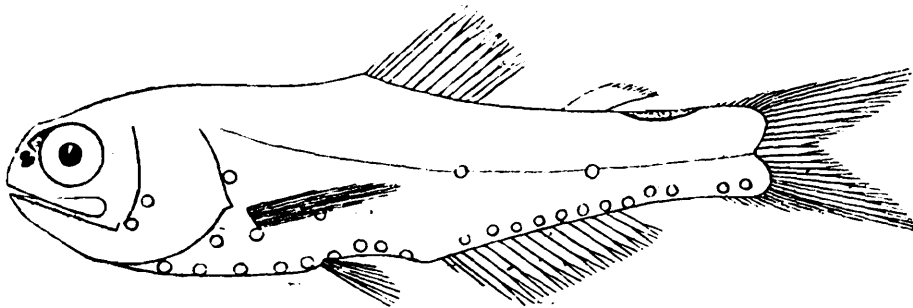
Key to the species of genus Diogenichthys Bolin

1. Maxilla extending beyond postorbit ;
dorsal origin behind pelvic origin;
VLO nearer to pelvics than to lateral
line ; first SAO above 4th VO *D. laternatum*
2. Maxilla extending to postorbit;
dorsal origin opposite pelvic origin;
VLO midway between lateral line
and pelvics; first SAO above and
a little behind VO *D. panurgus*

258. *Diogenichthys laternatum* (Garman)

(Text-fig. 93)

1899. *Myctophum laternatum* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 267, pl. 56, fig. 1 (type locality : 10° 14' N., 96° 28' W., surface to 200 fms.).
1906. *Myctophum* (*Myctophum*) *laternatum* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 178, 382, figs. 89—91 (Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m.).
1913. *Myctophum laternatum* Weber & de Beaufort, *Fish. Indo-Austral Archipel.*, 2, p. 156 (Banda Sea, 5° S., 128° E., 1500 (—0) m.).
1928. *Myctophum laternatum atlanticum* Taaning, *Vidensk. Medd. Dansk. Naturhist. Foren.*, 86, p. 52 (type locality : Atlantic Ocean).
1928. *Myctophum laternatum* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 3, pp. 61, 67 (Atlantic, Indian & Pacific Oceans).
1930. *Myctophum laternatum* Norman, "Discovery" *Rep.*, 2, p. 324 (8° N.—34° S., 16° E.—16° W., TYE, 250—2500 (—0) m., N 450, 125—175 (—0) m., N 70, 750—1000 m., at 34° S., 16° E., TYF, 1000 (—0) m., surf. temp. 16.53° C., bottom temp. 352° C.; at 3° N., 16° W., N 70, 750—1000 m., surf. temp. 25.30° C., bottom temp. 4.68° C. at 1000 m.).
1931. *Myctophum laternatum* Tanaka, *J. Faculty Sci. Tokyo*, 3, pt. 1, p. 18 (Southern Japan area).
1949. *Myctophum laternatum* Misra, *Rec. Indian Mus.*, 45, p. 427.
1953. *Myctophum laternatum* Misra, *Rec. Indian Mus.*, 50, p. 418, text-fig. 27 c.



TEXT-FIG. 93.—Lateral view of *Diogenichthys laternatum* Garm.
(After S. Garman)

B. 8-10;—D. 11-12/0; P. 10-11; V. 8; A. 15-16; L. 1. 32-34.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.7—5.1 in total length (3.7—4.2 in standard length). Head compressed, naked, 4.2 in total length (3.4 in standard length). Eyes 3.2 in head, 2.0

times snout. Cleft of mouth oblique, maxilla extending beyond postorbit. Jaws subequal. A single rayed dorsal fin; origin midway between snout end and caudal origin, or nearer to snout end than caudal origin, nearer to adipose dorsal origin than to snout end, about $\frac{3}{4}$ eye diameter behind pelvic origin. Adipose dorsal above last half of anal, nearer to caudal origin than to dorsal origin; base 2.0 in eye. Pectorals reaching beyond anal origin, 1.2 in head. Pelvics small, 2.5 in head; origin $\frac{3}{4}$ eye diameters before dorsal origin. Anal longer than dorsal; origin below last 10th or 11th dorsal ray, much nearer to pelvic origin than to caudal origin. Caudal forked, equal to or 1.1 in head, least height of caudal peduncle 1.6—2.0 in its length. Lateral line. Photophores: one antorbitals; no suborbitals, one suprapectoral (PLO); 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO) between isthmus and pectorals; 1 supraventral (VLO) nearer pelvics than to lateral line; 4 ventrals (VO) between pelvic and anal origins; second VO more or less elevated; first supra-anal (SAO) above fourth PO not in line with other 2 SAO, and much below VLO (supraventral); 3 supra-anals; anals (AO) 6 + 3; 1 postero-lateral (Pol); 2 precaudals (Prc) close together, falling far below the line between these two organs; a large supracaudal luminous scale male specimen.

It attains 220 mm. in length; abyssal.

Distribution.—India : Bay of Bengal, 7°1'2" N., 85°56'5" E., 2500 m.; Sri Lanka; Southeast of Maldives, 2°29'9" N. 76°47' E., 2500 m.—Cape Verde, 14° N., 21° W.; Sierra Leone, 5° N., 13° W., Gulf of Guinea, 0°25' N.—3° S. 7°E.—6°W., 2000—3500 m., between Seychelles and Chagos Archipelago, 2°—4° S., 58°—70° E., 2000—2500 m.; between Chagos Archipelago and Sri Lanka, 4° N.—6° S.; 73°—78° E., 1900—2500 m., S. of Socotra, 9° N. 53° E., 1500—2000 m.; Gulf of Aden, 13° N. 46°E., 1200 m., between New Amsterdam and Sumatra, 10°—26°S., 93°—97°E., 220°—2400 m. West coast of California between 7°N. and 27°39' N.; Gulf of Japan, 34°N. 130° E. Panama; in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 34° N.—26° S., 46° E.—80° W in the Indo-Pacific=(13° N.—26° S., 46°—97° E. in the Indian Ocean+32° N.—5° S., 128° E.—80° W. in the Pacific Ocean) and 14° N.—34° S., 16° E.—21° W. in the Atlantic.

259. *Diogenichthys panurgus* Bolin

1939. *Myctophum laternatum* Norman, (*nec.* Garman) *Sci. Rep. John Murray Exped.*, 7, p. 29 (Arabian Sea, 12° 8' 6" N., 63° 4' 36" E.; 12° 5' 18" N., 63° 1' 42" E., N 200, 480-980 m., 12. 12°—8·40° C.)
1946. *Diogenichthys panurgus* Bolin, *Stanford Ichth. Bull.*, 3, p. 140, fig. 2 (type locality: 5° 56' N., 76° 22' E., 0—200 fms., collected on 23-4-1924 A. D., with Mid-water Townet by R.I.M.S. Investigator").
- 1948-49. *Diogenichthys panurgus* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1053, fig. (Indian Ocean).

B. 8—10; D. 11—12/0. P. 10—11; V 8; A.15—16; L.1. 32—34.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4·7 in total length (3·9 in standard length). Eyes 3·1 in head, 2·4 times snout. Cleft of mouth oblique, maxilla extending to postorbit. Jaws subequal. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, nearer to adipose dorsal origin than to snout end and opposite pelvic origin. Adipose dorsal above last half of anal, near to caudal origin than to dorsal origin; 2·2 in eye. Pectorals 1·4 in head just reaching anal origin. Pelvics small, 2·2 in head reaching anal origin; origin opposite dorsal origin. Anal longer than dorsal; origin opposite last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked 1·3 in head; least height of caudal peduncle 2·0 in its length. Lateral line. Photophores: one antorbital; no suborbital; one suprapectoral (PLO); 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO); one supra-ventral (VLO) midway between lateral line and pelvics; 4 ventrals (VO), second VO elevated; first SAO (supra-anal) above and a little behind fourth VO, not in line with other two SAO; 3 supra-anals (SAO) 5 + 3 anals (AO); one postero-lateral (Pol); 2 precaudals (Prc) close together a large supracaudal luminous gland medially behind adipose fin in male; a smaller infracaudal luminous gland in female.

It attains 27 mm. in length; abyssal.

Distribution.—India: Arabian Sea, 12°5' 18"—12°8'6" N., 63°1' 42"—63°4' 36" E.—Arabian Sea 9°40'24"—9° 42' 18" N., 54° 33'36"—54°29' E., in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 9° N., 54°—63° E., in the Arabian Sea.

118. Genus **Gonichthys** Gistel

1839. *Alysia* Lowe, (*nec.* Latreille, 1804, in *Hymenoptera*) *Proc. zool. Soc. Lond.*, 7, p. 87 [type, *A. loricatus* Lowe (= *Scopelus coccoi* Cocco), name preoccupied; inadmissible].
1850. *Gonichthys* Gistel, *Isis Munich*, (5), p. 71 [type, *G. loricatus* (Lowe)=*Scopelus coccoi* Cocco]
1892. *Rhinoscopelus* Lütken, *Vid. Selsk. Skr.*, (6) 7, p. 242 (type, *Scopelus coccoi* Cocco, orthotypic).

Body moderately elongate, compressed, with scales and photophores. Photophores limited to definite and separate series; Prc two; superior antorbital (*sa*) and inferior antorbital (*ia*) present; PLO at upper end of pectoral base; PVO in straight line with first PO; 5 PO; 4 VO; PO and VO level; AO in 2 distinct series level; Pol far in advance of adipose dorsal; 2 Prc level; a series of separate luminous glands between procurrent caudal rays and adipose in male, a similar series between anal fin and procurrent caudal rays in female. Snout projecting. Eyes large. Cleft of mouth wide; maxillary slender extending beyond postorbit. Teeth cardiform in single series in premaxillaries; in bands in lower jaw and palatines; a small patch of similar teeth on vomers and large patch on entopterygoids. Gill openings wide; gill-rakers well developed. Pseudobranchiae well developed. No pterotic spine. Dorsal fin with 10-12 rays; origin behind pelvic origin; adipose dorsal above last third of anal base. Pectoral short reaching beyond pelvic base and end far away from anal origin. Pelvics not reaching anal origin. Anal with 19—21 rays; origin below 10th or 11th dorsal ray; base longer than dorsal base. Caudal forked; least height of caudal peduncle 5.0 in its length and less than eye diameter; procurrent caudal rays soft. Scales. Lateral line.

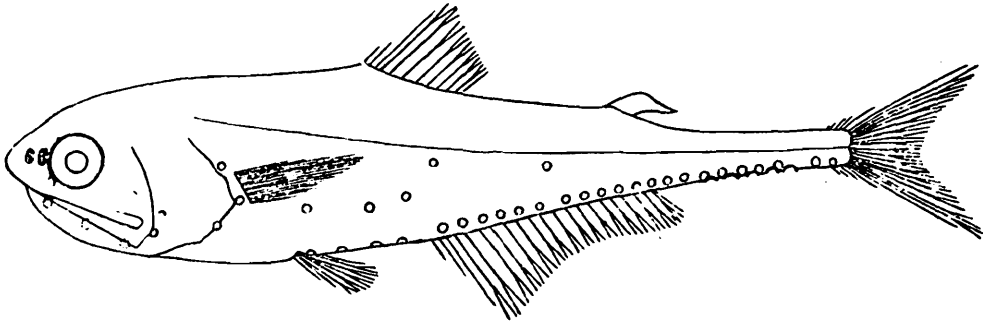
Distribution.—Atlantic: between Azores and Newfoundland; North of Bermudas; West Indies; off Cape Verde Is.; off Canary Is., off Brazil; mid-Atlantic Ocean between 42°—13° N., 57°—17° W., Gulf Guinea; Gulf of Mexico; West of S. Africa, 3000 m., South of Cape of Good Hope, 2000 m., Indian Ocean between Zanzibar and Seychelles; S. of Madagascar; Bay of Bengal; West of Sumatra; North of Australia, 15°—16° S., 109°—110° E., Pacific Ocean: East coast of Australia, New Zealand; Japan; Gulf of Panama; Admiralty Is., West coast of South America.

260. *Gonichthys coccoi* (Cocco)

(Text-fig. 94)

1829. *Scopelus coccoi* Cocco, *Giorn. Sci. per la Sicilia*, 7, p. 143 (type locality: Mediterranean).
1839. *Alysia loricata* Lowe, *Proc. zool. Soc. Lond.*, 7, p. 87.
- 1844-48. *Myctophum coruscans* Richardson, *Zool. Voy. "Erebus" & "Terror"*, London, Fish., 40, pl. 27, figs. 1—5 (type locality: S. Atlantic and Australian Ocean; specimen $2\frac{1}{2}$ inches in length).
- 1844-48. *Myctophum hianus* Richardson, *Zool. Voy. "Erebus" & "Terror"*, London, Fish., p. 41, pl. 27 (type locality: Open Sea., type in the British Museum).
1864. *Scopelus coccoi* Günther, *Cat. Fish. Brit. Mus.*, 5, p. 413.
1892. *Scopelus gracilis* Lütken, *Spolia Atlantica*, 11, p. 35 (type locality: west to 48° W., 23° N.)
1896. *Myctophum gracile* Jordan & Evermann, *Bull. U.S. nat. Mus.*, No. 47, p. 572.
1899. *Myctophum tenuiculum* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 262, pl. J, fig. 5 (type locality: $6^{\circ} 21' N.$, $80^{\circ} 41' W.$, 1793 fms.; surface temperature, $75^{\circ} F.$).
1906. *Myctophum hianus* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, p. 383 (Mid Atlantic Ocean, $22^{\circ} 12' N.$ $48^{\circ} W.$; south of the Cape of Good Hope. $37^{\circ} 30' S.$, $17^{\circ} E.$; south of Madagascar).
1906. *Myctophum (Myctophum) coccoi* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 199, 383, figs. 116—120 (Atlantic Ocean between $46^{\circ} N.$ and $38^{\circ} S.$; Indian Ocean north of $40^{\circ} S.$; Chile; Australia; South Pacific ocean, 30° — $31^{\circ} S.$, $126^{\circ} W.$, S. America; Caroline Is.; China Sea; Admiralty Is.; Japan; New Zealand).
1913. *Myctophum coccoi* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 158 (Ombai straits).
1928. *Myctophum coccoi* Parr, *Bull. Bingham Ocean. Coll.*, 3, art. 3, p. 61.
1930. *Myctophum coccoi* Norman, *Discovery Rep.*, 2, p. 325 (Atlantic: 33° — $37^{\circ} S.$, $90^{\circ} E.$ — $12^{\circ} W.$, TYF, 100—1000 (—0) m.; at $33^{\circ} S.$, $9^{\circ} E.$, TYF, 1000 (—0) m., surf. temp. $16.51^{\circ} C.$, bottom temp. $7.57^{\circ} C.$)
1931. *Myctophum coccoi* Chu, *Biol. Bull. St. John's Univ.*, 1, p. 85 (China Sea).
1949. *Gonichthys coccoi* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1061, fig.
1949. *Myctophum coccoi* Misra, *Rec. Indian Mus.*, 45, p. 427.
1953. *Myctophum coccoi* Misra, *Rec. Indian Mus.*, 50, p. 418, text-fig. 27 b.

1953. *Myctophum coccoi* Smith, *Sea Fish. South Africa*, p. 120, fig. 196 (occurs in large shoals, taken at several points in southern Africa).



TEXT-FIG. 94.—Lateral view of *Gonichthys coccoi* (Cocco) (After A. Brauer)

B. 8-10; D. 10-12/O; P. 14-15; V 8; A. 19-21.
L.1. 39-41.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 5.1—6.0 in total length (4.4—5.0 in standard length). Head compressed, naked, 4.1—5.1 in total length (3.5—4.2 in standard length). Eyes 4.1 in head, 0.7 in prominent, pointed snout. Cleft of mouth wide, oblique, maxilla extending an eye diameter behind orbit. Upper jaw prominent. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, nearer to adipose dorsal origin than to snout end, about an eye diameter behind pelvic origin. Adipose dorsal above last third of anal, nearly midway between dorsal and caudal origins. Pectorals moderate, 1.7 in head. Pelvics 2.8 in head; origin an eye diameter before dorsal origin, nearer to pectoral base than to anal origin. Anal longer than dorsal; origin below last 10th to 11th dorsal ray; origin nearer to pelvic origin than to caudal origin. Caudal forked, 1.3 in head. Least height of caudal peduncle 5.0 in its length. Lateral line. Photophores : 2 antorbitals; 2 operculars; one suprapectoral (PLO); 2 subpectoral isthmus and pelvics; one supraventral (VLO); 4 ventrals (VO) between pelvic and anal, second VO in a line with the rest of the series; anals (AO) 4—5+7—14; 3 supra-anals (SAO) broadly angulate; one lateral (POL) ; 2 precaudals (Prc); 5 infracaudals luminous scales (female specimen).

Silvery with blue iridescence.

It attains 60 mm., abyssal.

Distribution.—India : Bay of Bengal; Sri Lanka: 4°56' N., 78°15'3" E., 2000 m.—Between Azores Is. and Newfoundland 42° N., 43° W., North of Bermudas 35° N. 60° W., West Indies 28° N., 70° W., between Azores and Bermudas 31° N., 43° W., off Cape Verde Is. 4°—17° N. 28°—40° W., off Canary Is. 26°—30° N., 22°—26° W., off Brazil 4°—25° S., 28°—40° W., Gulf of Madiera; Mid-Atlantic Ocean between 42°—13° N., 57°—17° W., Gulf of Guinea; Gulf of Mexico; Atlantic Ocean between 46° N. and 38° S., West of South Africa, 3000 m., South of Cape of Good Hope, 2000 m; between Zanzibar and Seychelles; South of Madagascar; West coast of Sumatra, 520 m., North of Australia, 15°—16° S., 109°—110° E., East coast of Australia 33°—34° S., 153°—154° E., West coast of South America; West coast of Chile, 20°—39° S., 71°—90° W., Admiralty Is, Japan 34° N., 135° E., New Zealand; Gulf of Panama, 6° 21' N., 80° 41' W., 3279 m., in the mean annual isotherms of 20° C., 12° C. and 6° C. with the latitudinal and longitudinal range of 34° N.—39° S., 18° E.—71° W. in the Indo-Pacific=(7° N.—35° S., 18°—110° E. in the Indian Ocean+34° N.—39° S., 135° E.—71° W. in the Pacific Ocean), 46° N.—38° S., 2° E.—70° W. in the Atlantic Ocean and 37° 35' N., 14°10' E. in the Mediterranean.

119. Genus *Hygophum* Bolin

1939. *Hygophum* Bolin, *Stanford Ichth. Bull.*, 1, p. 2 (type, *Sco-pelus hygomi* Lütken, orthotypic).

Body elongate, compressed with scales and photophores. Photophores limited to definite and separate series; precaudal photophores (Prc) two; *sa* and *ia* PLO well above pectoral base; Two Pol, the posterior elevated; 5 PO and 4 VO level; third SAO elevated, near lateral line; AO in 2 distinct series; second AO elevated or level; 2 Prc, the second elevated, below or close to lateral line. Maxillary broadly expanded, posteriorly not extending beyond postorbit. Mouth wide. Snout short. Eyes large. Teeth cardiform in narrow bands in jaws and palatines; a large patch of similar teeth on entopterygoid; vomer edentulous or with a few small teeth mesially. Gill openings wide; gill rakers well developed. Pseudobranchiae well developed. Pterotic spine absent. Dorsal

short; origin behind pelvic origin: adipose dorsal origin opposite to hindmost anal rays. Pectorals moderate, reaching or just not reaching anal origin. Pelvics small; origin before dorsal origin. Anal base longer than dorsal base. Caudal forked; procurent caudal rays soft. Scales cycloid. Lateral line.

Distribution.—Atlantic: between Africa and South America 5°31' N., 23°15' W., South of Canaries Is., 2000 m., Madeira, 1800 m., coast of Sierre Leone, 1300—3000 m., Gulf of Guinea, 700—4000 m., S.W. coast of Africa, 2000 m., North Atlantic; Mediterranean, Indian Ocean: South of Socotra, 1500—2000 m., Gulf of Aden, 1200 m., Cape to East London; between Zanzibar and Seychelles, 2000 m., between Seychelles and Chagos Archipelago, 2000—2500 m., between Chagos Archipelago and Sri Lanka, 2000 m., Arabian Sea, 430—984 m., Bay of Bengal, 2000 m., Pacific Ocean; Banda Sea; Halmaheira sea, 1000—(O)m.; Japan; west coast of Chile; New Zealand.

261. *Hygophum reinhardti* (Lütken)

- 1892. *Scopelus reinhardti* Lütken, *Spolia Atlantica Scopelini*, p. 257. fig. 16 (type locality : Madeira, 34° 22' N., 18° 10' W.).
- 1899. *Myctophum atratum* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 268 (type locality : 25° 26' 15" N., 109° 48' W., 1218 fms., temp. 36.5° F.=1.97° C.).
- 1906. *Myctophum benoiti reinhardti* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 185, 382, figs. 96—101 (type locality : 24° 43' 4" N., 17° 1' 3" W., 2000 m.).
- 1913. *Myctophum benoiti* (Cocco) var. *reinhardti* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, pp. 152, 155, fig. 60, (Banda sea; Halmaheira sea).
- 1928. *Myctophum reinhardti* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 3, p. 66 (Atlantic, Indian and Pacific Oceans).
- 1931. *Myctophum reinhardti* Tanaka, *J. Faculty Sci. Tokyo*, 3, pt. 1, p. 18 (Southern Japan area).
- 1939. *Myctophum reinhardti* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 29 (Arabian Sea, 12° 8' 6" N., 63° 4' 36" E., 12° 5' 18" N., 63° 1' 42" E., N. 200, 430—984 m., 12.12°—8.48° C.).
- 1948-49. *Hygophum reinhardti* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1050, fig.
- 1949. *Myctophum renhardti* Misra, *Rec. Indian Mus.*, 45, p. 428.
- 1953. *Myctophum reinhardti* Misra, *Rec. Indian Mus.*, 50, p. 417.

1953. *Myctophum reinhardti* Smith, *Sea Fish. South Africa*, p. 121 (from Cape to East London).

B. 8-10; D. 12-14/0; P. 13-14; V 8; A. 18-20; L. 1. 39-40.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.6-5.5 in total length (3.7-4.6 in standard length). Head compressed, naked 4.0-4.5 in total length (3.1-3.4 in standard length). Eyes large, 2.6-3.5 in head, twice obtuse snout. Cleft of mouth oblique, maxilla extending to postorbit, dilated; jaws subequal; end of maxillary extending nearly to preopercular border. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, slightly behind pelvic origin. Adipose dorsal opposite to hindermost anal rays: origin midway between last dorsal ray and caudal origin. Pectorals moderate, nearly reaching anal, 1.1 in head. Pelvics moderate, 2.1 in head, reaching vent; origin slightly before dorsal origin and nearer to pectoral base than to anal origin. Anal longer than dorsal; origin below last dorsal ray, much nearer to pelvic than to caudal origin. Caudal forked, equal to or slightly longer than head. Least height of caudal peduncle 1.7 in its length. Lateral line. Scales cycloid, deciduous. Photophores: 2 antorbitals; no suborbitals; 2 operculars; one suprapectoral (PLO); 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO); one supraventral (VLO) branchiostegals; 5 pectorals (PO); one supraventral (VLO) below lateral line; 4 ventrals (VO); 3 supra-anals (SAO); first SAO above and behind second VO, Second SAO on level with VLO, third SAO elevated; anals (AO) 5—8+6—8; 3 Postero-laterals (Pol); 2 precaudals (Prc), the second nearer to lateral line; one or two supracaudal luminous scales.

Silvery.

It attains 25 mm. in length; abyssal.

Distribution. —India : Bay of Bengal, 7°43'2"N., 88°44'9"E., 2000 m.; Arabian Sea, 12°8'6" N., 63°4'36" E., 12°5'18" N., 63°1'42" E., N. 200, 430-984 m., 12°12'-8°48' C. between Africa and South America, 5°31' N., 23°15' W.; South of Canaries Is., 24°43'4" N., 17°1'3" W., 2000 m.; Madeira, 34°22' N., 18°10' W., 1800 m.; Coast of Sierra Leone, 1°-8° N., 10-16° W., 1300-3000m., Gulf of Guinea, 2°N.—5° S., 9° E.—6° W., 700-4000 m. South 24—1341ZSI/71

West coast of Africa, 11°—31° S., 9°—10° E., 2000 m.; South of Socotra, 9°6'1" N., 53°41'2" E., 1500—2000 m.; Gulf of Aden, 13°2'8" N., 46°41'6" E., 1200 m.; Cape to East London; between Zanzibar and Seychelles, 4°45' S., 48°58'6" E., 2000 m., between Seychelles and Chagos Archipelago, 2°—4° S., 58°—70° E., 2000—2500 m.; between Chagos Archipelago and Sri Lanka, 4° N.—6° S., 73°—78° E., 2000 m.; Banda Sea, 5° S., 128° E., surface plankton; Halmaheira Sea 1° N., 128° E., 1000 (—0 m.), vertical net; West coast of Chile; 30° S., 84° W., 31° S., 74° W., Japan; in the mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of 34° N.—35° S., 18° E.—74° W., in the Indo-Pacific = (13° N.—35° S., 18°—88° E. in the Indian Ocean + 32° N.—31° S., 128° E.—74° W. in the Pacific Ocean) 34° N.—31° S., 10° E.—18° W. in the Atlantic.

120. Genus *Notolychnus* Fraser-Brunner

1946. *Vestula* (nec. Stål, 1865) Bolin, *Stanford Ichth. Bull.*, 3, p. 144. (type, *Myctophum Valdiviae* Br., orthotypic).
- 1948-49. *Notolychnus* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118 p. 1077, fig. (type, *Myctophum valdiviae* Brauer, orthotypic).

Body elongate, compressed with scales and photophores. Photophores limited to definite series: precaudal scales two: superior antorbital (*sa*) present; no inferior antorbital (*ia*); PLO above pectoral base: subpectoral (PVO) in straight line with first pectoral (PO); 5 pectorals (PO), the second and third elevated; VLO (supraventral), above lateral line, close below dorsal origin; 4 ventrals (VO), first VO elevated; 3 supra-anals (SAO) angulate, the third SAO above lateral line, below end of dorsal base; Pol above lateral line close below adipose dorsal; last AOa elevated; AOp level; 2 prc, second elevated vertically above first; a single supracaudal luminous gland in both sexes. Maxillary narrow, extending beyond posterior margin of eye. Teeth cardiform in narrow bands in both jaws; a few small teeth on vomer; palatines and entopterygoid toothed. Gill-opening wide gill rakers well; developed. Pseudobranchiae developed. Dorsal fin with 11-12 rays, nearly midway between snout end and caudal origin and an eye diameter behind pelvic origin. A small

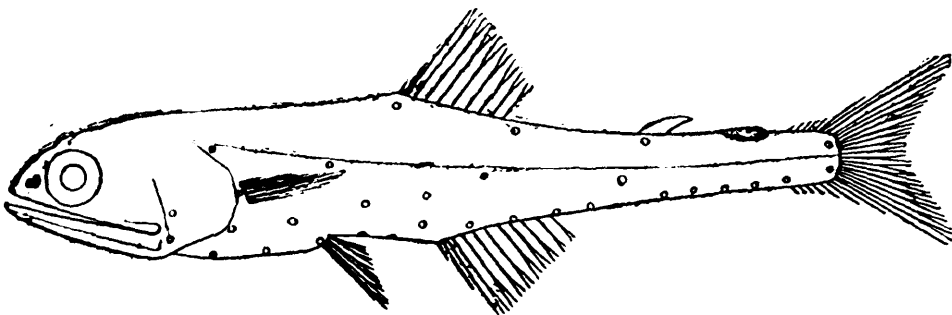
adipose dorsal; origin far behind last anal ray. Pectoral moderate not reaching anal origin. Pelvics moderate; origin before dorsal origin. Anal with 12-13 rays; origin nearly below middle of dorsal base and its base equal to dorsal base. Caudal forked; procurrent caudal rays soft. No distinct lateral line. Scales cycloid.

Distribution. —Atlantic Ocean; Canaries Is., 2000 m., between Sierre Leone and Gulf of Guinea, 600-3070 m., S. W Africa, 500-4000 m., Indian Ocean; between Zanzibar and Seychelles, 2000 m., between Seychelles and Chagos Archipelago, 1500—2000 m., between Chagos Archipelago and Sri Lanka, 2000 m., N. E. coast of Africa, 1500—2000m., Gulf of Aden, 1200 m., N. E. Coast of Amsterdam, 1800 m., North of Cocos Is., 2400 m.

262. *Notolychnus valdiviae* (Brauer)

(Text-fig. 95)

1904. *Myctophum valdiviae* Brauer, *Zool. Anz.*, 28, p. 398, fig. 6 (type locality : Atlantic and Indian Oceans).
 1906. *Myctophum*. (*Myctophum*) *valdiviae* Brauer, "*Valdivia*" *Tiefsee Fische*, 15, pp. 206, 384, fig. 127 (Bay of Bengal), 7° 43' 2" N., 88° 44' 9" E.).
 1928. *Myctophum valdiviae* Parr, *Bull. Bingham Ocean. Coll.*, 3, art. 3, p. 57.
 1948-49. *Notolychnus valdiviae* Fraser-Brunner, *Proc. zool. Soc., Lond.*, 118, p. 1077, fig.
 1949. *Myctophum valdiviae* Misra, *Rec. Indian Mus.*, 45, p. 428.
 1953. *Myctophum valdiviae* Misra, *Rec. Indian Mus.*, 50, p. 417, text-fig. 27 a.



TEXT-FIG. 95.—Lateral view of *Notolychnus valdiviae* Br. (After A. Brauer)

B. 8-10; D. 11-12/0; P. 14; V. 8; A. 12-13; L.1. 30.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 6.4 in total length (5.6 in standard length). Head compressed, naked, 4.0 in total length (3.6 in standard length). Eyes moderate, 4.0 in head. Snout short, bluntly pointed, 0.7 in eye diameter. Cleft of mouth very wide, oblique, maxilla extending to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin nearly midway between snout end and caudal origin and far behind last anal ray. Pectorals moderate, 2.0 in head, reaching beyond pelvic origin. Pelvics moderate, 2.1 in head, reaching vent, an eye diameter before dorsal origin, nearer to pectoral base than to anal origin. Anal equal to dorsal; origin below middle of dorsal, much nearer to pelvic origin than to caudal origin. Caudal forked, 1.2 in head. Least height of caudal peduncle 4.1 in its length. Lateral line. Cycloid deciduous scales. Photophores: one antorbital; 2 operculars; one supra-Pectoral (PLO) near the lateral line; 2 subpectorals (PVO) 3 branchiostegals; 4 pectorals (PO), third PO elevated; one supraventral (VLO) near lateral line; 4 ventrals (VO), first VO elevated in a vertical line with the second VO, last VO slightly elevated in a vertical line with supra-anal (SAO); one supra-anal; anals (AO) 5+4; 2 postero-laterals (Pol) anals (AO) 5+4; 2 postero-laterals (Pol) one above middle of anal, the other much behind last anal ray; 2 pre-caudals (Prc) widely set; 4 photophores above lateral line; one below dorsal origin, second behind last dorsal ray, 3rd below adipose dorsal, 4th opposite 2nd Prc; a large supracaudal luminous scale.

It attains 23 mm. in length; abyssal.

Distribution.—India : Bay of Bengal, 7°43'2" N., 88°44'9" E., 2000—2500 m.—S. of Canaries Is. 24°43'4" N., 17°1'3" W., 2000 m., between Sierre Leone and Gulf of Guinea, 5° N.—1° S., 7°—13° W., 600—3070 m., South west Africa, 26°49'2" S., 5°54' E., 500—4000 m., between Zanzibar and Seychelles, 4° S., 51°—53° E., 2000 m., between Chagos Archipelago and Sri Lanka, 4° N.—6° S., 73°—78° E., 2000 m., North east coast of Africa, 4°—9° N., 48°—53° E., 1500—2000 m., Gulf of Aden, 13°2'8" N. 46°41'6" E., 1200 m.; North east of New Amsterdam, 31°46'4" S., 84°55'7" E., 1800 m., North of Cocos Is., 10°8'2" S., 97°14'9" E., 2400 m.; between Seychelles and Chagos Archipelago, 2°—3° S., 58°—61° E., 1500—2000 m., in the

mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of 13° N.—31° S., 46°—97° E. in the Indian Ocean and 24° N.—26° S., 7° E.—17° W. in the Atlantic Ocean.

121. Genus *Myctophum* Rafinesque

1810. *Myctophum* Rafinesque, *Indice d' Ittiologia Siciliana* Messina, p. 56 (type, *M. punctatum* Raf.).
 1817. *Scopelus* Cuvier, *Régne Animal.*, 2, ed. 1, p. 169 (type, *Gasteropelecus humboldti* Risso).
 1864. *Dasyscopelus* Günther, *Cat. Fish. Brit. Mus.*, 5, p. 405 (type, *Myctophum asperum* Rich., orthotypic).

Body moderately elongate, compressed, with scales and photophores. Photophores limited to definite and separate series; precaudal photophores always two; superior antorbital (*sa*) present or absent; inferior antorbital (*ia*); PLO above pectoral base; subpectoral PVO in a straight or oblique series with PO (pectorals), last PO elevated; VO level; AO in 2 separate series; a single Pol below or before adipose fin; supracaudal luminous scales in males, infracaudal luminous scales in females. Maxillary slender extending beyond postorbit. Snout short. Cardiform teeth in band in jaws and palatines, a small patch of cardiform teeth on vomer and a large patch on entopterygoid. Gill-opening wide; gill-rakers long and numerous. Pseudobranchiae well developed. Dorsal fin with 10-15 rays, nearly in the middle of back; origin in front of anal origin. Pectoral moderate, not reaching anal origin. Pelvics small; origin before or opposite dorsal origin. Anal with 18—20 rays; base longer than dorsal base. A small adipose dorsal. Caudal forked; procurrent caudal rays soft. Scales ctenoid or cycloid. Lateral line.

Distribution.—Atlantic Ocean : Azores Is.; Newfoundland; Cape Verde Is., Canary Is., 2000 m., Madiera, 31° 59' 3" N., 15° 5' W., 1800 m., Brazil; East coast of North America, 38°—44° N., 73°—74° W., South Atlantic Ocean 37° S., 5° E., 29° 30' S., 12° W., 32° S., 50° W.; Atlantic Ocean between 38°—40° N., and 32° N., Portugal; Gulf of Guinea, 0° 25' 8" N., 7° 0' 3" E., 700—4000 m., Mediterranean; Indian Ocean : between Zanzibar and Seychelles, 2000—2500 m., between Seychelles and Chagos Archipelago; between Chagos Archipelago and Sri Lanka 2000—2500 m., S. of Madagascar; Gulf of Aden; Gulf

of Oman; Arabian Sea; Bay of Bengal; South Indian Ocean, 40° S, 41° 30' E., N. W. of Australia between 13°—16° S. and 103°—111° E. Pacific Ocean: Banda Sea 1500—2000—0 m., Halmahera Sea; Manipa Strait, 1536—0 m., Celebes Sea; Ombai Straits; North of New Zealand: Sandwich Is., China; Japan; Hawaiian Is., Admiralty Is.

*Key to species of genus Myctophum Rafinesque**

1. Scales cycloid; anal origin slightly behind middle of dorsal base *M. indicus*
2. Scales ctenoid; anal origin just behind last dorsal ray *M. spinosum*

263. *Myctophum indicus* (Day)

1878. *Scopelus indicus* Day, *Fish. India*, p. 507, pl. 118, fig. 2 (type locality: Vizagapatnam)
1889. *Scopelus lencicus* Day, *Fauna Brit. India*, Fish., 1, p. 413, fig. 133.
1899. *Myctophum indicus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 161.
1928. *Myctophum indicus* Parr, *Bull. Bingham Ocean. Coll.*, 3, art. 3, p. 53.
1949. *Myctophum indicus* Misra, *Rec. Indian Mus.*, 45, p. 427.
1953. *Myctophum indicus* Misra, *Rec. Indian Mus.*, 50, p. 418.

B. 8—10; D. 10/0; P. 14; V. 8; A. 18; L. 1. 43; L. tr. 3½/5.

Body moderately elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4·5—4·7 in total length (3·9 in standard length). Head compressed, partially scaly, 5·0 in total length (4·1 in standard length). Eyes 2·4—2·5 in head, 4·0 times in snout and interorbital. No orbital spine. Cleft of mouth wide, oblique, maxilla extending beyond postorbit. Jaws subequal. Teeth villiform in both jaws, palatines, pterygoid and tongue. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, nearer to adipose dorsal origin than to snout end and about ¾ eye diameter behind pelvic origin. Adipose dorsal in the last third of anal, nearer to caudal origin than to dorsal origin. Pectorals moderate, 1·1 in

*Jones and Kumaran (1968, *J. mar. biol. Ass. India*, 8, p. 163-164) reported two more species, *Myctophum aurolaternatum* Garman and *M. evermanni* Gilbert from the Laccadive Sea.

head, reaching middle of pelvics, nearly extending to anal origin. Pelvics 1 1 in head; origin $\frac{3}{4}$ eye diameter before dorsal origin, nearer to pectoral base than to anal origin. Anal slightly longer than dorsal; origin below 8th—10th dorsal rays; origin much nearer to pelvic origin than to caudal origin. Caudal forked, 1 1 in head. Least height of caudal peduncle twice in its length. Lateral line. Photophores in line along lower edge of abdomen and a few larger ones scattered over the sides; superior (*sa*) and inferior (*ia*) antorbitals; postero-lateral (Pol) above middle of anal fin close to the lateral line, away from adipose dorsal.

Deep metallic blue in the upper portion of body becoming lighter on sides and beneath.

Distribution.—India : Off Vizagapatnam coast, 17° 42' N., 83° 20' E., in the mean annual isotherm of 20°C.

264. *Myctophum spinosum* (Steindachner)

- 1867. *Scopelus spinosus* Steindachner, *Ichth. Notizen*, **5**, Sitzbar. Akad. Wien, **55**, p. 711, pl. 3, fig. 4. (type locality : China).
- 1896. *Dasyscopelus spinosus* Jordan & Evermann, *Bull. U. S. nat. Mus.*, **47**, p. 575 (mid-Atlantic, 14° 11' N. and 7° 6' S., 11° 30'—29° 32' W., Hawaiian Is.).
- 1906. *Myctophum (Myctophum) spinosum* Brauer, "Valdivia" *Tiefsee Fische*, **15**, pp. 196, 383, figs. 113, 114 (Bay of Bengal).
- 1913. *Myctophum spinosum* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 163.
- 1928. *Myctophum spinosum* Parr, *Bull. Bingham Ocean. Coll.*, **3**, art. 3, p. 63.
- 1931. *Dasyscopelus spinosus* Chu, *Biol. Bull. St. John's Univ.*, **1**, p. 85 (China).
- 1931. *Dasyscopelus spinosus* Tanaka, *J. Faculty Sci. Tokyo*, **3**, pt. 1, p. 18 (Southern Japan area).
- 1948-49. *Myctophum (M.) spinosum* Fraser-Brunner, *Proc. zool. Soc. Lond.*, **118**, p. 1057, fig.
- 1949. *Myctophum spinosum* Misra, *Rec. Indian Mus.*, **45**, p. 428.
- 1953. *Myctophum spinosum* Misra, *Rec. Indian Mus.*, **50**, p. 418.

B. 8-10; D. 13-14/0; P. 14; V. 8; A. 19-20; L. 1. 40.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.6—4.8 in total length (4.0—4.2 in standard length). Head compressed, naked 4.5—5.0 in total length (4.0—4.4 in standard length). Eye moderate, 2.4—3.2 in head. Snout short, blunt, 3.0 in eye. Cleft of mouth oblique, maxilla reaching to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin much nearer to snout end than to caudal origin, nearer to adipose dorsal origin than to snout end, $\frac{1}{3}$ eye diameter behind pelvic origin. Adipose dorsal above the last quarter of anal; origin nearer to caudal origin than to the last dorsal ray. Pectorals moderate, 1 1 in head, reaching beyond pelvic origin. Pelvics small, not reaching vent, 2.5 in head; origin nearer to pectoral base than to anal origin, $\frac{1}{3}$ eye diameter before dorsal origin. Anal longer than dorsal; origin nearly half eye diameter behind last dorsal ray. Caudal forked, 1.2 in head. Least height of caudal peduncle 3.0 in length. Lateral line. Scales ctenoid. Gill rakers 7+16. Photophores: 2 antorbitals; 2 opercular; one suprapectoral (PLO) midway between lateral line and pectoral base; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO); one supraventral (VLO), below lateral line; ventrals (VO), second VO in a line with the rest of series; 3 supra-anals (SAO), all in a concave or oblique line, first SAO above space between third and fourth VO; anals (AO) 6—8+5—8, 2 AOp above end of anal fin; one postero-lateral (Pol) before adipose fin; 2 precaudals (Prc), second Prc slightly elevated; 7 supracaudal luminous scales in male, 3 infracaudal luminous scales in females.

Dark blue above, silvery below.

It attains 90 mm. in length; bathypelagic.

Distribution.—India : Bay of Bengal. Atlantic Ocean, 14° N. to 7°6' S. and 29° 11' W. to 11° 30' W., Zanzibar; North-West of Australia, between 13°—16°S., and 103°—111° E.; North of New Zealand; Sandwich Is., Hawaiian Is., China; S. Japan area; in the mean annual isotherms of 20° C. and 12° C. with the latitudinal and longitudinal range of 34° N.—32° S., 38° E.—153° W. in the Indo-Pacific=(14° N.—16° S., 38°—111° E. in the Indian Ocean + 32° N.—32° S., 114° E.—155°W. in the Pacific Ocean) and 14° N.—7° S., 11°—29° W. in the Atlantic Ocean.

122. Genus *Lampanyctus* Bonaparte

1810. "Serpe" Risso, *Ichth. Nice.* p. 356, Vernacular name for *Gasteropelecus* spp. (Risso described *S. microstoma*, *S. crocodilus* and *S. humboli*.).
1827. *Serpa* Cloquet, *Dict. Sci. nat.*, 48, p. 190 (type, *Gasteropelecus crocodilus* Risso, logotypic).
1840. *Lampanyctus* Bonaparte, *Fauna Ital.* pt. 27, fasc. 138, (type, *Myctophus bonapartii* Cocco, orthotypic).
1887. *Mannobranchium* Günther, *Rep. Deep Sea Fish.*, "Challenger" (1873-76), 22, pt. 57, p. 199 (type, *M. nigrum* Gthr., orthotypic).
1890. *Stenobranchius* Eigenmann & Eigenmann, *Proc. Calif. Acad. Sci.*, 3, p. 4 (type, *S. leucosparum* Eig. & Eig., orthotypic).
1922. *Nyctomaster* Jordan, *Proc. U. S. nat. Mus.*, p. 645 (type, *Lampanyctus jordani* Gilbert, orthotypic).
- 1948-49. *Triphoturus* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1083, (type, *Myctophum* (L.) *micropterus* Br., orthotypic).
- 1948-49. *Lepidophanes* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1090 (type, *Lampanyctus guentheri* Goode & Bean, orthotypic).

Body elongate, compressed, with scales and photophores. Photophores limited to definite and separate series; precaudal photophores (Prc) when separate from postero-anal series (AOP) present in numbers 3 or 4; the lower precaudals in some forms confluent with postero-anals; inferior antorbital (*ia*); PLO above pectoral base; first PVO always below the second in a vertical or oblique line; 5 PO, the fourth greatly elevated; 4 or 5 VO; first AOa never elevated, last AOp often elevated; one Pol; luminous glands at dorsal, pelvic and anal bases present or absent. Snout short. Eyes large. Cleft of mouth wide; maxillary slender, expanded posteriorly, extending beyond postorbit. Teeth cardiform in narrow bands in jaws and palatines; a small patch on each side of vomer; a large patch of small teeth on entopterygoids. Gill openings wide; gill rakers long, numerous. Pseudobranchiae present. Dorsal origin opposite or behind pelvics and before anal origin; base usually shorter, never longer than anal base. Pectoral short or long. Pelvics short; origin opposite or before dorsal origin. Anal base equal to or slightly longer than dorsal base; origin below dorsal base. Adipose dorsal present. Caudal forked; procurent caudal rays, spine like, stiff.

Distribution.—Atlantic Ocean : Madeira, 1800 m., Gulf of Guinea, 2000 m., East coast of North America; Indian Ocean : North east coast of Africa, 1000—2000 m., Gulf of Aden, 1200 m., between Zanzibar and Seychelles, 2000 m.; Seychelles, 1500—2000 m. Chagos Archipelago, 2000 m., Cocos Is., 2200—2400 m., Arabian Sea, 1731m., South of Sri Lanka, 2000 m., Bay of Bengal, 2000—2500 m., Pacific Ocean : Japan.

The genus **Lampanyctus** Bonaparte is represented by 2 subgenera in the Indian region.

Key to subgenera of genus Lampanyctus Bonaparte

1. Luminous glands at dorsal, pelvic and anal bases ; 5-6 VO, the second VO elevated ; Prc 3-4 **Lepidophanes**
2. Luminous glands at dorsal, pelvic and anal bases absent ; 4 VO, level or second elevated ; Prc 4 **Lampanyctus**

xii. Subgenus **Lepidophanes** Fraser-Brunner

Luminous glands at dorsal, pelvic, anal bases and also on procurent caudal rays. Pectorals reaching anal or beyond anal origin. 5 or 6 VO, the second elevated. 3₄ or 4 Prc.

The subgenus **Lepidophanes** is represented by 2 species in the Indian region.

Key to species of subgenus Lepidophanes Fraser-Brunner

1. Lateral line scales 29 ; adipose dorsal origin behind last anal ray ; AO 4+3 *Lampanyctus (Lepidophanes) pyrsobolus*
2. Lateral line scales 35—36 ; adipose dorsal origin opposite 10th branched ray of anal ; AO 4-6+3-5 *Lampanyctus (Lepidophanes) longipes*

265. *Lampanyctus* (*Lepidophanes*) *longipes* Brauer

1906. *Myctophum* (*Lampanyctus*) *longipes* Brauer, "Valdivia" Tiefsee Fische, 15, p. 236, fig. 155 (type locality : Madeira, 31° 59' 3" N., 15° 5' W., 1800 fms., Gulf of Guinea; Cocos Is., Bay of Bengal; Seychelles).
1928. *Lampanyctus longipes* Parr, Bull. Bingham Ocean. Coll., 3, art. 3, p. 82 (Atlantic and Indian Oceans).
1949. *Lampanyctus longipes* Misra, Rec. Indian Mus., 45, p. 429.
1953. *Lampanyctus longipes* Misra, Rec. Indian Mus., 50, p. 419.

B. 8-10; D. 11-13/O; P. 12; V 8; A. 13-15; L. 1. 35-36.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 5.7 in total length (4.8 in standard length). Head compressed, naked, 3.8 in total length (3.2 in standard length). Eyes moderate, 3.0—3.3 in head, snout obtusely rounded, 2.3 in eye. Cleft of mouth very wide, maxilla extending upto preopercular edge. Jaws subequal. A single rayed dorsal fin; origin nearer to snout end than to caudal end and opposite pelvic origin. Adipose dorsal above last third of anal, origin nearer to last dorsal ray than to caudal origin. Pectorals long, reaching slightly beyond anal, equal to head. Pelvics moderate, reaching vent, 2.0 in head; origin opposite dorsal origin, nearer to pectoral base than to anal origin. Anal slightly longer than dorsal; origin distinctly behind last dorsal ray, much nearer to pelvic origin than to caudal origin. Caudal forked, 1.2 in head. Least height of caudal peduncle 1.9 in its length. Lateral line. Scales deciduous. Photophores: one antorbital; 3 postorbitals; 2 operculars 1 suprapectoral (PLO) near the lateral line; 2 subpectorals (PVO) not above pectoral base; 3 branchiostegals; 5 pectorals (PO) fourth PO elevated from the rest of the series; one supra-ventral (VLO) near the lateral line; 5 Ventrals, VO, second VO elevated; 3 supra-anals (SAO) oblique in disposition, superior SAO on lateral line in a line with superior Pol (postero-lateral); anals (AO) 4—6+3—5; 2 postero-laterals (Pol); 3 precaudals (Prc), the superior one on lateral line; 2 supracaudal luminous scales; 2 or 3 infracaudal luminous scales; one luminous scale below middle of dorsal base, pelvic base and at the anterior end of anal base.

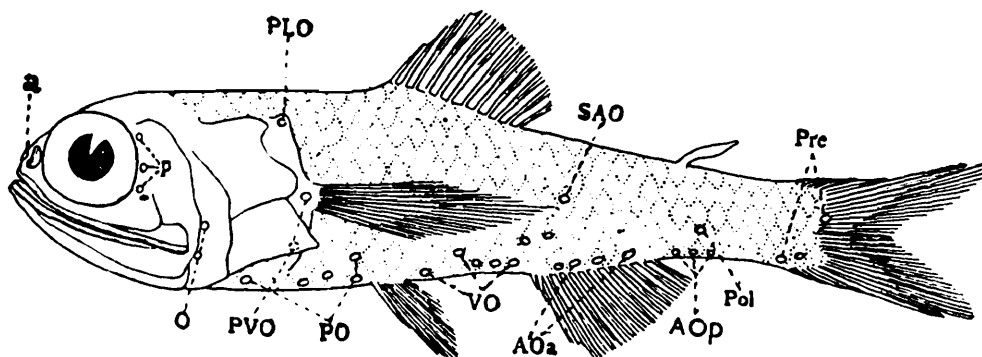
It attains 32 mm. in length; abyssal.

Distribution.—India: Bay of Bengal, $7^{\circ}1'2''$ N., $85^{\circ}56'5''$ E 2500 m.; Sri Lanka : South of Sri Lanka, $4^{\circ}56'$ N., $78^{\circ}15'3''$ E., 2000 m.; Madeira, $31^{\circ}59'3''$ N., $15^{\circ}5'$ W., 1800 m., Gulf of Guinea, $0^{\circ}25'8''$ N., $7^{\circ}3''$ E., 2000 m.; Off Seychelles, 2° — 4° S., 53° — 61° E., 1500—2000 m.; Chagos Archipelago, 4° S., 70° — 73° E., 2000 m.; South of Cocos Is., 10° — 26° S., 93° — 97° E., 2200 m., North Cocos Is., 2400 m., in the mean annual isotherms of 20° C. & 12° C. with the latitudinal and longitudinal range of 7° N.— 26° S., 53° — 97° E., in the Indian Ocean and 0° — $25'$ N.— 31° N., 7° E.— 15° W.

266. *Lampanyctus (Lepidophanes) pyrsobolus* (Alcock)

(Text-fig. 96)

1890. *Scopelus pyrsobolus* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 218, pl. 8, fig. 3 (type locality : Bay of Bengal, $15^{\circ} 38' N.$, $82^{\circ} 30' E.$, 690—920 fms., $4.3^{\circ} C.$; type in the Zoological Survey of India).
1896. *Scopelus pyrsobolus* Alcock, *J. As. Soc. Bengal*, 65, p. 333 (off Madras coast, 690—920 fms.).
1899. *Scopelus pyrsobolus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 163 (Bay of Bengal, 690—920 fms.).
1900. *Scopelus pyrsobolus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 30, fig. 3.
1928. *Lampanyctus pyrsobolus pyrsobolus* Parr. *Bull. Bingham Oceanogr. Coll.*, 3, p. 82.
- 1948-49. *Lampanyctus (Lepidophanes) pyrsobolus* Fraser-Brunner, *Proc. zool. Soc. London*, 118, p. 1092.
1949. *Lampanyctus pyrsobolus* Misra, *Rec. Indian Mus.*, 45, p. 429.
1949. *Lampanyctus pyrsobolus* Misra, *J. zool. Soc. India*, 1, (1), p. 37, text-fig. 1.
1953. *Lampanyctus pyrsobolus* Misra, *Rec. Indian Mus.*, 50, p. 419.



TEXT-FIG. 96.—Lateral view of *Lampanyctus (Lepidophanes) pyrsobolus* (Alc.)

B. 8—10; D. 12/0; P. 12; V 8; A. 13; L. 1. 29.

Body compressed, moderately elongate, scaly; abdomen smooth, non-keeled. Depth 4·5 in total length (3·8 in standard length). Head compressed, naked, 3·1 in total length (2·6 in standard length). Eyes large, round, 3·0 in head, strongly convergent, bulging beyond dorsal profile, a little more than interorbital. Cleft of mouth wide, oblique, maxilla not quite reaching preopercular angle. Jaws subequal, villiform teeth on vomer. Opercle large, extremely thin; vertical border of preoperculum oblique. A single rayed dorsal fin; origin slightly nearer to snout end than to caudal origin, opposite to pelvic origin. Adipose fin above last anal ray, nearer to caudal origin than to last dorsal ray. Pectorals long, reaching 6th anal ray, 1·3 in head. Pelvics moderate, 2·7 in head; origin opposite to dorsal origin, nearer to pectoral base than to anal origin. Anal more or less equal to dorsal; origin 1/4 eye diameter behind last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked, 1·6 in head. Least height of caudal peduncle 1·8 in its length. Lateral line. Scales deciduous. About 5 large pyloric caecae. A well developed air bladder. Photophores : one antorbital; 3 post-orbitals; 2 operculars; one suprapectoral (PLO) on the lateral line; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO), fourth PO elevated; one supraventral (VLO) below lateral line; 5 ventrals (VO), second VO elevated; 3 supra-anals, angulate in disposition; 4+3 anals (AO); 2 posterolaterals (Pol), the superior one on the lateral line; 3 precaudals, the superior one on the lateral line; one or 2 supracaudal luminous scales; one or 2 infracaudal luminous scales.

Apparently black; iris and lower part of opercles like burnished silver; opercles when in the fresh state brilliantly coruscating.

It attains 76 mm. in length; bathypelagic.

Distribution.—India : Bay of Bengal, 15°38' N., 82°30' E., 1261—1682 m., 4·3° C., in the mean annual isotherm of 20° C.

xiii. Subgenus *Lampanyctus* Bonaparte

No luminous glands at dorsal, pelvics or anal base. Pectorals small or long, not reaching beyond pelvics or

reaching to anal origin. 2 postero-laterals (Pol). Last antero-anal (AOa) elevated. Ventrals (VO) 4, level or second elevated. Pectorals (PO) 5, the fourth elevated. Prc 4, distinct or continuous with postero-anals (AOp). Anal origin below middle or end of rayed dorsal.

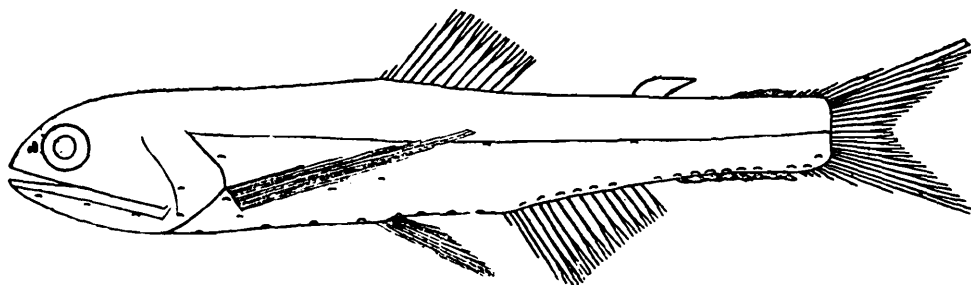
The subgenus **Lampanyctus** is represented by 2 species in the Indian region.

Key to species of subgenus Lampanyctus Bonaparte

1. Prc not continuous with AOp;
AO 6—7+8—10; lateral line
scales 35 *Lampanyctus (Lampanyctus)*
macropterus
2. Prc continuous with AOp; AO 5—7+
6—8; lateral line scales 38 *Lampanyctus (Lampanyctus)*
crocodilus

267. *Lampanyctus (Lampanyctus) crocodilus* (Risso)
(Text-fig. 97)

1810. *Gastropolecus crocodilus* Risso, *Ichth. Nice*, p. 357 (type locality : Mediterranean).
1895. *Lampanyctus gemmifer* Goode & Bean, *Ocean. Ichth.*, **81**, fig. 88 (type locality : Grand Banks, 39°39'45" N., 71°35'15" W., 538 fms.).
1896. *Lampanyctus gemmifer* Jordan & Evermann, *Bull. U. S. nat. Mus.*, **47**, p. 559.
1906. *Myctophum (Lampanyctus) gemmifer* Brauer, "Valdiviae" *Tiefsee Fische*, **15**, pp. 246, 385, fig. 163.
1928. *Lampanyctus gemmifer*., Parr. *Bull. Bingham Oceanogr. Coll.*, **3**, art. 3, pp. 90, 112 (Atlantic Ocean).
- 1948-49. *Lampanyctus (L.) crocodilus* Fraser Brunner, *Proc. zool. Soc. Lond.* **118**, p. 1089 (3 photophores on cheek, second AOa elevated, those behind forming descending series).
1949. *Lampanyctus gemmifer* Misra, *Rec. Indian. Mus.*, **45**, p. 429 (22°14'25" N., 67°8'5" E., 947 fms., 4·7°C.).
1953. *Lampanyctus gemmifer* Misra, *Rec. Indian. Mus.*, **50**, p. 420, text-fig. 28 b.



TEXT-FIG. 97.—Lateral view of *Lampanyctus (Lampanyctus) crocodilus* (Risso) (After A. Brauer)

B. 8-10; D. 13-14/0; P. 12-16; V 8; A. 16-18; L. 1.38.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 6·7 in total length (5·5-5·7 in standard length). Head compressed, naked, 4·3-4·4 in total length (3·6-3·7 in standard length). Eyes moderate, 4·5 in head. Snout obtusely rounded, 0·5 in eye. Cleft of mouth very wide, maxilla extending upto preopercular edge. Jaws subequal. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, nearly opposite the pelvic origin. Adipose dorsal above last fourth of anal; origin nearer to caudal origin than dorsal origin. Pectorals very long, reaching beyond anal, 1·2 times head. Pelvics moderate, reaching anal, 1·6 in head; origin opposite to dorsal origin, midway between pectoral base and anal origin. Anal slightly longer than dorsal; origin just behind last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal moderate, forked, 1·1 in head. Least height of caudal peduncle 2·3 its length. Lateral line. Cycloid scales, on lateral line scarcely longer than others. Gill rakers 6+12, $\frac{2}{3}$ as long as eye. Photophores: 1 antorbital; 2 preoperculars; 2 operculars, none on shoulder; one suprapectoral (PLO); 2 subpectorals (PVO), not above the pectoral base; 3 branchiostegals; 5 pectorals (PO), fourth PO elevated considerably above the rest of the series, one supraventral (VLO), nearly on a line with 4th PO; 4 ventrals (VO); 3 supra-anals, angulate in disposition; anals (AO), 5—7+6—8; 2 postero-laterals (Pol); 4 pre-caudals (Prc); 4 supracaudal luminous scales; 7 infra-caudal luminous scales.

It attains 54·5 mm. in length; bathypelagic.

Distribution.—Arabian Sea, 22°14'25" N., 67°8'55" E., 1731 m.; East coast of North America, 39°39'45" N.; 71°35'15" W., Mediterranean, 36°—38° N., 15° E.—5° W.; in the mean annual isotherms of 20° C. and 12° C.; with the latitudinal and longitudinal range of 22°14'25" N., 67°8'55" E., in the Indian Ocean and 39°39'45" N., 71°35'15" W. in the Atlantic Ocean and 36°-38°N., 15° E.-5°W. in the Mediterranean.

268. **Lampanyctus (Lampanyctus) macropterus** (Brauer).

1904. *Myctophum (Lampanyctus) macropterus* Brauer, *Zool. Anz.*, 28, p. 404, fig. 5 (type locality: Indian Ocean).

1906. *Myctophum (Lampanyctus) macropterus* Brauer, "Valdivia" Tiefsee Fische, 15, pp. 249, 386, figs. 166, 167 (South of Ceylon, 4°56' N., 78°15'3" E., Bay of Bengal).
1928. *Lampanyctus macropterus* Parr, Bull. Bingham Ocean. Coll., 3, art. 3, pp. 88, 110, fig. 20 (Atlantic, Indian, Pacific Oceans).
1931. *Lampanyctus macropterus* Tanaka, J. Faculty Sci. Tokyo, 3, pt. 1, p. 18 (Southern Japan area).
1939. *Lampanyctus macropterus* Norman, Sci. Rep. John Murray Exped., 7, p. 29 (Arabian Sea, 12°8'6" N., 63°4'36" E., 12°5'18" N., 63°1'42" E., N. 200, 430—984 m., 12·12° to 8·48° C., 9°40'24" N., 54°33'36" E., 9°42'18" N., 54°39' E., N 100, 200 (—0) m.).
1944. *Lampanyctus macropterus* Beebe & Vander Pyl, Zoologica, 29, No. 9, pp. 59, 82 (surface to 100 fms., 2° S.—4°50' N., 87°—91°53' W ; length of specimens 16—70 mm.).
- 1948-49. *Lampanyctus (Lampanyctus) macropterus* Fraser-Brunner, Proc. zool. Soc. Lond. 118, p. 1088 (Prc distinct from AOp).
1949. *Lampanyctus macropterus* Misra, Rec. Indian Mus., 45, p. 429.
1953. *Lampanyctus macropterus* Misra, Rec. Indian Mus., 50, p. 420.

B. 8-10; D. 12-14/0; P. 13; V. 8; A. 18-19; L. 1. 35.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 5·5 in the total length (4·7 in standard length). Head compressed, naked, 3·7 in total length (3·3-3·5 in standard length). Eyes moderate, 5·0-5·5 in head. Snout obtusely pointed, nearly equal to eye. Cleft of mouth very wide, oblique, maxilla extending to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin midway between snout end and caudal origin and an eye diameter behind pelvic origin. Adipose dorsal; origin nearer to last dorsal ray than to caudal origin, and above the last fourth of anal. Pectorals long, low, reaching beyond anal origin, 1 1 in head. Pelvics moderate, reaching anal origin, 1·7 in head and an eye diameter before dorsal origin, nearer to pectoral base than to anal origin or nearly equidistant between them. Anal longer than dorsal; origin below middle of dorsal base, much nearer to pelvic origin than to anal origin. Caudal forked, 1·3 in head. Least height of caudal peduncle 2·0 in its length. Lateral line. Scales deciduous. Photophores : one antorbital; one on shoulder; 2 operculars; one suprapectoral (PLO) near lateral line; 2 subpectorals

(PVO); 3 branchiostegals; 5 pectorals (PO), fourth PO elevated; one supraventral (VLO) much below lateral line; 4 ventrals (VO), second VO elevated; 3 supraanals (SAO) in an obtuse angle, the superior one on lateral line in a line with the superior postero-lateral; anals (AO) 6—7+8—10; 2 postero-laterals (Pol), 4 precaudals (Prc.), the superior most one on the lateral line, inferior most when 2 close together; 3-4 supracaudals luminous scales; 5-7 infracaudal luminous scales.

It attains 65 mm. in length; abyssal.

Distribution.—India : Arabian Sea, $12^{\circ}8'6''$ N., $63^{\circ}4'36''$ E., N 200, 430-984 m., $12^{\circ}12'$ to $8^{\circ}48'$ C., N. 200, 2091 (-0) m., Bay of Bengal, $6^{\circ}53'1''$ N., $93^{\circ}33'5''$ E., $7^{\circ}57'9''$ N., $91^{\circ}47'2''$ E., 2000m., $7^{\circ}1'2''$ N., $85^{\circ}56'5''$ E., 2500m., Sri Lanka South of Sri Lanka, $4^{\circ}56'$ N., $78^{\circ}15'3''$ E., 2000 m.—North east Coast of Africa, 0° – 9° N., 43° – 53° E. 1000–2000 m., Gulf of Aden, $13^{\circ}2'8''$ N., $46^{\circ}41'6''$ E., 1200 m., between Zanzibar and Seychelles, $4^{\circ}45'$ S., $48^{\circ}58'6''$ E., 2000 m., North of Chagos Archipelago, $4^{\circ}5'8''$ S., $73^{\circ}24'8''$ E. 2000 m., Arabian Sea, $9^{\circ}40'24''$ N., $54^{\circ}33'36''$ E. $9^{\circ}42'18''$ N., $54^{\circ}39'$ E., N 100, 200 (—0) m., North of Cocos Is., $10^{\circ}8'2''$ S., $97^{\circ}14'9''$ E., 2400 m., Japan; Atlantic Ocean 23° – 24° N., 75° – 77° W., in the mean annual isotherm of 20° C. with the latitudinal and longitudinal range of 34° N.– 10° S., 46° – 135° E. in the Indo-Pacific = (12° N.— 10° S., 46° – 97° E. in the Indian Ocean + 34° N. 135° E. in the Pacific Ocean) and 23° – 24° N., 75° – 77° W. in the Atlantic.

123. Genus *Diaphus* Eigenmann & Eigenmann

1891. *Diaphus* Eigenmann and Eigenmann, *Proc. Calif. Acad. Sci.*, (2) 3, p. 3 (type, *D. theta* Eig. & Eig., orthotypic).
1896. *Collettia* Goode & Bean, *Spcl. Bull. U. S. nat. Mus.* (1895) 2, p. 83 (type, *Myctophum rafinesquii* Cocco, orthotypic).
1896. *Aethoprora* Goode & Bean, *Spcl. Bull. U.S. nat. Mus.*, (1895) 2, p. 86 (type, *Nyctophus metopoclampus* Cocco, orthotypic).
1925. *Pantophos* Jordan & Hubbs, *Mem. Carnegie Mus.*, 10, p. 156 (type, *Diaphus glandulifer* Gilbert, orthotypic).
1925. *Lamprossa* Jordan & Hubbs, *Mem. Carnegie Mus.*, 10 (type, *Diaphus antorbitalis* Gilbert, orthotypic).
1933. *Cavelampus* Whitley, *Rec. Austral Mus.*, 19, p. 62 (type, *Aethoprora perspicillata* Ogilbey, orthotypic), 25—1341 ZSI/71

Body moderately elongate, compressed, with scales and photophores. Photophores limited to definite and separate series, precaudal photophores usually or always separate from posteroanal series, their number being 4; antorbital photophores greatly enlarged. No supra or infracaudal luminous scales in Indian species. Luminous scales at suprapectoral organ, but never along dorsal or anal base. Snout blunt, short. Eye large, prominent. Cleft of mouth wide. Villiform teeth in bands on jaws, palatine, pterygoid, and tongue. Gill openings wide; gill-rakers long, numerous. Pseudobranchiae present. Dorsal fin with 12-17 rays, in or nearly in middle of back; origin in front of anal origin. Pectoral short, low. Pelvic origin opposite to, or behind, or slightly in front of dorsal origin. Anal with 12-17 rays; origin below or behind dorsal origin; anal base equal to or shorter than dorsal base. Adipose dorsal present. Caudal forked, {procurrent caudal rays soft.

Distribution.—Atlantic Ocean : Mediterranean; coast of Cuba; Southeast coast of South America; Gulf of Mexico, East coast of North America between 35°—39°N., and 70°—74°W.; Gulf of Guinea, 600—3500 m., Indian Ocean: Red Sea, North east coast of Africa, 1000—2000 m., Gulf of Aden 1200 m., Seychelles, 1500—2000 m., Mauritius, 1500-2000 m., Zanzibar, 3000 m., Chagos Is., 2000 m., Arabian Sea, 214—1024 m., Bay of Bengal, 2000—2500 m., Maldiva area, 457—2000 m., between Cocos Is. and West coast of Sumatra, 520—2400 m., West coast of Sumatra, 371 m., Pacific Ocean: Madura Sea, 289 m., Molucco passage, Celebes Sea, 457 m, Japan; Australia; Polynesia.

The genus *Diaphus* is represented by three subgenera in the Indian region.

Key to the subgenera of genus Diaphus Eigenmann & Eigenmann

1. A single inferior antorbital (ia)	•	3	
2. Two inferior antorbitals (ia) con- fluent or extending beyond midor- bit.			<i>Diaphus</i>
3. Inferior antorbital (ia) and superior antorbital (sa) separated by nasal organ.	•		<i>Pantophos</i>
4. Inferior antorbital (ia) and superior antorbital (sa) touching or con- fluent behind nasal organ, not extending beyond midorbit	•		<i>Lamprossa</i>

xiv. Subgenus **Pantophos** Jordan & Hubbs

A single inferior (ia) and superior (sa) antorbital separated by nasal organ; last antero-anal elevated; first antero-anal not elevated.

269. **Diaphus (Pantophos) dumerili** (Bleeker)

1836. *Scopelus dumerili* Bleeker, *Act. Soc. Sci. Ind. Neerl. (Menado)*, 1, p. 66 (type locality : Menado, Celebes).
1860. *Myctophum nocturnum* Poey, *Mem. Hist. nat. Cuba*, 2, p. 426 (type locality : coast of Cuba).
1890. *Scopelus schmitzi* Johnson, *Proc. zool. Soc. Lond.*, p. 456 (type locality : Fossil Bed at the east end of Madeira; type in the British Museum).
1895. *Lampanyctus lacerta* Goode & Bean, *Ocean. Ichth.*, p. 74, fig. 83 (type locality : Gulf of stream, 28°38'30" N., 85°52'30" W.).
1896. *Lampanyctus lacerta* Jordan & Evermann, *Bull. U. S. nat. Mus.*, 47, p. 560.
1896. *Collettia nocturna* Jordan & Evermann, *Bull. U. S. nat. Mus.*, 47, p. 567.
1899. *Scopelus dumerili* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 162 (off the Malabar Coast, 13°5'6" N., 72°48'10" E., 172 fms.).
1906. *Myctophum (Diaphus) lacerta* Brauer, "Valdivia" *Tiefsee Fische*, pp. 214, 384, text-figs. 132—135.
1913. *Myctophum dumerili* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 166 (Celebes : tropical Indian and Pacific oceans; Atlantic between 39° N. and 37°S.).
1928. *Diaphus dumerili* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art 3, pp. 118, 126.
1930. *Diaphus dumerili* Norman, *Discovery Rep.*, 2, p. 331 (O°36' S., 8°28' E., TYF, 100—200 (—0) m; 1 specimen, 47 mm.).
- 1948-49. *Diaphus (Pantophos) dumerili* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1068, fig. (error in spelling of *Pantophos*).
1949. *Diaphus dumerili* Misra, *Rec. Indian Mus.*, 45, p. 430.
1953. *Diaphus dumerili* Misra, *Rec. Indian Mus.*, 50, p. 421.
1958. *Diaphus dumerili* Briggs, *Bull. Florida State Mus. Biol. Sci.*, 2, (8) p. 258 (Florida, 24°—30° N., 78°—87°W.).

B. 8-10; D. 15-16/0; P. 12; V. 8-9; A. 15-16; L. 1. *ca* 34.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 5.8-6.4 in the total length (4.5-5.3 in standard length). Head compressed, naked, 4.0-4.5 in total length (3.2-3.7 in standard length). Eyes moderate, 3.0-3.8 in head, nearly twice in snout. Cleft of mouth very wide, oblique, maxilla extending to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin much nearer to snout end than to caudal origin, opposite to pelvic origin. Adipose dorsal in the last third of anal, slightly nearer to caudal origin than to last dorsal ray. Pectorals short, reaching pelvic origin, 2.0 in head. Pelvics 1.4 in head, reaching vent; origin opposite dorsal origin much nearer to pectoral base than to anal origin. Anal equal to dorsal; origin just behind last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked, nearly equal to head. Lateral line. Least height of caudal peduncle 1.5 in its length. Scales cycloid, deciduous. Photophores: 2 small antorbitals, both widely separated from each other; one minute suborbital; 2 operculars; one suprapectoral (PLO) near lateral line; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO), fourth PO elevated one supraventral (PLO), much below lateral line; 5 ventrals (VO), second and third VO outside the series; 3 supra-anals (SAO), the superiormost near the lateral line; usually 7+5 anals (AO), last antero-anal series elevated appearing like second Pol., one postero-lateral (Pol) just below lateral line and below adipose dorsal; 4 precaudals (Prc) the superiormost one near the lateral line; one luminous scale at PLO.

Violet brown, opercle silvery.

It attains 80 mm. in length; abyssal.

Distribution.—India : Arabian Sea; Off the Malabar coast, 13°5'6" N., 72°48'10" E., 214 m., Bay of Bengal, 7°53'2" N., 88°44'9" E., 2000 m., Sri Lanka, 4°56' N., 78°15'8" E., 2000 m.,—Coast of Cuba, 22° N., 80° W., South east Coast of South America, 37°S., 53°W., Gulf of Mexico Florida, 24°—30° N., 78°—87° W., East coast of North America between 35°—39° N. and 70°—74° W., Gulf of Guinea, 5° N.—9° S., 9° E.—13° W., 600—3500 m., West and east coasts of Seychelles, 3°—4° S., 51°—58° E., 2000 m., North of Chagos Archipelago, 4°5'8" S., 73°24'8" E., 2000 m., Celebes, 2°S., 120°E., in the mean annual isotherms of 12°C. and 20°C. with the latitudinal and longitudinal range of 13°

N.—4° S., 51°—120° E. in the Indo-Pacific—(13° N.—4° S., 51°—88° E. in the Indian Ocean+2° S. 120° E. in the Pacific Ocean) and 39° N.—37° S., 9° E.—87° W. in the Atlantic Ocean.

xv. Subgenus **Lamprossa** Jordan & Hubbs

A single inferior (ia) and superior (sa) antorbitals touching or confluent behind nasal organ, but not extending beyond mid-orbit. First and last antero-anal elevated.

The subgenus **Lamprossa** is represented by 3 species in the Indian region.

Key to species of subgenus Lamprossa Jordan & Hubbs

1. Upper SAO (supra anal organs),
Pol (postero-lateral organ) and
superior most Prc (precaudals)
touching lateral line; pectoral just
reaching or not reaching pelvic
origin. 3
2. Upper SAO, Pol and superiormost
Prc far below lateral line; pectoral
reaching beyond pelvic origin *Diaphus (Lamprossa) coeruleus*
3. VLO midway between lateral line
and pelvic base ; pelvic origin
before dorsal origin ; pectoral
almost reaching pelvics *Diaphus (Lamprossa) garmani*
4. VLO nearer lateral line than to
pelvic base ; pelvic origin opposite
dorsal origin; pectoral not reaching
pelvics *Diaphus (Lamprossa) splend-*
dum

270. **Diaphus (Lamprossa) coeruleus** (Klunzinger)

1871. *Scopelus coeruleus* Klunzinger, *Verh. zool. bot. Ges. Wien.*, 21, p. 592 (type locality : Kosseir, Red Sea; type in the Berlin Museum).
1887. *Scopelus engraulis* Günther, "Challenger" *Rep.*, 22, p. 197, pl. 51, fig. C (type locality : Philippines, 250 fms.).
1891. *Scopelus engraulis* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 129 (Andaman Sea, 11°31'40" N., 92°46'6" E., 188—220 fms., 13.3°C.).
1896. *Scopelus engraulis* Alcock, *J. As. Soc. Bengal*, 65, p. 333 (Andaman Sea, 188—220 fms.).
1899. *Scopelus engraulis* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 161.

1904. *Diaphus watasei* Jordan & Starks, *Bull. U. S. Fish. Comm.*, **22**, p. 580 (type locality : off Atami in Sagami Bay, 153 fms.).
1906. *Myctophum (Diaphus) coeruleum* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 217, 384, text-fig. 137.
1913. *Myctophum caeruleus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 168, fig. 65 *b*. (Celebes Sea; Molucco Passage, West coast of Sumatra).
1928. *Diaphus coeruleus* Parr, *Bull. Bingham Ocean. Coll.*, **3**, art. 3, p. 122 (Indian & Pacific Oceans).
1929. *Diaphus coeruleus* Mc Culloch, *Mem. Austral Mus.*, **5**, pt. 1., p. 81 (Great Australian Bight).
1931. *Diaphus coeruleus* Tanaka, *J. Faculty Sci. Tokyo*, **3**, pt. 1, p. 17 (Southern Japan area).
1941. *Diaphus coeruleus* Herre, *Mem. Indian Mus.*, **13**, p. 341.
- 1948-49. *Diaphus (Lamprossa) coeruleus* Fraser-Brunner, *Proc. zool. Soc. Lond.*, **118**, p. 1070, fig.
1949. *Diaphus coeruleus* Misra, *Rec. Indian Mus.*, **45**, p. 429.
1953. *Diaphus coeruleus* Misra, *Rec. Indian Mus.*, **50**, p. 421. text-fig. 28 *a*.
1953. *Myctophum coeruleus* Herre, *Check List Philippine Fish.*, p. 143. (Philippines).

B. 8-10; D. 12-14/0; P. 10-12; V 8-9; A.15; L. 1. 37.

Body elongate compressed, scaly; abdomen smooth, non-keeled. Depth 5.5 in total length (4.5-5.0 in standard length). Head compressed, naked, 4.0 in total length (3.4—3.6 in standard length). Eyes moderate, 3.8—4.0 in head, 1.5 times snout, 3 times in interorbital. Cleft of mouth very wide, maxilla reaching preopercular edge. A single rayed dorsal fin; origin near to snout end than to caudal origin, opposite to pelvic origin. Adipose dorsal above 13-14th anal ray, nearer to caudal origin than to last dorsal ray. Pectorals small, low, reaching beyond pelvic origin, 2.1 in head. Pelvics just reaching vent, 1.8 in head; origin opposite dorsal origin, much nearer to pectoral base than to anal origin. Anal nearly equal to dorsal; origin

half an eye diameter behind last dorsal ray, much nearer to pelvic origin than to anal origin. Caudal forked, 1.3 in head. Least height of caudal peduncle 1.7 in its length. Lateral line. Scales cycloid, deciduous. Photophores; 2 antorbitals, upper one smaller, one behind nasal organ; no suborbital; 2 operculars; one suprapectoral (PLO) below lateral line; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO), fourth PO elevated one supraventral (VLO) much below lateral line. 5 ventrals (VO), second and third VO outside the series; 3 supra-anals (SAO), superior-most SAO far below lateral line; anals (AO), 6+5, first and last in the antero-anal series elevated, one postero-lateral (Pol) below lateral line; 4 precaudals (Prc), superior-most one far below lateral line.

Silvery, black, blackish-blue; fins hyaline.

It attains 150 mm. in length.

Distribution.—India : Andaman Sea, 11°31'40" N., 92°46'6" E., 343—402 m., 13.3°C.—Red Sea; West coast of Sumatra, 0°43'2" S., 98°33'8" E., 371 m., Molucco passage, 1500 m., Philippines; Celebes Sea off Mindanao, 457 m., Japan; Australia in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 34°N.—32°S., 39°—135° E. in the Indo-Pacific=(11°N.—32°S., 39°—135° E. in the Indian Ocean+34° N.—2°S., 123°—135° E. in the Pacific Ocean).

271. *Diaphus* (*Lamprossa*) *garmani* Gilbert

1906. *Diaphus garmani* Gilbert, *Bull. Harv. Mus. Comp. Zool.*, **46**, (14), p. 258, pl. 2, (type locality: Cuba).
1928. *Diaphus garmani* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 3, pp. 123, 145 (West Indian waters).
1939. *Diaphus garmani* Norman, *Sci. Rep. John Murray Exped.*, **7**, p. 30 (Arabian Sea, 23°2'48" N., 64°31'54" E., 23°2'30" N., 64°41' E., N 100, 1000 (-0) m., 9°C., N 200, 2000(-0) m., 3.18°C., 9°42'18" N., 54°39' E., N 200, 2091 (-0) m.).
- 1948-49. *Diaphus* (*Lamprossa*) *garmani* Fraser-Brunner, *Proc. zool. Soc. Lond.*, **118**, p. 1070, fig.

1949. *Diaphus garmani* Misra, *Rec. Indian Mus.*, **45**, p. 430.

1953. *Diaphus garmani* Misra, *Rec. Indian Mus.*, **50**, p. 420.

B. 8-10; D. 14/0; P. 12; V 8; A. 15; L. 1. 34.

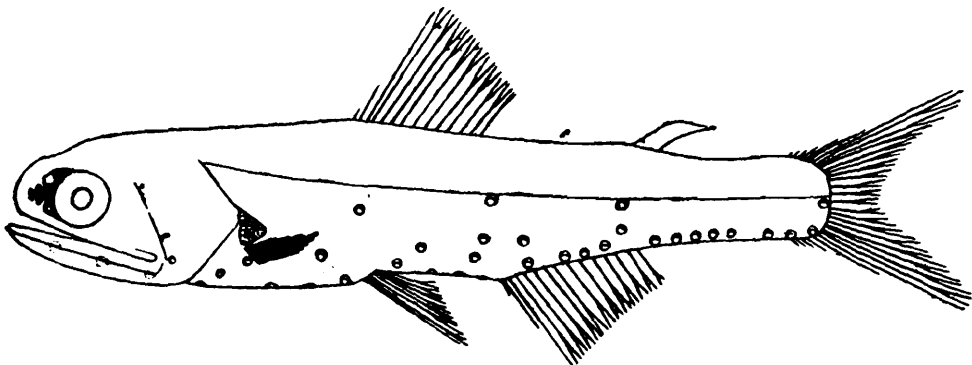
Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.2—4.6 in total length (3.4—3.8 in standard length). Head compressed, naked, 4.0—4.4 in total length (3.2—3.8 in standard length). Eyes moderate, 3.0—3.7 in head. Snout obtusely rounded, half in eye diameter. Cleft of mouth very wide, oblique, maxilla extending to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin much nearer to snout than to caudal origin, about 3 eye diameters behind pelvic origin. Adipose dorsal over 11th or 12th anal ray; origin nearer to last dorsal ray than to caudal origin. Pectorals very short, almost reaching pelvics, 1 1 times eye, 3 1 in head. Pelvics not reaching vent, 1.8 in head, about 3/4 eye diameter before dorsal origin, nearer to pectoral origin than to anal origin. Anal nearly equal to dorsal; origin below last dorsal ray, much nearer to pelvic origin than to caudal origin. Caudal forked, 1 1 in head. Least height of caudal peduncle 2.1 in its length. Lateral line. Scales deciduous. Photophores, 2 antorbitals, upper small meeting the lower behind nasal organ; one opercular; one supra-pectoral (PLO) much below lateral line; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO), fourth PO elevated; one supraventral (VLO) midway between lateral line and pelvic base, 5 ventrals (VO), 2nd and 3rd VO outside of the series; 3 supra-anals (SAO), the superiormost touching lateral line; anals (AO) 7+5, first and last of the antero-anal series elevated; one postero-lateral (Pol) touching the lateral line; 4 precaudals (Prc), the superiormost near lateral line; one large luminous scale at PLO; one luminous scale at antorbital.

It attains at least 49 mm. in length excluding caudal; abyssal.

Distribution.—Arabian Sea, 23°3'48" N., 64°31'54" E., N 100, 1000 (-0)m., 23°2'30" N., 64°41' E., N 200, 2000 (-0) m.—Arabian Sea, 9°42'18" N., 54°39' E., 9°40'24" N., 54°39' E., N 200, 2091 (-0) m., Cuba, 22°N. 80°W., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 9°—23° N., 54°—64° E. in the Indian Ocean and 22°N. 80°W. in the Atlantic.

272. *Diaphus* (*Lamprossa*) *splendidum* (Brauer)
(Text-fig. 98)

1904. *Myctophum* (*Nyctophus*) *splendidum* Brauer, *Zool. Anz.*, **28**, p. 399, fig. 7 (type locality: Atlantic and Indian Oceans).
 1906. *Myctophum* (*Diaphus*) *splendidum* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, p. 218, 384, figs. 138, 139 (Bay of Bengal, 7°1'2" N., 85°56'5" E., 2500 m.).
 1913. *Myctophum splendidum* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, **2**, p. 170 (Madura Sea, 289 m.).
 1928. *Diaphus splendidus* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 3, p. 123 (Indian and Atlantic Oceans)
 1930. *Diaphus splendidus* Norman, "*Discovery*" *Rep.*, **2**, p. 335 (2°43' 30" S., 0°56'36" W., 125—175(-0)m.).
 1931. *Diaphus splendidus* Tanaka, *J. Faculty Sci. Tokyo*, **3**, pt. 1, p. 18 (Southern Japan area).
 1939. *Diaphus splendidum* Norman, *Sci. Rep. John. Murray Exped.*, **7**, p. 31 (Maldives, 4°47' N., 72°50'54" E., 4°45'30" N., 72°47'42" E., AT, 457 m., 9°7'6" N., 55°27'6" E., 9°8'48" N., 55°31'48" E. AT 3840—3872 m., 3.68°C. at 2000 m.).
 1948-49. *Diaphus* (*Lamprossa*) *splendidus* Fraser-Brunner, *Proc. zool. Soc. Lond.*, **118**, p. 1070, fig.
 1949. *Diaphus splendidum* Misra, *Rec. Indian Mus.*, **45**, p. 430.
 1953. *Diaphus splendidum* Misra, *Rec. Indian Mus.*, **50**, p. 421, fig. 28a.
 1955. *Diaphus splendidus* Munro, *Mar. Freshwater Fish. Ceylon*, p. 37 (Ceylon).



TEXT-FIG. 98.—Lateral view of *Diaphus* (*Lamprossa*) *splendidum* (Br.)(After A. Brauer)

B. 8—10; D. 13—15/0; P. 11; V. 8; A. 15-16; L. 1. 38-39.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 5.8 in total length (4.8 in standard length). Head compressed, naked, 4.0—4.2 in total length

(3.2—3.5 in standard length). Eyes moderate, 3.0—4.2 in head. Snout rounded, 1.5 in eye. Cleft of mouth wide, oblique, maxilla reaching to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin nearer to snout end and adipose dorsal origin than to caudal origin, slightly before pelvic origin. Adipose dorsal above last 14th to 15th anal ray. Pectorals short, not reaching pelvic origin, 2.9 in head. Pelvics almost reaching anal, 1.8 in head; origin slightly behind dorsal origin, midway between pectoral base and anal origin. Anal nearly equal to dorsal; origin about half eye diameter behind last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked, 1.2 in head. Least height of caudal peduncle 2.2 in its length. Lateral line. Scales deciduous. Photophores: 2 antorbitals, upper or superior antorbital small, meeting the lower or inferior one behind the nasal organ; no suborbital; 2 operculars; one suprapectoral (PLO) midway between pectoral base and lateral line; 2 subpectorals (PVO), 3 branchiostegals; 5 pectorals (PO), fourth elevated; one supraventral (VLO), much nearer to lateral line than to pelvics; 5 ventrals (VO), second elevated; 3 supra-anals (SAO), the superiormost touching lateral line; anals (AO) 5-6+4-6, the first and last AO of the antero-anal series elevated; 4 precaudals (Prc), the superiormost touching lateral line; one luminous scale at PLO.

It attains 75—90 mm. in length ; abyssal.

Distribution.—India: Bay of Bengal, 7° 1' 2" N., 85° 56' 5" E., 2500 m., Maldivé area, 4° 47' N., 72° 50' 54" E., 4° 45' 30" N., 72° 47' 42" E., 457 m.—Arabian Sea, 9° 7' 6" N., 55° 27' 6" E., 9° 8' 48" N., 55° 31' 48" E., AT 3840—3872 m., 3.68°C. at 2000 m., Gulf of Guinea, 3°—9° S., 7°—9° E., 700—3000 m., Northeast coast of Africa, 9° N.—0° 27' S., 42°—53° E., 1500—2000 m., off Seychelles, 3° 26' 2" S., 58° 34' 2" E., 1500 m., Mauritius, 1500—2000 m., between Cocos Is. and West Coast of Sumatra, 8° N.—10° S., 94°—99° E., 520—2400 m., Madura Sea, 7° S. 113° E., 289 m. Japan, 35° N., 135° E., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 35° N.—20° S., 42°—135° E. in the Indo-Pacific=(9° N.—20° S., 42°—99° E. in the Indian Ocean+35° N.—7° S., 113°—135° E., in the Pacific Ocean) and 3°—9° S., 7°—9° E. in the Atlantic Ocean.

xvi. Subgenus **Diaphus** Eigenmann & Eigenmann

A single upper or superior (*sa*) antorbital and 2 or 3 lower or inferior antorbitals (*ia*) separate or confluent extending beyond mid-orbit. First antero-anal elevated or not elevated; last antero-anal (AOa) elevated.

The subgenus **Diaphus** is represented by 2 species in the Indian region.

Key to species of subgenus Diaphus Eigenmann & Eigenmann

1. Anal origin $1/3$ eye diameter behind last dorsal ray; supra ventral (VLO) midway between pelvic base and lateral line; 2 inferior antorbitals (*ia*) separate *Diaphus (Diaphus) rafinesquii*
2. Anal origin before last dorsal ray; supra ventral (VLO) nearer; lateral line than to pelvic base; 2 inferior antorbitals confluent. *Diaphus (Diaphus) lutkeni*

273. *Diaphus (Diaphus) lutkeni* (Brauer)

1904. *Myctophum (Myctophum) lutkeni* Brauer, *Zool. Anz.*, **28**, p. 400 (type locality: Indian Ocean).
1906. *Myctophum (Diaphus) lutkeni* Brauer, "*Valdivia*" *Tiefsee Fische*, **15**, pp. 221, 384, figs. 141, 142.
1928. *Diaphus lutkeni* Parr, *Bull. Bingham Oceanogr. Coll.*, **3**, art. 3, p. 118 (Indian and Atlantic Oceans).
1930. *Diaphus lutkeni* Norman, "*Discovery*" *Rep.*, **2**, p. 333 (3°N.—35°S. and 10°E.—16°W., TYF, 125—1000(-0)m., at 1000 m. 7.57°C., at 200 m. 13.48°C).
1939. *Diaphus lutkeni* Norman, *Sci. Rep. John Murray Exped.*, **7**, p. 30 (Arabian Sea, 10°54'42" N., 61° 20'54" E. 10°53'18" N., 61°22'24" E., N 200, 400—645 m., 1°39'6" N., 61°13'44" E., 2°7'30" N., 61°21'12" E., N 200, 600—0 m.).
1949. *Diaphus lutkeni* Misra, *Rec. Indian Mus.*, **45**, p. 430.
1953. *Diaphus lutkeni* Misra, *Rec. Indian Mus.*, **50**, p. 420.

B. 8—10; D. 15—16/0; P. 11; V. 8; A. 16; L. 1. 36.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.4 in total length (3.8 in standard length). Head compressed, naked, 3.7 in total length (3.2 in standard length). Eyes large, 3.1—4.0 in head. Snout obtusely rounded, half of eye. Cleft of mouth very wide, oblique, maxilla extending to preopercular edge. Jaws subequal. A single rayed dorsal fin; origin nearer to snout end and adipose dorsal origin than to caudal origin, slightly behind pelvic origin. Adipose dorsal above 14th to 15th anal ray; origin nearer to caudal origin than to last dorsal ray. Pectorals short, not reaching pelvics, 3.0 in head. Pelvics reaching anal; origin slightly before dorsal origin, nearer to pectoral base than to anal origin. Anal nearly equal to dorsal; origin below 13th to 14th dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked, 1.8 in head. Least height of caudal peduncle 1.8 in its length. Lateral line. Scales cycloid, deciduous. Photophores: one superior antorbital (*sa*) and 2 inferior antorbitals (*ia*) confluent occupying entire ventral margin of orbit; 2 operculars; 3 branchiostegals, 5 pectorals (PO), fourth PO elevated; one supraventral (VLO), much below lateral line; 4 ventrals (VO), first and second VO outside the series, 3 supra-anals (SAO), superiormost below lateral line; anals (AO) 6+5, first and last AO of antero-anal series elevated; one postero-lateral (Pol) just below lateral line; 4 precaudals (Prc), superiormost just below lateral line; one luminous scale below PVO.

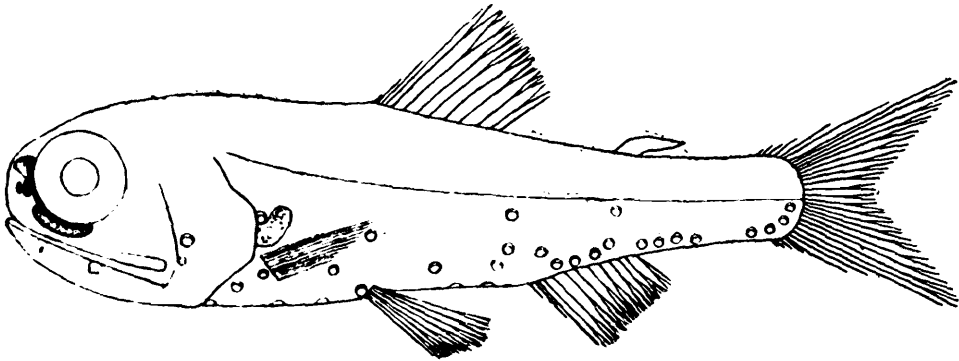
It attains 55 mm. in length; abyssal.

Distribution.—India: Arabian Sea, 10°54'42" N., 61°20'54" E., N. 200, 400—465 m., 1°39'6" N., 61°13'48" E., 2°7'30" N., 61°21'12" E.—North coast of Africa, 0°—9° N., 43°—53° E., 1000—2000 m., Atlantic Ocean, 9° N.—35° S., 10° E.,—16° W., TYF, 125—1000 (-0)m., at 1000m. 7.57°C., at 200 m. 13.48°C.; West of Chagos archipelago, 4°5'8" S., 70°1'9" E., 2000 m., near Zanzibar, 5°12'5" S., 46°32'3" E., 3000 m., in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 10° N.—5° S., 43°—70° E., in the Indian Ocean and 9° N.—35° S., 10° E.—16° W. in the Atlantic Ocean.

274. *Diaphus* (*Diaphus*) *rafinesquii* (Cocco)

(Text-fig. 99)

1838. *Nyctophus rafinesquii* Cocco, *N. Ann. Sci. Nat. Bologna*, 2, p. 20, pl. 3, fig. 7 (type locality: Mediterranean).
1864. *Scopelus rafinesquii* Günthür, *Cat. Fish. Brit. Mus.*, 5, p. 410.
1906. *M. (Diaphus) rafinesqueii* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 223, 384, figs. 144, 145.
1908. *Diaphus nunus* Gilbert. *Mem. Harv. Mus. Comp. Zool.*, 26, No. 6 p. 224, pl. 1. (type locality: near Nukuhiva I, Marquesas group, taken in open intermediate net from surface to 300 fms.).
1928. *Diaphus rafinesquii* Parr, *Bull. Bingham Oceanogr. Coll.*, 3, art. 3, pp. 119, 131 (Mediterranean, Atlantic, Pacific).
1930. *Diaphus rafinesquii* Norman, "Discovery" *Rep.*, 2, p. 334 (Marquesas Is., Japan, Mediterranean, Atlantic, 2°—40° S., 16°E.—36°W., N 450, 125—400(-0) m., TYF, 100—550 (-0) m.).
1939. *Diaphus rafinesquii* Norman, *Sci. Rep. John. Murray Exped.*, 7, p. 30 (Arabian Sea, 23°2'48" N., 64°31'54" E., 23°2'12" N., 64°33'39" E., 23°2'30" N., 64°15'54" E., N 100, 1500 (-0) m., 5·57°C, N 200 2000(-0) m., 3·18° C., 19°24'20" N 69°24'18" E., 19°25'42" N., 69°22'54" E., AT, 759—1024 m., 10°54'42" N., 61°20'54" E., 10°53'18" N., 61°22'24" E., N 200 400—645m., 1°39'6" S., 61°13'48" E., N 200 2°7'30" S., 61°21'12" E., N 200, 600 (-0) m).
1949. *Diaphus rafinesquii* Misra, *Rec. Indian Mus.*, 45, p. 430.
1953. *Diaphus rafinesquii* Misra, *Rec. Indian Mus.*, 50, p. 421, text-fig. 28 d.



TEXT-FIG. 99.—Lateral view of *Diaphus* (*Diaphus*) *rafinesquii* (Cocco) (After A. Brauer)

B. 8—10; D. 12/0; P. 9—10; V. 8; A. 12—14; L. 1.
32—36.

Body elongate, compressed, scaly; abdomen smooth, non-keeled. Depth 4.6 in total length (3.8 in standard length). Head compressed, naked, 3.8 in total length (3.1 in standard length). Eyes large, 2.6—2.9 in head. Snout rounded, 3.5 in eye. Cleft of mouth wide, oblique, maxilla reaching preopercular edge, maxilla 5.0 in standard length. Jaws subequal. A single rayed dorsal fin; origin nearer to snout end than to caudal origin, opposite pelvics. Adipose dorsal over 10th or 11th anal ray, nearer to caudal origin than to last dorsal ray. Pectorals low, 2.1 in head, reaching pelvic origin. Pelvics reaching vent, 1.8 in head; origin opposite dorsal origin, nearer to pectoral base than to anal origin. Anal nearly equal to dorsal; origin $\frac{1}{3}$ eye diameter behind last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked, 1.2 in head. Least height of caudal peduncle 2.0 in its length. Lateral line. Scales deciduous. Photophores: One superior (*sa*) antorbital (*ia*) and 2 inferior (*ia*) antorbitals separate extending beyond mid-orbit; 2 operculars; one suprapectoral (PLO), below lateral line; 2 subpectorals (PVO); 3 branchiostegals; 5 pectorals (PO), 4th PO elevated; one supraventral (VLO), nearly midway between lateral line and pelvic base; 5 ventrals (VO), 3rd VO elevated; 3 supra anals (SAO) the superiormost near the lateral line; anals (AO) 5—7+3—5, usually 6+4, the first and last AO of the antero-anal series elevated; one postero-lateral (Pol) near the lateral line; one luminous scale below antorbital; one very large, broad luminous scale at PLO.

It attains 66 mm. in length; bathypelagic.

Distribution.—Arabian Sea, 19°24'20" N., 69°24'18" E., 19°25'42" N., 69°22'54" E., AT, 759—1024 m., 10°54'42" N., 61°21'54" E., 10°53'18" N., 61°22'24" E., N 200, 400—645 m., Off Indus Delta, 23°2'12" N., 64°33'39" E., 23°2'30" N., 64°15'54" E., N 100, 1500 (-0) m., 5.57° C., N 200, 2000 (-0) m., 3 18°C—Arabian Sea, 1°39'6" S., 61°13'48" E., 2°7'30" S., 61°21'12" E., N 200, 600 (-0) m., East coast of North America, 37°12'20" N., 69°39' W., Messina, 38°13' N., 15°13' E., Gulf of Aden, 13° N., 46° E., 1061—1080 m., Japan, 35° N., 135° E., Marquesas Is., 140°W., 10° S., Atlantic Ocean, 2°—40° S., 16° E.—36° W., in the mean annual isotherms of 20°C. and 12° C. with the latitudinal and longitudinal range of 35°N.—10° S., 46°E.—140°W. in the Indo-Pacific=(1°—23° N., 46°—69° E. in the Indian Ocean +35°N.—10° S., 135°E.

—140° W. in the Pacific Ocean) 37° N.—40° S., 16° E.—69° W. in the Atlantic Ocean and 38°13' N., 15° 13' E. in the Mediterranean.

xv. Subfamily *NEOSCOPELINI*

Photophores not restricted to definite and separate series, but one photophore to each on entire body or photophores only on the ventral part of body. Vomerine teeth in one patch; teeth on entopterygoid.

The subfamily *NEOSCOPELINI* is represented by a single genus in the Indian region.

124. Genus *Neoscopelus* Johnson

1863. *Neoscopelus* Johnson, *Proc. zool. Soc. Lond.*, p. 44, (type, *N. macrolepidotus* Johnson, orthotypic).

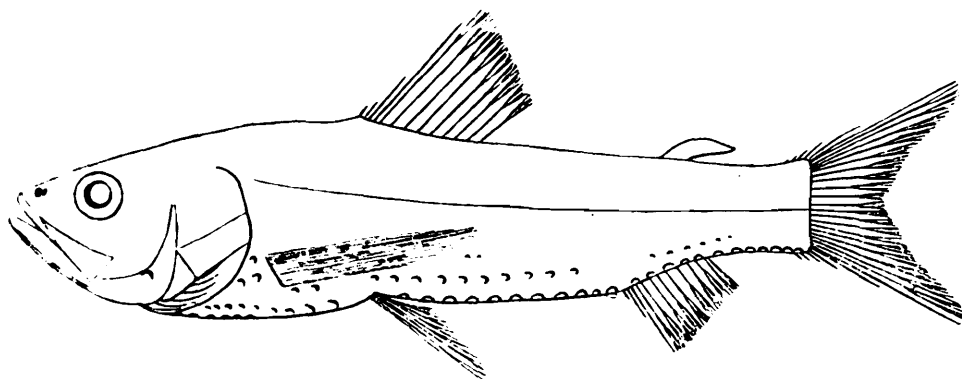
Body moderately elongate, compressed, scales spiny cycloid, deciduous; with photophores. Photophores not limited to definite and separate series, they being present only on ventral part of body. Snout rather long, depressed. Eyes moderate. Cleft of mouth moderate. Villiform teeth on jaws, palatine pterygoid, tongue and vomer. Gill-openings wide, gill membranes free from isthmus. Branchiostegals 8-9, gill rakers slender, long, numerous. Pseudobranchiae well developed. Dorsal with 11—13 rays; origin midway between tip of snout and adipose dorsal and much in advance of anal origin. Pectorals moderate, slightly below middle of height. Pelvic origin below dorsal fin. Anal with 11—13 rays; origin far remote from dorsal origin. Adipose dorsal present. Caudal forked.

Distribution.—Atlantic Ocean: Madeira, Coast of Morocco, 1350—1590 m.; West Indies, 592—652m., Indian Ocean: Alagoa Bay to Natal, 548 m.; East coast of Africa, 693 m.; Arabian Sea, 658 m.; Maldivé area, 494 m.; Bay of Bengal, 343—740m.; West coast of Sumatra, 614 m.; Pacific Ocean: Japan, Northeast of New Zealand, 940—1097 m.; Sandwich Is.; Australia.

275. *Neoscopelus macrolepidotus* Johnson

(Text-fig. 100)

1863. *Neoscopelus macrolepidotus* Johnson, *Proc. zool. Soc. Lond.*, p. 44.
1891. *Neoscopelus macrolepidotus* Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 129 (Andamans, 11°31'40" N., 92°46'6" E., 188—220 fms., 13. 3°C).
1896. *Neoscopelus macropidotus* Alcock, *J. As. Soc. Bengal*, 65, p. 33 (Andamans Sea, 188—220 fms.).
1899. *Neoscopelus macrolepidotus* Alcock, *Cat. Ind. Deep Sea Fish.*, p. 164 (Andaman Sea, 11°25'5" N., 92°47' E., 405 fms., 8.3°C., Arabian Sea, off Travancore coast, 9°29'34" N., 75°38'360 fms., 9.2°C.).
1904. *Neoscopelus alcocki* Jordan & Starks, *Bull. U.S. Fish Comm.*, p. 580 pl. 2 figs. 1.2 (type locality: Suruga Bay, 173—260 fms.).
1906. *Neoscopelus macrolepidotus* Brauer, "Valdivia" *Tiefsee Fische*, 15, pp. 147, 381, pl. 11, figs. 2, 3, text-figs. 72—76 (West Coast of Sumatra, East coast of Africa, 614—693 m., 10.2°—90°C., North east of New Zealand, 950—1097m., 6°—4°C., Sandwich Is., 405—1463m.).
1913. *Neoscopelus macrolepidotus* Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, 2, p. 174, fig. 67. (Madura Sea, 289m., Bali Sea, 538 m., Flores Sea, 521 m., Timor Sea, 709 m., Arafura Sea, 560 m., west of Sumatra, 614 m.).
1928. *Neoscopelus macrolepidotus* Parr, *Bull. Bingham Oceanogr. Coll.* 3, art. 3, p. 48 (known from all temperature and warm seas).
1929. *Neoscopelus macrolepidotus* Mc Culloch., *Mem. Austral. Mus.*, 5, pt. 1, p. 81 (Great Australian Bight).
1931. *Neoscopelus macrolepidotus* Tanaka, *J. Faculty Soci. Tokyo*, 3, pt. 1, p. 17 (Southern Japan area).
1939. *Neoscopelus macrolepidotus* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 28 (Maldiva area, 45°84'2" S., 73°16'24" E., AT, 494 m., 10.86°C. at 400 m.).
1941. *Neoscopelus macrolepidotus* Herre, *Mem. Indian Mus.*, 13, p. 341 (Andamans).
- 1948-49. *Neoscopelus macrolepidotus* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1039, fig.
1949. *Neoscopelus macrolepidotus* Misra, *Rec. Indian Mus.*, 45, p. 431.
1953. *Neoscopelus macrolepidotus* Misra, *Rec. Indian Mus.*, 50, p. 422, fig. 28 c.
1953. *Neoscopelus macrolepidotus* Smith, *Sea Fish. South. Africa*, p. 188, fig. 190 (from Algoa Bay to Natal, 300 fms.).



TEXT-FIG. 100—Lateral view of *Neoscopelus macrolepidotus* Johnson (After A. Brauer)

B. 8—9; D. 11—13/0; P. 15—18; V. 8; L 1. 30—31; L. tr. 3/5.

Body elongate, compressed scaly; abdomen smooth, non-keeled. Depth 4.8—5.3 in total length (4.0—4.5 in standard length). Head compressed, naked, 3.5—4.0 in total length (3.0—3.4 in standard length). Eyes moderate, 4.5—5.0 in head, midway between tip of the depressed snout and the vertical limb of preopercle, less than inter-orbital. Snout depressed, 1.1 times eye. Cleft of mouth moderate, oblique, maxilla reaching hind border of eye. Jaws subequal. Villiform teeth on vomer. A single rayed dorsal fin; origin much nearer to snout end and adipose dorsal origin than to caudal origin, half eye diameter before pelvic origin. Adipose dorsal above middle of anal; origin nearer to caudal origin than to last dorsal ray. Pectorals low, long, equal to head, reaching nearly pelvic tips. Pelvics moderate, 1.8 in head, not reaching vent; origin half an eye diameter behind dorsal origin, much nearer to pectoral base than to anal origin by a distance nearly half of that between pelvic and anal origins. Anal slightly shorter than dorsal; about half head length, behind last dorsal ray. Caudal forked, 1.2 in head. Least height of caudal peduncle 1.1 in its length. Lateral line. Scales with minute spines. Air bladder. Gillrakers long, slender. Photophores: One opercular; a few small ones on gill membranes; 8-9 small ones on each side on lower surface of tongue, with a large one behind them; 8-9 along each side on isthmus; 3 smaller ones medially on isthmus followed by 14—17 to vent; a small one between urogenital papillae followed by 4-5 behind last ray of anal; on each side of vent, a row of 4 small ones; in the ventrolateral series 31—35 beginning at the vertical through the first one in

the median series to caudal; in the inferior lateral series 9 from the vertical through the first one in the median series to pelvics; in the superior lateral series 20—25 from dorsal of pectorals to somewhat behind end of anal; 3 large ones before base of pectoral, 3—4 smaller behind it, 2—3 small ones before pelvic base; besides some scattered smaller ones.

Reddish with back and belly darker; head silvery; fins red.

It attains 240 mm. in length; bathypelagic.

Distribution.—India* Andaman Sea, 11°31'40" N., 92°46'6" E., 11°25'5" N., 92°47' E., 343—740 m., 13.3°—8.3°C; Arabian Sea, 9°29'34" N., 75°38' E., 658 m., 9.2°C., Maldiva area, 4°58'42" S., 73°16'24" E., 494m., 10.86°C. at 400 m. Madeira, Coast of Morocco, 30°—35° N., 5°—10° W., 1350—1590m. West Indies, 22° N., 80° W., 592—652m., Alagoa Bay to Natal, 548 m., East coast of Africa, 1°40'6" S., 41°47'1" E., 693 m., 9°C., West coast of Sumatra, 0°15'2" N., 98°8'9" E., 614 m., 10.2°C., Indonesia, 289—709 m., Japan, Northeast of New Zealand 29°55' S., 178°14' W., 950—1097 m., 6°—4°C., Sandwich Is., 405—1463 m., Australia, in the mean annual isotherms of 20°C. and 12°C. with the latitudinal and longitudinal range of 35°N.—29°S., 30°E.—178°W. in the Indo-Pacific=(11°N.—29° S., 30°—125° E. in the Indian ocean+35° N.—29° S., 120° E.—178° W. in the Pacific), 22°—36° N., 50°—80° W. in the Atlantic Ocean.

xvi. Subfamily *SCOPELENGINI*

The subfamily *SCOPELENGINI* differs from the subfamilies Neoscopelini and Myctophini in having no photophores and no teeth on entopterygoid and in having 2 separate patches of vomerine teeth.

This subfamily is represented by a single genus in the Indian region.

125. Genus *Scopelengys* Alcock

1890. *Scopelengys* Alcock, *Ann. Mag. nat. Hist.*, (6) 6, p. 302 (type, *S. tristis* Alc., orthotypic).

Body elongate, compressed (scales unknown, if present very deciduous): without photophores. Head compressed. Snout moderate; eye small. Cleft of mouth wide, oblique.

* Samuel (1966, *Bull. Dept. mar. biol. & Oceanogr. Univ. Kerala*, 2, p. 29) also records the species from off the South west coast of India.

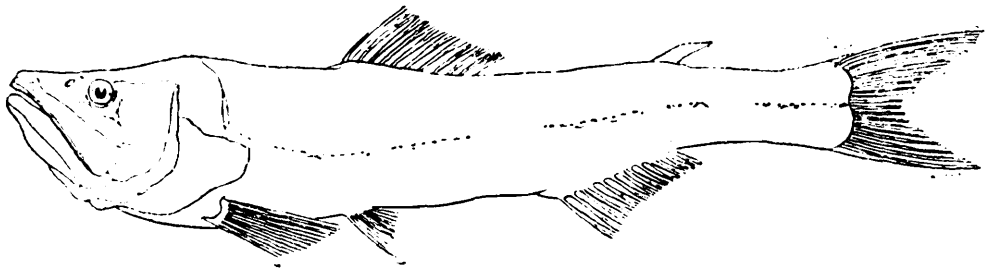
Villiform teeth in premaxilla, mandible, palatine and head of vomer; no teeth on tongue. Gill openings wide; gill rakers closely set. Branchiostegals 8. Pseudobranchiae rudimentary. Dorsal fin with 12 rays, placed in anterior half of body measured with caudal; origin far in advance of anal origin. Pectorals inserted close to ventral profile. Pelvic origin opposite to dorsal origin. Anal fin with 13 rays, in posterior half of body measured with caudal and originating far remote from dorsal origin. Adipose dorsal present. Caudal forked. No air bladder. Pyloric caeca in moderate number.

Distribution.—Atlantic Ocean: West coast of Central America, 1271-3279m., Indian Ocean: Laccadive Sea, 1828m., Arabian Sea, N 200, 430-984m.

276. *Scopelengys tristis* Alcock

(Text-fig. 101)

1890. *Scopelengys tristis* Alcock, *Ann. Mag. nat. Hist.*, (6), 6, p.303 (type locality : Laccadive Sea, 11°12' 47" N., 74° 25' 30" E., 1000 fms., 3·7°C.; type in the Zoological Survey of India).
1892. *Scopelengys tristis* Alcock. *Ill. Zool. Investig. Fish.*, pl. 7, fig. 7.
1899. *Scopelengys dispar* Garman, *Mem. Harv. Mus. Comp. Zool.*, 24, p. 254, pl. 54, figs. 2-2d (type locality : 7°6'15" N., 80° 34' W., 695 fms., 39° E., 6°17' N., 82°5' W., 1072 fms. 36·4° E., 6° 21' N., 80° 41' W., 1793 fms., 35·8° E.).
1899. *Scopelengys tristis* Alcock, *Cat. Ind. Deep. Sea Fish.*, p. 166 (Arabian Sea, off the Laccadive Is., 1,000 fms.).
1928. *Scopelengys tristis* Parr, *Bull. Bingham Ocean. Coll.*, 3, art. 3, p. 48.
1939. *Scopelengys tristis* Norman, *Sci. Rep. John Murray Exped.*, 7, p. 28 (Arabian Sea, 12°8'6" N., 63° 4' 36" E., 12° 5' 18" N., 63° 1' 42" E., N., 200, 430—984 m., 12·2°—8·48° C.).
- 1948-49. *Scopelengys tristis* Fraser-Brunner, *Proc. zool. Soc. Lond.*, 118, p. 1040.
1949. *Scopelengys tristis* Misra, *Rec. Indian Mus.*, 45, p. 431.
1953. *Scopelengys tristis* Misra, *Rec. Indian Mus.*, 50, P. 422, text-fig. 30a.



TEXT-FIG. 101.—Lateral view of *Scopelengys tristis* Alc., (After A. Aloock)

B. 8; D. 11-12/0; P. 15; V. 8, A. 11-13.

Body elongate, compressed; scales if present rudimentary and deciduous; abdomen smooth, non-keeled. Depth 5.9 in total length (5.0 in standard length). Head compressed, naked, 4.0 in total length (3.4 in standard length). Opercle complete. Eyes small, situated high up, slightly more than snout, 9—10 in head. Snout 3.0 in head. Cleft of mouth very wide, oblique, maxilla reaching beyond postorbit. Acute villiform teeth in rather broad bands uncovered by lips in the premaxillae and mandibles; in narrow bands in palatine and a small patch on each side of vomer. No teeth on tongue. A single rayed dorsal fin in the anterior half of the standard length, much nearer to snout end than to caudal origin, nearly midway between adipose dorsal origin and snout end, opposite pelvic origin. Adipose dorsal large, fimbriated, origin slightly nearer to caudal origin than to last dorsal ray, above 10th or 11th anal ray. Pectorals very low, reaching pelvic origin, 1.8 in head. Pelvics short, 3.1 in head; origin opposite dorsal origin, much nearer to pectoral base than to anal origin. Anal nearly equal to dorsal; origin a little more than snout length, behind the last dorsal ray, nearer to pelvic origin than to caudal origin. Caudal forked, 1.5 in head. Least height of caudal peduncle 2.4 in its length. Lateral line. Deciduous, rudimentary scales rarely present. No photophores. Gill rakers long, close-set on the first arch. 8 large pyloric caeca. No air bladder.

Uniform black throughout.

It attains 171 mm. in length; abyssal.

Distribution.—India: Laccadive Sea, 11°12' 47" N., 74°25' 30" E., 1828 m., 3.7°C., Arabian Sea, 12°5' 18" N., 63° 1' 42" E., 200, 430—984m., 12.2°—8.48°C. Pacific coast of Central Americas, 6°-7° N., 80°—82° N., 1271-3279m., 3.8°-2.1°C., in the mean annual isotherm of 20°C. with the latitudinal and longitudinal range of 6°-12° N., 63° E. 80°W. in the Indo-Pacific=(11°—12° N.

63°-74° E. in the Indian Ocean + 6°-7°N., 80°-82°W. in the Pacific Ocean).

XI. Order ATELEOPIFORMES

No air bladder. Abdomen neither keeled nor serrated. Mouth bordered by premaxillaries only. Orbitosphenoid, basisphenoid, alisphenoid, epiotic and opisthotic absent. Pelvics jugular, each reduced to a single, stout filament of 2 coherent rays, scarcely ossified, articulated to coracoids. Supratemporal loosely attached by ligament to skull. No adipose fin. Endocranium mainly cartilaginous. Post-temporal forked. No photophores. No scales.

The order ATELEOPIFORMES is represented by a single family in the Indian region.

XLVI. Family ATELEOPIDAE

Body elongate, gelatinous, scaleless semi-transparent. Head scaleless. No photophores. Abdomen rounded. Mouth inferior, protractile, maxilla extending to midorbit. Eyes small. Toothless or minute teeth. No adipose dorsal. Tail elongate and tapering. A single rayed dorsal fin above pectorals. Pectorals long reaching anal. Pelvics wide with 2 foramina and 2 ossified laminae or narrow with a foramen and no ossified laminae. Vent much nearer to pelvic base than to caudal origin. Anal very long, continuous with caudal. Precaudal vertebrae with trasverse processes, attaching the ribs. No pyloric caeca, no air bladder. Gill membranes narrow, attached to isthmus. Gills 4. No pseudobranchiae. 8 or 9 branchiostegal rays. No scales.

The family ATELEOPIDAE is represented by a single genus in the Indian region.

126. Genus *Ateleopus* Temminck & Schlegel

1846. *Ateleopus* Temminck & Schlegel (*Atelopus* Dumeril Biboon, 1841) *Fauna, Japon-Pisc.*, p. 255 (type, *A. japonicus* Blkr., orthotypic).

1902. *Podateles* Boulenger, *Ann. Mag. nat. Hist.*, (7) 10, p. 403 (type *Ateleopus japonicus* Blkr., orthotypic).

Body elongate, somewhat compressed, tapering to the pointed tail, with scaleless, gelatinous skin without photophores. Skeleton semi-cartilaginous. Snout projects well beyond small, inferior, protractile mouth. Teeth minute, villiform; in a band in upper jaw only, or

in both jaws; palate smooth. Gill openings fairly wide; gill rakers short, cartilaginous. Pseudobranchiae absent. Gill membranes slightly united anteriorly. Branchiostegals 8. Dorsal fin with 8-10 rays, short, in anterior one fourth of body and above pectoral fins; origin considerably in front of anal origin. Pectorals long pointed, inserted a little below middle of height. Pelvics wide with 2 foramina and 2 ossified laminae, jugular, consisting of a single, short filament formed by two closely coherent rays; origin a little ahead of dorsal origin. Anal fin with 76 rays, very long, occupying more than half length of body, continuous with 9 caudal rays and originating far remote from dorsal origin. Adipose dorsal absent. Caudal pointed united with anal fin. No air bladder. No pyloric caeca.

Distribution.—Indian Ocean: Arabian Sea, 409—529m., Bay of Bengal, 343—402m., Maldiva area, 494m.; Pacific Ocean: Philippines.

277. *Ateleopus indicus* Wood-Mason & Alcock*

(Pl. XI, fig. 3; Text-fig. 102)

1891. *Ateleopus indicus* Wood-Mason & Alcock, *Ann. Mag. nat. Hist.*, (6) 8, p. 123, fig. 3 (type locality : Andaman Sea, 10°31' 40" N., 92°46' 6" E., 188—220 fms., 13·3° C., type in the Zoological Survey of India).
1892. *Ateleopus indicus* Alcock, *Ill. Zool. Investig. Fish.*, pl. 2, fig. 2.
1896. *Ateleopus indicus* Alcock, *J. As. Soc. Bengal*, 65, p. 327.
1899. *Ateleopus indicus* Alcock, *Cat. Ind. Deep Sea Fish.*, 123, (Andaman Sea, 188—220 fms., Arabian Sea, off Travancore Coast, 8° 37' N., 75°37' 30" E., 224—284 fms., 12·2—11·1° C.)
1939. *Ateleopus indicus* Norman, *Sci. Rep. John Murray Exped.*, 8, p. 32 (Maldiva area, 4° 58' 42" S., 73° 16' 24" E., 494 fms. 10·86° C., at 400 m.).
1949. *Podateles indicus* Misra, *Rec. Indian Mus.*, 45, p. 431.
1953. *Podateles indicus* Misra, *Rec. Indian Mus.*, 50, p. 422, text-fig. 29b.

*Besides this species, Samuel (1963, *Curr. Sci.* 32, p. 413) recorded *Ateleopus natalensis* Regan off the South West coast of India.

1953. *Ateleopus indicus* Herre, *Check List Philippine Fish.*, p. 145, (Philippines).



TEXT-FIG. 102.—Lateral view of *Ateleopus indicus* Wood-Mason & Alcock (After J. Wood-Mason & Alcock)

B. 8; D. 8-10; P. 12; V 2; A+C. 76-85.

Body elongate, compressed, naked, gradually tapering to the pointed tail. Depth equal to head, behind middle of snout, 8.0 in total length (7.2 in the standard length). Head large, with muciferous cavities, 5.7 in total length (5.2 in standard length). Eyes 5.5-6.7 in head, 1.6 in interorbital, 1.8 in snout. Snout broadly pointed, depressed, projecting, marginally inflated, 3.0 in head, 1.8 times eye; nearly half its extent in preoral. Nostrils large, situated superiorly immediately in front of eye. Mouth small, inferior, crescentic, width hardly equal to diameter of eye-ball, its angle barely reaching the vertical through anterior border of orbit; maxilla reaching nearly mid-orbit and slightly protractile downwards as if adopted for suction. A short band of very minute teeth in the inner aspects of upper jaw; lower jaw toothless. A single, short, rayed dorsal fin; origin midway between snout end and vent, above pectoral base, half an eye diameter behind pelvic origin, just behind head; its base about $\frac{3}{4}$ of snout. Pectorals long, reaching vent, 1 1 in head, equal to the longest dorsal ray. Pelvics jugular consisting of 2 stiff coherent cartilaginous rods, nearly half as long as head; origin about an eye diameter before dorsal origin. Anal long, confluent with caudal, its base 1.5 times trunk. Lateral line following the dorsal curve of trunk runs along the middle of the tail. Head, body and fins covered with thick gelatinous, scaleless skin. Gill rakers short, coarse, cartilaginous.

Mottled dark brown to purple black; all fins except pelvics black.

It attains 381 mm. in length. 260-370m., bathypelagic.

Distribution.—India: Andaman Sea, $10^{\circ} 31' 40''$ N., $92^{\circ} 46' 6''$ E., 343—402 m., 13.3°C .; Arabian Sea, $8^{\circ} 37'$ N., $75^{\circ} 37' 30''$ E., 409—529 m., 12.2° — 11.1°C .—Maldivé area, $4^{\circ} 58' 42''$ S., $73^{\circ} 16' 23''$ E., 494 m., 10.86°C ., at 400 m., Philippines; in the mean annual isotherm of 20°C . with

the latitudinal and longitudinal range of 14° N.—4° S., 73°—123° E. in the Indo-Pacific=(10° N.—4° S., 73°—92° E. in the Indian Ocean+14° N., 123° E. in the Pacific Ocean).

A field key to Orders of TELEOSTOMI :

CLUPEIFORMES, BATHYCLUPEIFORMES, GALAXIIFORMES, SCOPELIFORMES and ATELEOPIFORMES of the Indian region.

1. Radials of pectorals and pelvics, biserially arranged; 2 rayed dorsals (mostly fossils except Order COELACANTHIFORMES not yet been found in the Indian region) Subclass *CROSSOPTERYGII*
2. Radials of pectorals and pelvics uniserially arranged; 1 or 2 dorsals (mostly living, found in the Indian region). Subclass *ACTINOPTERYGII*, 3
3. Air bladder totally absent 5
4. Air bladder present (except in superfamily ALEPOCEPHALOIDAE of Order CLUPEIFORMES; in some species of Order ANGUILLIFORMES; in some species of Order TETRODONTIFORMES; in some species of suborder AMMODYTOIDEI of Order PERCIFORMES 13
5. Skull mainly cartilaginous Order ATELEOPIFORMES
Family ATELEOPIDAE
Genus *Ateleopus*
(*A. indicus*)
6. Skull mainly bony 7
7. Gill openings confluent as a single transverse slit. Order SYMBRANCHIFORMES
8. Gill openings as two lateral slits 9
9. Pelvics modified into a true sucking disc. Order GOBIESOCIFORMES
10. Pelvics not modified into a true sucking disc. .. 11
11. A sucking disc, (modified spinous dorsal) on top of head; body not covered with bony plates Order ECHENEIFORMES
12. No sucking disc on top of head; body covered with bony plates .. Order PEGASIFORMES

13. Physostomous
14. Physoclistic 25
15. Body cylindrical, greatly elongate 17
16. Body neither cylindrical nor greatly elongate 19
17. A distinct caudal; pelvics present; body not eel like; air bladder always present

Order GALAXIIFORMES
 Family GALAXIIDAE
 Genus *Galaxias*
 (*G. indicus*)
18. No distinct caudal; pelvics present or absent; body eel-like; air bladder present or absent

Order ANGUILLIFORMES
19. Weberian ossicles present

Order CYPRINIFORMES
20. Weberian ossicles absent 21
21. Photophores always present (except in genus *Scopelogadus* and family SYNODIDAE); air bladder present or absent

Order SCOPELIFORMES, 327
22. Photophores always absent (except in suborder STOMIATOIDEI of Order CLUPEIFORMES); air bladder always present

23
23. Pelvics thoracic; always physostomous

Order BATHYCLUPEIFORMES
 Family BATHYCLUPEIDAE
 Genus *Bathyclupea*
 (*B. hoskynii*)
24. Pelvics abdominal (except in genus *Raconia* where they are absent; rarely physoclistic, as in genera *Argentina* and *Opiosthobranchius*)

Order CLUPEIFORMES, 69
25. Head asymmetrical; both eyes on one side; no air bladder in adult (except in *Manichthys hispidus* Rafinesque)

Order PLEURONECTIFORMES
26. Head symmetrical; eyes normal; air bladder present or absent in adult

27
27. A non-labyrinthic suprabranchial organ

Order OPHIOCEPHALIFORMES
28. No non-labyrinthic suprabranchial organ

29
29. Pectoral fins divided into distinct upper and lower portions

31

30. Pectoral fins not divided into upper and lower portions except in genus **Dicrolene** of family OPHIDIIDAE, genus **Lepidotrigla** of family TRIGLIDAE and family CIRRHITIDAE of order PERCIFORMES 33
31. Upper portion of pectoral elongate and wing-like and lower portion devoid of free filamentous rays Order DACTYLOPTERIFORMES
32. Upper portion of pectoral neither elongate nor wing-like; lower portion of free filamentous rays Order POLYNEMIFORMES
33. Anterior vertebrae 1-4 immovably united .. Order SYNGNATHIFORMES
34. Anterior vertebrae normal 35
35. Lateral muscles highly vascular and dark red; warm blooded; scales on the anterior part of body forming corselets Order THUNNIFORMES
36. Lateral muscles not highly vascular and not dark red; cold blooded; no corselets 37
37. No post-temporal 39
38. Post-temporal (either large, small or replaced by ligament) present 41
39. No spines before dorsal fin Order CHAUDHURIFORMES
40. Free spines before dorsal fin Order MASTACEMBELIFORMES
41. Orbitosphenoid present 43
42. Orbitosphenoid absent 45
43. Vertical fins with true spines Order BERYCIFORMES
44. Vertical fins without true spines Order LAMPRIDIFORMES
45. Dorsal with spines except in families CEPOLIDAE and CORYPHAENIDAE and suborders *OPHIDIOIDEI* *AMMODYTOIDEI* and *TRICHIUROIDEI* of order PERCIFORMES and families TRJODONTIDAE; OSTRACIIDAE, TETRODONTIDAE, Diodontidae and MOLIDAE of order TETRODONTIFORMES, 47

46. Dorsal without spines	63	
47. Exoskeleton of bony rings	Order	GASTEROSTEIFORMES
48. No exoskeleton of bony rings	49	
49. Gill openings restricted	51	
50. Gill openings wide (except in suborder <i>CALLIONYMOIDEI</i> of order PERFORMES)	55	
51. Mesethmoid present	53	
52. Mesethmoid absent	Order	BATRACHOIDIFORMES
53. Upper ribs present	Order	TETRODONTIFORMES
54. No ribs	Order	LOPHIIFORMES
55. Anal very long, $\frac{2}{3}$ of the total length of fish and equal to second dorsal (when present)	57	
56. Anal short, or if long not equal to second dorsal	59	
57. 14 anal spines; single dorsal reduced to 10 spines	Order	NOTACANTHIFORMES
58. No anal spines; two dorsals without spines		MACRURIFORMES
59. 3 anal spines remote from soft anal; body covered with spiny scales	Order	ZEIFORMES
60. Anal spines continuous with soft anal or if remote only 2 spines; body not covered with spiny scales	61	
61. Pelvics always abdominal	Order	MUGILIFORMES
62. Pelvics, mental, jugular, thoracic and sometimes abdominal	Order	PERCIFORMES
63. Pelvics abdominal	65	
64. Pelvics jugular	Order	GADIIFORMES
65. Anal very long; caudal tapering; pelvics with 8—10 rays; bathypelagic		Order HALOSAURIFORMES
66. Anal short; caudal not tapering; pelvics with 6—7 rays; pelagic or littoral	67	
67. Lateral line present	Order	BELONIFORMES
68. Lateral line absent	Order	CYPRINODONTIFORMES

69. Photophores present (in double rows) Suborder *STOMIATOIDEI*, 267
70. Photophores absent (or when present as in superfamily *ALEPOCEPHALOIDAE* of suborder *CLUPEOIDEI*, not in double rows) 71
71. Adipose fin present Suborder *SALMONOIDEI* 261
72. Adipose fin absent 73
73. Dorsal fin situated in caudal region of body 75
74. Dorsal fin situated in trunk region of body 77
75. Body elongate, narrow; anal fin short (less than 40 rays); caudal bifurcate; dorsal fin always present Suborder *CHIROCENTROIDEI*
Family *CHIROCENTRIDAE*
Genus *Chirocentrus*, 259
76. Body neither elongate nor narrow; anal fin very long (more than 100 rays); caudal not bifurcate; dorsal fin present or absent Suborder *NOTOPTEROIDEI*
Family *NOTOPTEROIDAE*
Genus *Notopterus*, 325
77. Mouth small, terminal; gill membranes entirely united below; accessory branchial organ present Suborder *CHANOIDEI*
Family *CHANIDAE*
Genus *Chanos*
(*C. chanos*)
78. Mouth large, not terminal; gill membranes entirely separate below; accessory branchial organ absent Suborder *CLUPEOIDEI*, 79
79. Abdomen smooth, non-keeled 81
80. Abdomen serrated or keeled or both . Superfamily *CLUPEOIDAE*, 87
81. Gular plate present Superfamily *ELOPOIDAE*, 85
82. Gular plate absent 83

83. Eyes moderate with well developed adipose lids (pelagic) Superfamily ALBULOIDAE
Family ALBULIDAE
Genus *Albula*
(*A. vulpes*)
84. Eyes large, with adipose lids (bathypelagic or abyssal) Superfamily ALEPOCEPHALOIDAE, 225
85. Scales small L. 1. above 90; anal short, less than 20 rays Family ELOPIDAE
Genus *Elops*
(*E. saurus*)
86. Scales large (L. 1. below 50); anal moderate (more than 20 rays) Family MEGALOPIDAE
Genus *Megalops*
(*M. cyprinoides*)
87. Upper jaw prominent, projecting over lower jaw; maxillaries much elongated Family ENGRAULIDAE, 175
88. Upper jaw not prominent, not projecting over lower jaw; maxillaries not much elongated Family CLUPEIDAE, 89
89. Abdomen serrated 91
90. Abdomen non-serrated Subfamily DUSSUMIERIINI, 93
91. Edentulous Subfamily DOROSOMATINI, 165
92. Toothed Subfamily CLUPEINI, 101
93. Dorsal origin nearer caudal origin than snout end 95
94. Dorsal origin nearer snout end than caudal origin Genus *Stolephorus*, 99
95. Lateral line scales less than 40 (35—38); enlarged scales at base of caudal Genus *Ehirava*
(*E. fluviatilis*)
96. Lateral line scales more than 39 (40—56); no enlarged scales at base of caudal Genus *Dussumieria*, 97
97. Lateral line scales 40—42; depth of body 5—5-1/4 times in total length *D. acuta*
98. Lateral line scales 52—56; depth of body 5-3/4—6-1/4 times in total length *D. hasselti*
99. Pelvic origin behind dorsal origin; L. 1. scales 40—45; eye 4·0-4·5 in head *S. japonica*

100.	Pelvic origin slightly before dorsal origin; L. 1. scales 38; eye 3.3 in head	<i>S. malabaricus</i>
101.	Anal one, continuous	103
102.	Anal two, divided (second detached as two enlarged connected rays)	Genus Corica (<i>C. soborna</i>)
103.	Anal moderate (14-22 rays); jaws equal or subequal; pelvic well developed	105
104.	Anal long (36—95 rays); lower jaw prominent; pelvics small or absent	113
105.	Lateral line scales less than 50 (39—49)	107
106.	Lateral line scales more than 79 (80—110)	Genus Gudusia , 143
107.	Dorsal origin before pelvic origin	109
108.	Dorsal origin opposite pelvic origin	Genus Kowala (<i>K. coval</i>)
109.	Upper jaw without median notch	111
110.	Upper jaw with median notch	Genus Macrura , 139
111.	Last 2 anal rays enlarged	Genus Sardinella , 121
112.	Last 2 anal rays not enlarged	Genus Harengula , 119
113.	Pelvics absent	115
114.	Pelvics present	.. 117
115.	Dorsal fin present	Genus Opisthopterus (<i>O. tardoore</i>)
116.	Dorsal fin absent	Genus Raconda (<i>R. russelliana</i>)
117.	Occipital ridges converging behind; oral edge of upper jaw with a toothed bone between maxillary and premaxillary	Genus Pellona , 163
118.	Occipital ridges subparallel behind; oral edge of upper jaw with a ligament between maxillary and premaxillary	Genus Ilisha , 145
119.	L. 1. scales 38—41; post ventral scutes 11—13; anal as long as dorsal	<i>H. vittata</i>

120. L. 1. scales 42—45; post ventral scutes 13—14; anal shorter than dorsal	<i>H. ovalis</i>
121. Ventral scutes sharp, keeled and exposed	125
122. Ventral scutes little evident, less exposed	123
123. Maxillary reaching eye; 18 pre-ventral and 16 post ventral scutes; L. 1. scales 47	<i>S. clupeoides</i>
124. Maxillary not reaching eye; 16 pre-ventral and 13—14 post-ventral scutes; L. 1. scales 40	<i>S. sirm</i>
125. Lower gill-rakers 130—250	127
126. Lower gill-rakers 31—80	129
127. Depth of body 3·8 in total length; eye 3·7—4·0 in head; lower gill-rakers 130	<i>S. dayi</i>
128. Depth of body 5·0 in total length; eye 4·5 in head; lower gill-rakers 180—250	<i>S. longiceps</i>
129. Lower gill rakers 35—38; abdominal scutes 26	<i>S. melanura</i>
130. Lower gill rakers 58—80; abdominal scutes 27—33	131
131. Depth of body 4·5—5·0	<i>S. sindensis</i>
132. Depth of body 3·3—4·1	133
133. Anal base longer than dorsal base; depth of body 4·1 in total length	<i>S. jussieu</i>
134. Anal base equal to or smaller than dorsal base; depth of body 3·3—3·9 in total length	135
135. Pelvic origin nearer to anal origin than to pectoral base; lower gill rakers 80	<i>S. fimbriata</i>
136. Pelvic origin nearer to pectoral base than to anal origin; lower gill-rakers 58—65	137
137. Depth of body 3·3—3·5 in total length; anal base equal to dorsal base	<i>S. albella</i>
138. Depth of body 3·9 in total length; anal base slightly smaller than dorsal base	<i>S. perforata</i>

139. L. tr. scales less than 16; 16—18
preventral and 11—13 post-
ventral scutes 141
140. L. tr. scales more than 16 (17-19);
16—17 preventral and 14—15
postventral scutes *M. ilisha*
141. Parietal ridges expanded and
striated; length of head 4-1/2
times in total length *M. kelee*
142. Parietal ridges narrow and co-
vered with smooth skin;
length of head 5-5.5 times in
total length *M. sinensis*
143. Anal fin longer, 24—26 rays;
caudal equal to head, lobes
subequal; cross bars on sides *G. variegata*
144. Anal fin shorter, 21—24 rays; ca-
udal longer than head, lower
lobe longer; no cross bars on
sides *G. chapra*
145. L. 1. scales 70 *I. leschenaulti*
146. L. 1. scales 40—53 147
147. Dorsal entirely over anal, origin
opposite anal origin; depth
of body 5.2 to 5.5 in total
length *I. sladeni*
148. Dorsal not entirely over anal, ori-
gin before anal origin; depth
of body 3.2 to 4.7 in total
length 149
149. Dorsal origin nearer to caudal
origin than to snout end *I. novacula*
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to 3.5 in total length *I. brachysoma*
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169. Pelvic origin behind dorsal origin; L. 1. scales 40—42; L. tr. scales 12—15 Genus *Anodontostoma* (*A. chacunda*)

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172. L. 1. scales 53—58; height of body 3·1 to 3·4 in standard length *C. punctatus*
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174. L. 1. scales 55—65; L. tr. scales 21—25 *G. manmina*
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184. Anal origin behind dorsal origin; lower gill-rakers 15-16; anal rays 51-60 *S. taty*
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186. Anal rays 60-68; lower gill-rakers 12-13; L.1. scales 54-56 *S. breviceps*
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189. 5-6 free pectoral filaments; anal rays 105 *C. dussumieri*
190. 12-14 free pectoral filaments; anal rays 82-87 *C. borneensis*
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193. Anal rays 95-110 .. *C. ramcarati*
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223. Pelvic origin midway between pectoral base and anal origin; scales in lateral series 39-40; lower gill-rakers 21-25 *T. malabaricus*
224. Pelvic origin nearer to pectoral base than to anal origin; scales in lateral series 44-47; lower gill-rakers 12-16 *T. hamiltonii*

225. Anterior portion of head produced into a long tube terminating in a narrow mouth; gill openings narrow, not surpassing level of pectorals
Family DOLICHOPTERYGIDAE
Genus *Aulastomatomorpha*
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226. Anterior portion of head not produced into a long tube terminating in a narrow mouth; gill openings wide, surpassing level of pectorals
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227. Shoulder organ present 229
228. Shoulder organ absent 231
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(*P. mirus*)
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233. Branchiostegals 6; teeth in jaws uniserial; no teeth on maxilla
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234. Branchiostegals 7; teeth in jaws uniserial or pluriserial; teeth on maxilla 235
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(*N. erimelas*)
237. Dorsal and anal fins short; body moderately elongate
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238. Dorsal and anal fins very long; body exceedingly elongate
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249. Maxilla extending to level of midorbit only . *B. macrolepis*
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251. L.1. scales 50; maxilla reaching just behind postorbit *B. squamosus*
252. L.1. scales 70-100; maxilla reaching postorbital level or beyond midorbit 253
253. L.1. scales 98-100; maxilla reaching postorbital level *B. rostratus*
254. L.1. scales 70; maxilla not reaching post orbital level *B. microlepis*
255. Lateral line inconspicuous, without scales *X. guentheri*
256. Lateral line conspicuous, with underlying scales *X. squamilaterus*
257. Maxilla extending beyond midorbit; gill rakers 7+16-18; gill rakers twice gill filaments . *C. nudus*
258. Maxilla not extending beyond midorbit; gill rakers 3+11-14; gill rakers shorter than gill filaments . . . *C. dorab*
259. Mouth wide, oblique; opisthotic present; freshwater, anadromous

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Subfamily SALMONINAE

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260. Mouth small, terminal; opisthotic absent; marine, bathypelagic . Family MACROSTOMIDAE
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(*N. graenlandicus*)
261. L. 1. scales 115-145; spotted below lateral line, colour greenish or brownish; no lateral band 263
262. L.1. scales 127-160; not spotted below, colour steel blue; a flesh coloured lateral band *S. gairdnerii gairdnerii*
263. Colour brownish; L. 1. scales 115-130 *S. trutta fario*
264. Colour greenish; L.1. scales 120-130 *S. levenensis*
265. Tail markedly short in relation to length of trunk; body always naked Superfamily ASTRONESTHOIDAE, 315 (*Gymnophotodermi*)
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267. Gill rakers rudimentary or absent; body elongate Superfamily STOMIATOIDAE, 307 (*Lepidophotodermi*)
268. Gill rakers present; body elongate or elevated Superfamily GONOSTOMOIDAE, 271 (*Heterophotodermi*)
269. Body elongate, low; gape of mouth oblique Family GONOSTOMIDAE, 273
270. Body short, elevated; gape of mouth vertical Family STERNOPTYCHIDAE, 295
271. Dorsal origin in advance of anal origin 273
272. Dorsal origin opposite to or behind anal origin 277
273. No additional serial photophores on sides of body; anal rays 14-32 275
274. Additional serial photophores on sides of body; anal rays 57-61 Genus *Triplophos*
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275. Anal rays 23-32 Genus *Yarrella*
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276. Anal rays 14-15 Genus *Vinciguerrria*, 291

277. Serial photophores on body more or less distinctly divided into groups, each group on black background; pseudobranchiae present Genus **Valenciennellus** (*V. stellatus*)
278. Serial photophores on body arranged in continuous longitudinal rows; pseudobranchiae absent 279
279. Premaxillary toothed; eye moderate; anal rays 22-31 Genus **Gonostoma** (*G. elongatum*)
280. Premaxillary not toothed; eye small; anal rays 16-20 Genus **Cyclothone**, 281
281. Photophores clearly visible along sides of body .. 283
282. Photophores hidden along sides of body *C. obscura*
283. Ground colour pinkish; scales absent 285
284. Ground colour dark; scales present . 287
285. 7 photophores in lateral row; 4 photophores between pelvic and anal in ventral row; no photophores between last anal ray and caudal origin *C. signata signata*
286. 6 photophores in lateral row; 3 photophores between pelvic and anal in ventral row; one photophore between last anal ray and caudal origin *C. signata alba*
287. Pectoral almost reaching pelvic base; distance between pelvic and anal origins equal to distance between pelvic and pectoral origins *C. acclinidens*
288. Pectorals not reaching pelvic base; distance between pelvic and anal origins contained twice in the distance between pelvic and pectoral origins 289
289. Length of head 4 times in standard length; area between pelvic and anal fins unpigmented *C. microdon pallida*

290. Length of head 5 times in standard length; area between pelvic and anal fins pigmented *C. microdon microdon*
291. 9 photophores between pelvics and anal in the lateral series; an adipose dorsal *V. lucetius*
292. 11 photophores between pelvics and anal in the lateral series; no adipose dorsal *V. nimbarius*
293. Dorsal fin preceded by a large triangular transparent plate; an abrupt ventral constriction between trunk and tail 295
294. Dorsal fin preceded by a forked spine; no abrupt ventral constriction between trunk and tail Genus *Polyipnus* (*P. spinosus*)
295. Eye normal; anal undivided; ventral constriction between trunk and tail with integumentary plate Genus *Sternoptyx* (*S. diaphana*)
296. Eye telescopic; anal divided; ventral constriction between trunk and tail without integumentary plate Genus *Argyropelecus* , 297
297. Photophores forming a nearly continuous series *A. affinis*
298. Photophores forming groups (preanal, supraanal and caudal) 299
299. A single serrated abdominal spine *A. hemigymnus*
300. A pair of smooth abdominal spines 301
301. Posterior abdominal spine longer than anterior; double series of spines on lower edge of caudal peduncle *A. aculeatus*
302. Posterior abdominal spine subequal or shorter; no spine on caudal peduncle 303
303. A single preopercular spine *A. olfersii*
304. Two preopercular spines *A. sladeni*
305. Adipose fin absent Family STOMIATIDAE , 307

306. Adipose fin present .. Family CHAULIODONTIDAE, 311
307. Pectorals present; dorsal origin behind anal origin Genus *Stomins*, 309
308. Pectorals absent; dorsal origin opposite anal origin Genus *Photostomias* (*P. guernei*)
309. Photophores between pectoral and pelvic bases 42-46 in the ventral series; caudal pointed; depth of body 16 in total length *S. affinis*
310. Photophores between pectoral and pelvic bases 34-38 in the ventral series; caudal forked; depth of body 12 in total length *S. nebulosus*
311. Luminous organs very prominent, those between pelvics and anal 23-26; preanal adipose ventral present *C. sloani*
312. Luminous organs less prominent, those between pelvics and anal 20-21; preanal adipose ventral absent *C. pammelas*
313. Dorsal and anal very long; their rays with lateral spines at base Family IDIACANTHIDAE
Genus *Idiacanthus* (*I. fasciola*)
314. Dorsal and anal short; their rays without lateral spines at base 315
315. Adipose dorsal present; dorsal fin not confined to tail Family ASTRONESTHIDAE, 317
316. Adipose dorsal absent: dorsal fin confined to tail Family MELANOSTOMIATIDAE, 321
317. A well developed mental barbel; a conspicuous suborbital organ Genus *Astronesthes*, 319
318. No mental barbel; no conspicuous suborbital organ Genus *Bathylchnus* (*B. cyaneus*)
319. Dorsal fin terminating in advance of anal origin *A. martensii*
320. Dorsal fin not terminating in advance of anal origin *A. indicus*

321. Chin with barbel; distance between pelvic and anal origins about 3 times in the distance between pelvics and pectoral Genus **Melanostomias**
(*M. melanops*)
322. Chin without barbel; distance between pelvic and anal origins about $1\frac{1}{2}$ times in the distance between pelvic and pectoral Genus **Malacosteus**
(*M. niger*)
323. Maxilla extending far beyond hind edge of orbit; opercular scales not larger than those on body *N. chitala*
324. Maxilla not extending beyond hind edge of orbit; opercular scales much larger than those on body *N. notopterus*
325. Photophores present (except in genus **Scopelengys**) Family **SCOPELIDAE**, 355
326. Photophores absent 327
327. Body totally naked (inclusive of lateral line) Family **EVERMANNELLIDAE**
Genus **Evermannella**
(*E. atratus*)
328. Body not totally naked 329
329. Eye telescopic Family **SCOPELARCHIDAE**
Genus **Scopelarchus**
(*S. guentheri*)
330. Eyes normal 331
331. Cleft of mouth very oblique and wide, extending upto operculum; teeth prominent, eye moderate Family **SYNODIDAE**, 333
332. Cleft of mouth neither oblique nor very wide (except in genus **Bathypterois**) with cleft of mouth horizontal; teeth not prominent; eyes large (except in genus **Bathypterois** with poorly developed eyes) Family **SUDIDAE**, 347
333. Caudal fin trilobed; pelvic origin almost opposite to dorsal origin Genus **Harpodon**, 339

334. Caudal fin bilobed ; pelvic origin clearly in front of dorsal 335
335. Inner rays of pelvics much longer than outer ones; a single band of teeth on each side of palate 337
336. Inner rays of pelvics not much longer than outer ones ; a double band of teeth on each side of palate Genus *Saurida* , 341
337. Snout pointed, longer than eye diameter ; vent nearer to base of caudal than to base of pelvics Genus *Synodus*, 345
338. Snout blunt, shorter than eye diameter ; vent a little nearer to base of pelvics than to base of caudal Genus *Trachinocephalus* (*T. myops*)
339. Pectorals long, reaching to below middle of dorsal fin ; pelvics long, reaching anal fin *H. nehereus*
340. Pectorals short, not reaching to below dorsal origin; pelvics short, not reaching anal fin *H. squamosus*
341. Pectoral rays 12-13; axillary scale short broad ; back and sides mottled and blotched *S. gracilis*
342. Pectoral rays 14-16; axillary scale long, pointed ; back and sides of uniform colouration or with rather indistinct darker markings. 343
343. Outer bands of palatine teeth in 3 rows anteriorly *S. tumbil*
344. Outer bands of palatine teeth in 2 rows anteriorly *S. undosquamis*
345. L.1. scales 60-64, scales between middle of dorsal fin and lateral line $5\frac{1}{2}$ -- $6\frac{1}{2}$ (rarely $4\frac{1}{2}$) *S. japonicus*
346. L.1. scales 55-57, scales between middle of dorsal fin and lateral line $3\frac{1}{2}$ *S. indicus*

347. Eyes well developed; pelvic, pectoral and caudal rays normal; head compressed. 349
348. Eyes vestigial or absent; some of the pelvic, pectoral and caudal rays unusually prolonged
Subfamily *BATHYPTEROINI*, 355
Genus *Bathypterois*
349. Tail (when measured from vent to hypural) shorter than trunk; dorsal and pelvic origins nearer to caudal end than to snout end; adipose dorsal; anal longer than dorsal ..
Subfamily *PARALEPIDINI*, 353
350. Tail (when measured from vent to hypural) not shorter than trunk but equal to trunk (when measured in total length); dorsal and pelvic origins much nearer to snout end than to caudal end; adipose dorsal present; anal not longer than dorsal
Subfamily *CHLOROPHTHALMINI*
Genus *Chlorophthalmus*
(*C. agassizi*)
351. Teeth on each gill-raker in single row; nostrils distinctly behind hind end of maxillary; body very elongate; a single patch of teeth on pharyngobranchials
Genus *Stemonosudis*
(*S. elongatus*)
352. Teeth on each gill-raker in 2 or 3 rows; nostrils distinctly before hind end of maxillary; body not very elongate; two separate large patches of teeth on pharyngobranchials
Genus *Paralepis*
(*P. elongatus*)
353. Pectoral of 3 distinct portions; an upper of 2 long, detached, rigid filaments, the middle of 6 short, branched rays connected together by stout interradi al membrane and the lower of 5 free long, simple rays ..
Subgenus *Hemipterois*
(*B. (Hemipterois) guentheri*)

354. Pectoral of 2 distinct portions ;
an upper of 2 long, basally
coherent rays and a lower of
12-13 long, free, rigid rays Subgenus **Bathypterois**, 355
355. Ventral outline of tail notched
at base of lower caudal
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356. Ventral outline of tail not
notched *B. (Bathypterois) insularum*
357. Photophores present 359
358. Photophores absent Subfamily **SCOPELENGINI**
Genus **Scopelengys**
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359. Photophores restricted to definite
and separate series Subfamily **MYCTOPHINI**, 361
360. Photophores not restricted to
definite and separate series,
but one photophore to each
scale on entire body or
photophores only on the
ventral part of body Subfamily **NEOSCOPELINI**
Genus **Neoscopelus**
(*N. macrolepidotus*)
361. Anal base longer than rayed
dorsal base 2; Prc 363
362. Anal base equal to or slightly
shorter than rayed dorsal
base (except genus **Lam-**
panyctus where slightly
longer); Prc 2,3,or 4 371
363. PLO above pectoral base 365
364. PLO not above pectoral base Genus **Gonichthys**
(*C. coccoi*)
365. 2 Pol; VO level; PVO oblique
in a straight line with first
PO : second Prc elevated Genus **Hygophum**
(*H. reinhardti*)
366. 1 Pol : second VO elevated or
level ; PVO not in a straight
line with first PO or PVO
oblique in straight line with
first PO 367
367. Second VO elevated ; PVO
horizontal ; anal origin
before last dorsal ray 369
368. Second VO level ; PVO oblique;
anal origin opposite or
behind last dorsal ray Genus **Myet**

369. Teeth cardiform; second Prc much elevated Genus *Benthosema* , 375
370. Teeth flattened lanceolate ; second Prc level Genus *Diogenichthys* , 377
371. Procurrent caudal rays spine-like ; superior or upper (*sa*) antorbital absent ; inferior or lower (*ia*) antorbital normal ; Prc 3 or 4 Genus *Lampanyctus* , 381
372. Procurrent caudal rays soft; superior or upper (*sa*) antorbital well developed or not; inferior or lower (*ia*) antorbital in 2 or 3 separate or confluent parts or absent; 2 or 4 Prc ; fourth PO elevated or third and fourth PO much elevated; lateral line prominent or obsolete ; photophores above or below lateral line. 373
373. Superior or upper antorbital (*sa*) well developed ; inferior or lower antorbital (*ia*) in 2 or 3 separate or confluent parts ; 4 Prc in ascending series ; lateral line prominent ; Photophores below lateral line Genus *Diaphus* , 387
374. Superior or upper antorbital (*sa*) not well developed; inferior or lower antorbital (*ia*) absent ; 2 Prc in vertical line ; lateral line obsolete ; photophores above lateral line Genus *Notolychnus* (*N. valdiviae*)
375. PO level: second Prc well below lateral line ; PLO nearer lateral line than to pectoral base *B. fibulatum*
376. Last PO elevated ; second Prc near lateral line ; PLO midway between lateral line and pectoral base *B. pterotus*
377. Maxilla extending beyond post orbit ; dorsal origin behind pelvic origin ; VLO nearer to pelvics than to lateral line; first SAO above fourth VO *D. laternatum*

378. Maxilla extending to post orbit; dorsal origin opposite pelvic origin; VLO midway between lateral line and pelvics; first SAO above and a little behind VO *D. panurgus*
379. Scales cycloid; anal origin slightly behind middle of dorsal base *M. indicus*
380. Scales ctenoid; anal origin just behind last dorsal ray *M. spinosum*
381. Luminous glands at dorsal, pelvic and anal bases; 5-6 VO, the second VO elevated ; Prc 3-4 Subgenus **Lepidophanes** , 383
382. Luminous glands at dorsal, pelvic and anal bases absent; 4 VO level or second elevated. Subgenus **Lampanyctus** , 385
383. Lateral line scales 29 ; adipose dorsal origin behind last anal ray; AO 4+3 *L. (Lepidophanes) pyrsobolus*
384. Lateral line scales 35-36 ; adipose dorsal origin opposite 10th branched ray of anal; AO 4-6+3-5 *L. (Lepidophanes) longipes*
385. Prc not continuous with AOp; AO 6-7+8-10; lateral line scales 35 *L. (Lampanyctus) macropterus*
386. Prc continuous with AOp ; AO 5-7+6-8; lateral line scales 38 *L. (Lampanyctus) crocodilus*
387. A single inferior or lower antorbital (*ia*) 389
388. Two inferior or lower antorbital (*ia*) confluent or extending beyond mid-orbit Subgenus **Diaphus** , 395
389. Inferior or lower antorbital (*ia*) and superior or upper antorbital (*sa*) separated by nasal organ Subgenus **Pantophos**
(*Diaphus* (*Pantophos*) *dumerili*)

390.	Inferior or lower antorbital (<i>ia</i>) and superior or upper antorbital (<i>sa</i>) touching or confluent behind nasal organ not extending beyond mid orbit	Subgenus	Lamprossa , 391
391.	Upper SAO (supraanal organs), Pol (posterior-lateral organ) and superior most pre-caudal touching lateral line.	393	
392.	Upper SAO, Pol and superior most Prc far below lateral line ; pectoral reaching pelvic origin	<i>Diaphus</i> <i>coeruleus</i>	(<i>Lamprossa</i>)
393.	VLO midway between lateral line and pelvic base; pelvic origin before dorsal origin	<i>Diaphus</i> <i>garmani</i>	(<i>Lamprossa</i>)
394.	VLO nearer lateral line than to pelvic base ; pelvic origin opposite dorsal origin	<i>Diaphus</i> <i>splendidum</i>	(<i>Lamprossa</i>)
395.	Anal origin 1/3 eye diameter behind last dorsal ray; VLO midway between pelvic base and lateral line ; 2 inferior or lower antorbitals (<i>ia</i>) separate	<i>Diaphus</i>	(<i>Diaphus</i>) <i>rafinesquii</i>
396.	Anal origin before last dorsal ray; VLO nearer lateral line than to pelvic base; 2 inferior or lower antorbitals (<i>ia</i>) confluent . ..	<i>Diaphus</i>	(<i>Diaphus</i>) <i>lutkeni</i> .

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 trachinus, Saurus, 302
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 Engraulis, 215,126
 Stolephorus, 126
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 Trichonotus, 8
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 Myctophum, (Myctophum), 343
 Notolychnus, 343,403
 Stomias, 245
 Valeuciennellus, 198,219
 Stellatus, 219,396
 valenciennesi, Engraulis, 146
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 corythaeolum, 221,395
 Zalarges, 214
 nimbarius, 214,217
 Zeiformes, 5,383
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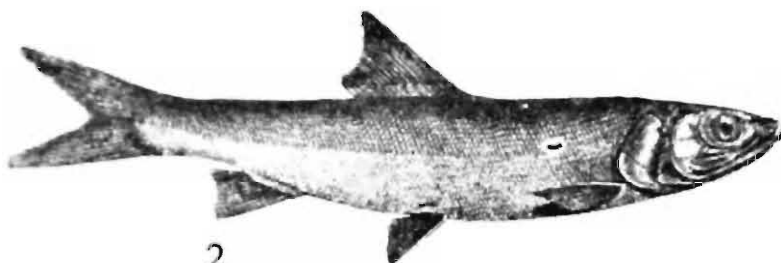
PLATE I

- FIG. 1. Photograph of the illustration of the type specimen of *Sardinella sindensis* (Day) (After F. Day)
- FIG. 2. Photograph of the illustration of *Elops saurus* L. (After F. Day)
- FIG. 3. Photograph of the illustration of *Sardinella albella* (V.) (After F. Day)
- FIG. 4. Photograph of the illustration of *Megalops cyprinoides* (Brouss.) (After F. Day)

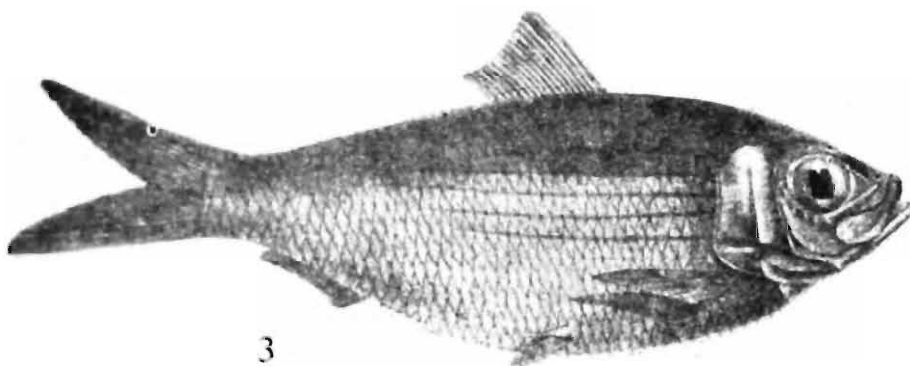
PLATE I



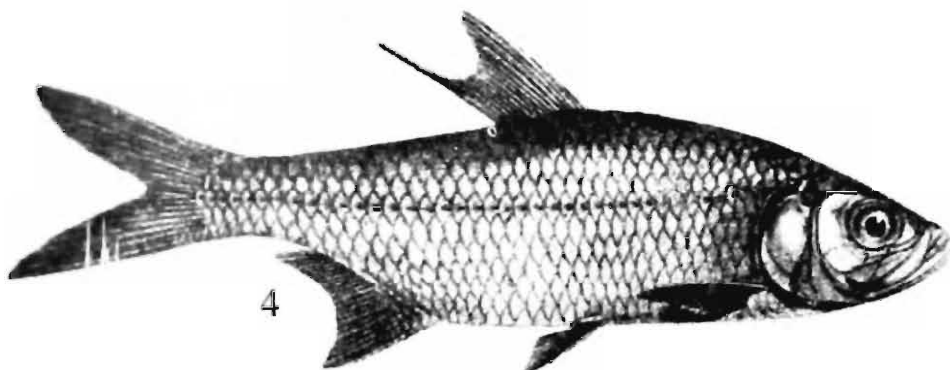
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PLATE II

Lateral view of *Thrissocles annandalei* (Chaudhuri)
(After B.L. Chaudhuri)

PLATE II

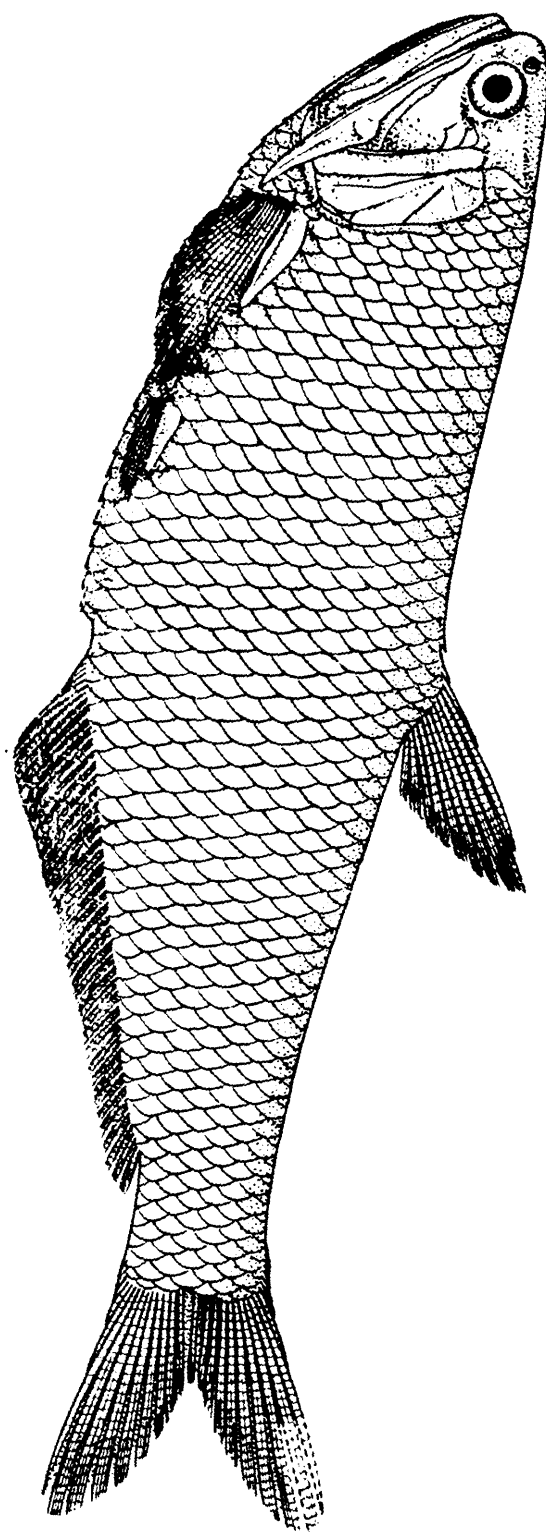


PLATE III

- FIG. 1. Photograph of the illustration of *Thrissocles dussumieri* (Val.) (After F. Day)
- FIG. 2. Photograph of the illustration of *Anodontostoma chacunda* (Ham.) (After F. Day)
- FIG. 3. Photograph of the illustration of *Anchoviella commersonii* (Lac.) (After F. Day)
- FIG. 4. Photograph of the illustration of *Gonialosa manmina* (Ham.) (After F. Day)

PLATE III

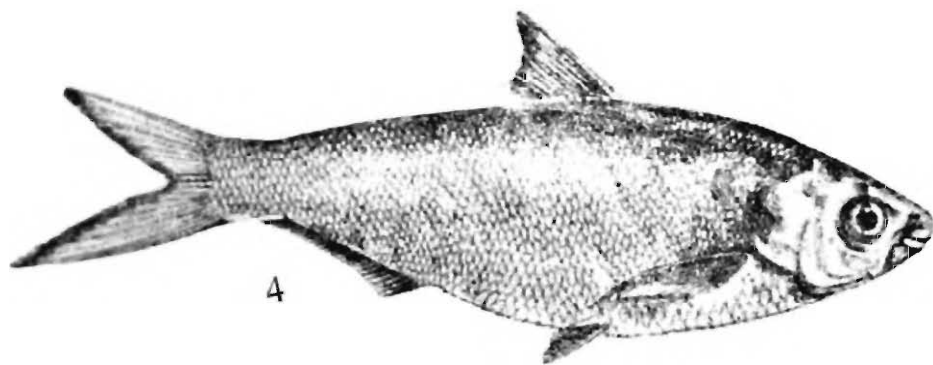
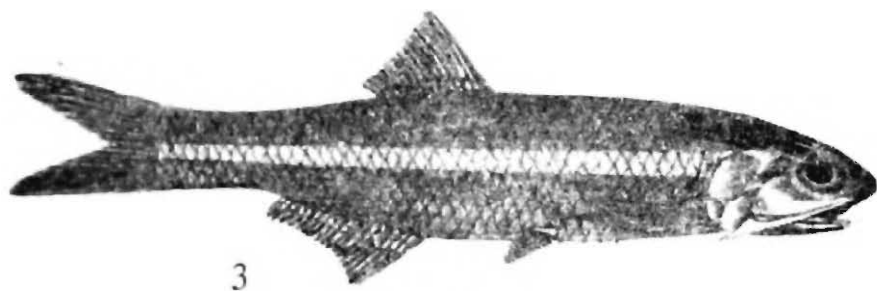
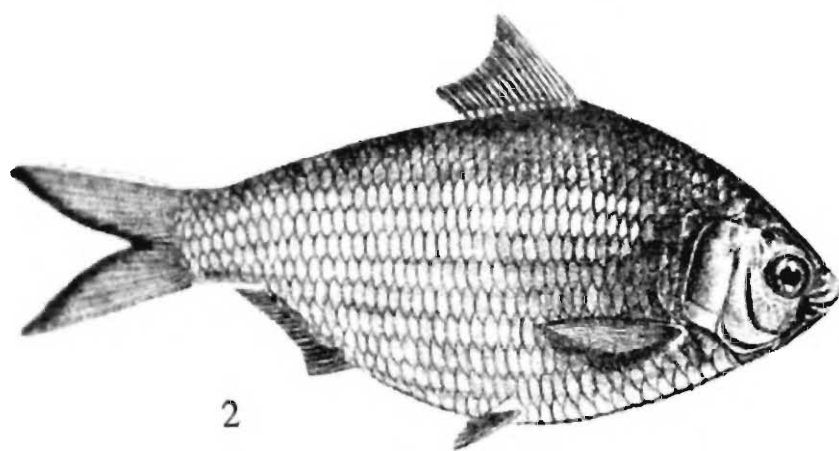
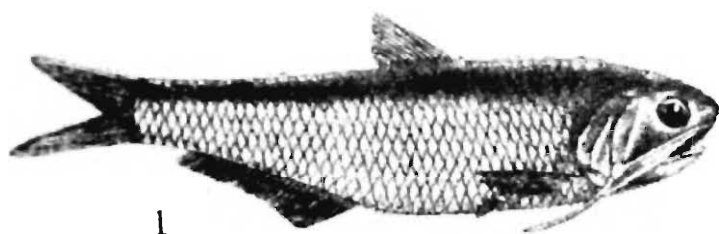


PLATE IV

- FIG. 1. Photograph of the illustration of the type specimen of *Alepocephalus bicolor* Alc. (After A. Alcock)
- FIG. 2. Photograph of the illustration of the type specimen of *Alepocephalus blanfordi* Alc. (After A. Alcock)
- FIG. 3. Photograph of the illustration of the type specimen of *Alepocephalus edentulus* Alc. (After A. Alcock)
- FIG. 4. Photograph of the illustration of the type specimen of *Alepocephalus longiceps* Lloyd (After R.E. Lloyd)
- FIG. 5. Photograph of the illustration of the type specimen of *Alepocephalus microlepis* Lloyd (After R.E. Lloyd)
- FIG. 6. Photograph of the illustration of the type specimen of *Alepocephalus macrops* Lloyd (After R.E. Lloyd)
- FIG. 7. Photograph of the illustration of the type specimen of *Bathytroctes squamosus* Alc. (After A. Alcock)

PLATE IV

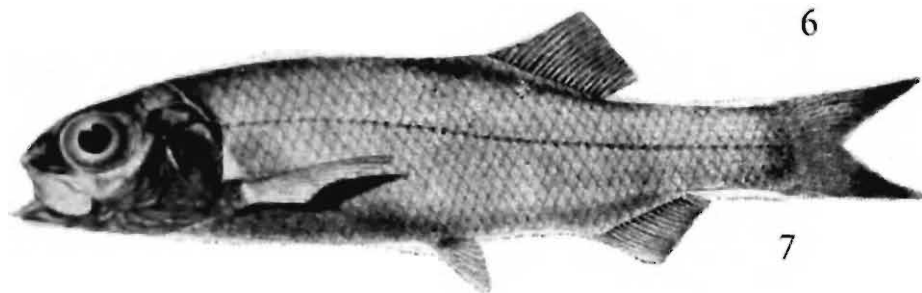
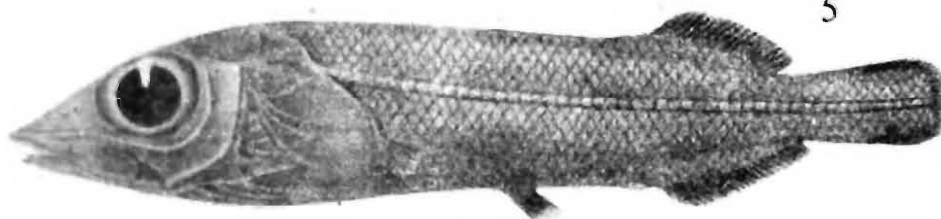
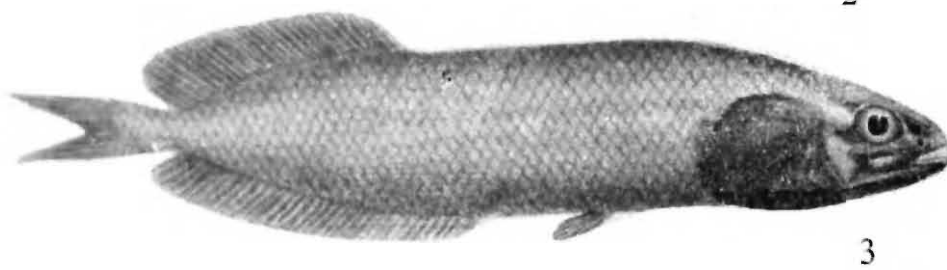
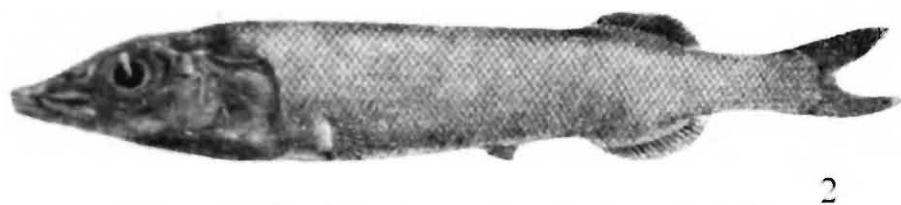
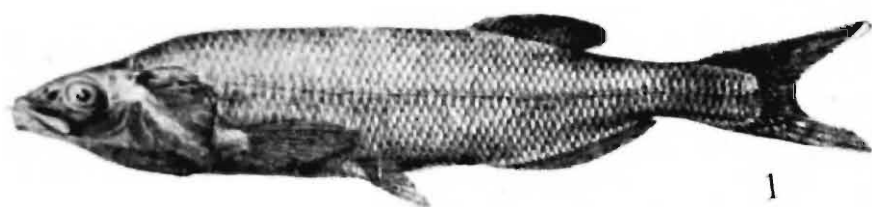


PLATE V

- FIG. 1. Photograph of the illustration of the type specimen of *Narcetes erimelas* Alc. (After A. Alcock)
- FIG. 2. Photograph of the illustration of the type specimen of *Xenodermichthys guentheri* Alc. (After A. Alcock)
- FIG. 3. Photograph of the illustration of the type specimen of *Xenodermichthys squamilaterus* Alc. (After A. Alcock).
- FIG. 4. Photograph of the illustration of the type specimen of *Leptoderma affinis* Alc. (After A. Alcock)
- FIG. 5. Photograph of the illustration of the type specimen of *Aulostomatomorpha phosphorops* Alc. (After A. Alcock)
- FIG. 6. Photograph of the illustration of the type specimen of *Photostomias atrox* Alc. (= *P. guernei* Collett) (After A. Alcock)

PLATE V

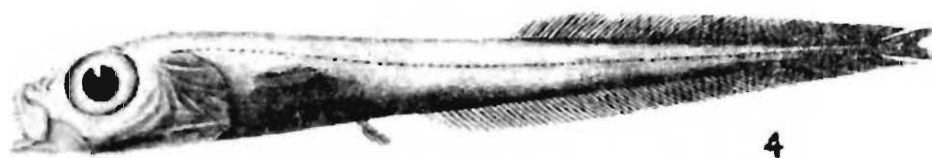
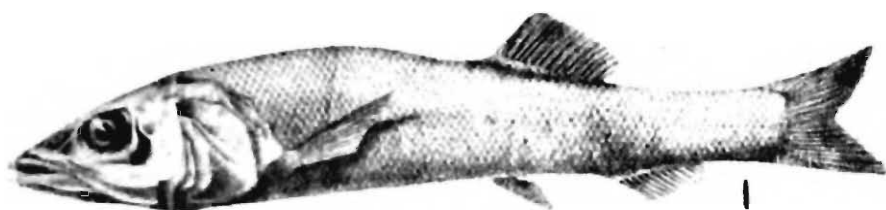


PLATE VI

Photograph of the illustration of *Astronesthes* sp.=*A.*
indicus Br. (After A. Alcock: delineation
defective as the dorsal and ventral adipose
fins are not shown)

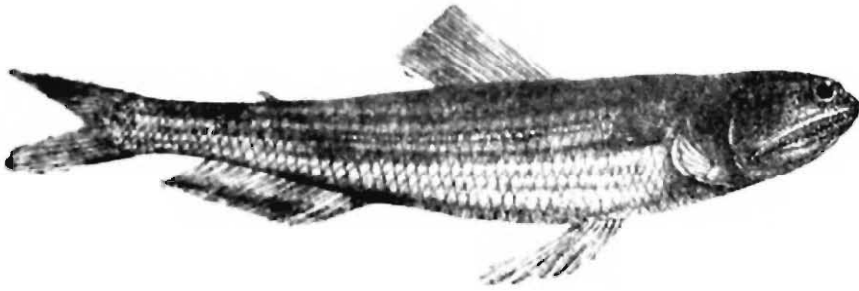
PLATE VI



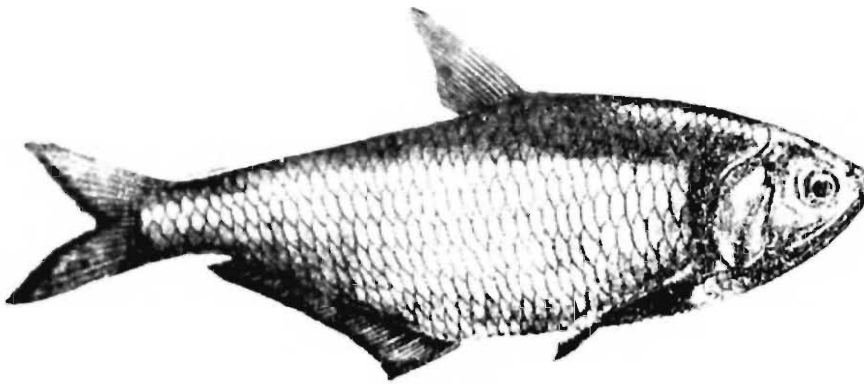
PLATE VII

- FIG. 1. Photograph of the illustration of *Trachinocephalus myops* (Schn.) (After F. Day)
- FIG. 2. Photograph of the illustration of *Thrissocles malabaricus* (Bl.) (After F. Day)
- FIG. 3. Photograph of the illustration of *Notopterus notopterus* (Pallas) (After F. Day)
- FIG. 4. Photograph of the illustration of *Notopterus chitala* (Ham.) (After F. Day)

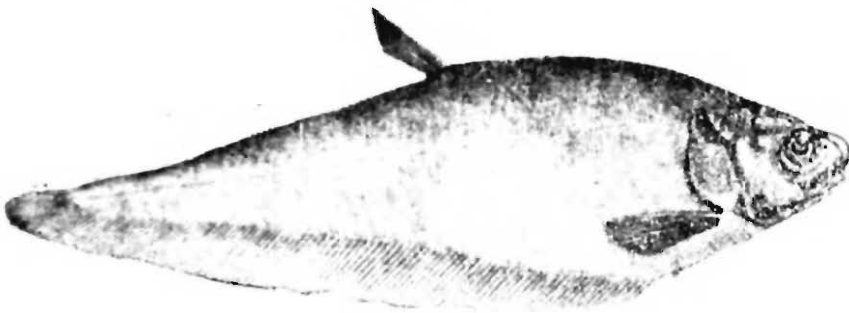
PLATE VII



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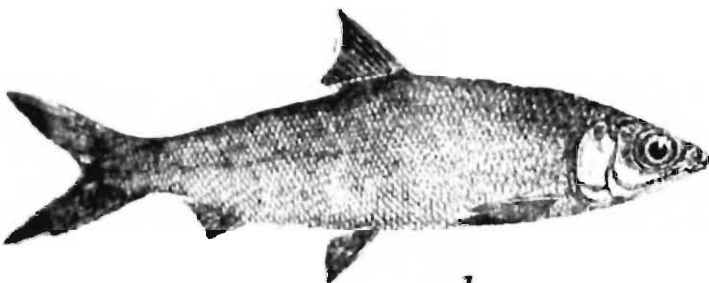


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PLATE VIII

- FIG. 1. Photograph of the illustration of *Chanos chanos* (Forsk.) (After F. Day)
- FIG. 2. Photograph of the illustration of *Harpodon nehereus* (Ham.) (After F. Day)
- FIG. 3. Photograph of the illustration of *Chirocentrus dorab* (Forsk.) (After F. Day)
- FIG. 4. Photograph of the illustration of the type specimen of *Synodus indicus* (Day) (After F. Day)
- FIG. 5. Photograph of the illustration of *Salmo levenensis* Walker (After F. Day)

PLATE VIII



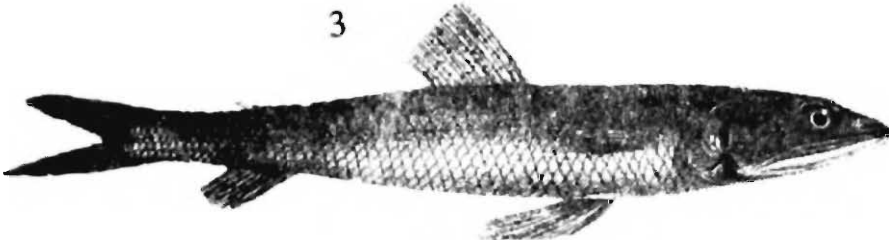
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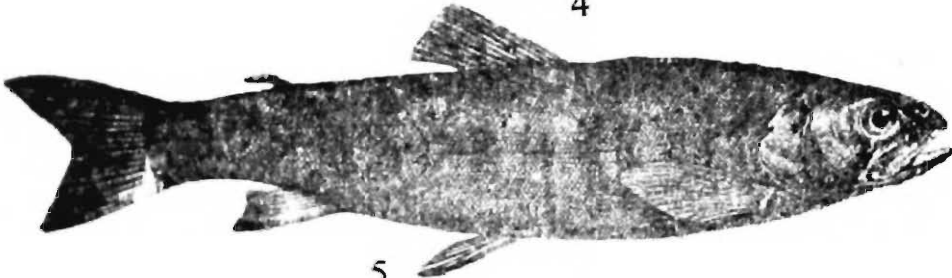
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PLATE IX

- FIG. 1. Photograph of the illustration of the type specimen of *Chauliodus pammelas* Alc. (After A. Alcock)
- FIG. 2. Photograph of the illustration of the type specimen of *Bathyclupea hoskynii* Alc. (After A. Alcock)
- FIG. 3. Photograph of the illustration of the type specimen of *Harpodon squamosus* Alc. (After A. Alcock)
- FIG. 4. Photograph of the illustration of the type specimen of *Scopelarchus guentheri* Alc. (After A. Alcock)
- FIG. 5. Photograph of the illustration of the type specimen of *Evermannella atratus* (Alc.) (After A. Alcock)

PLATE IX

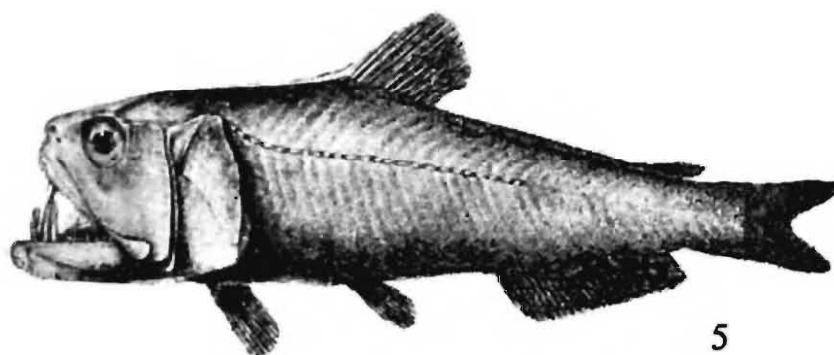
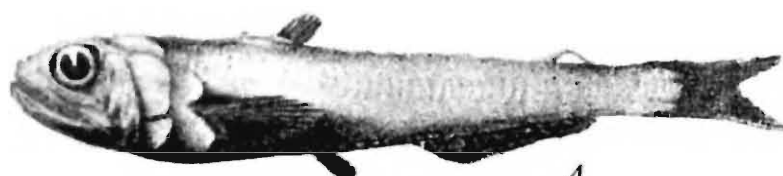
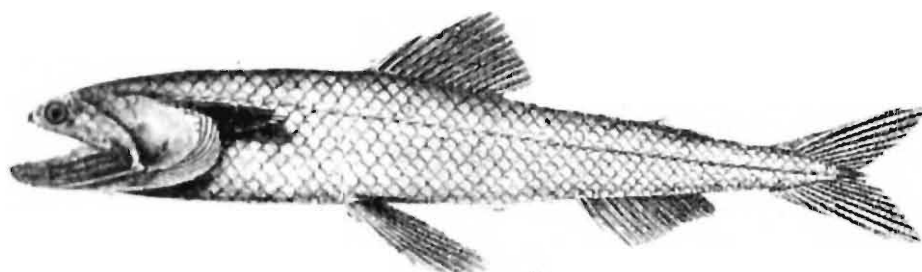
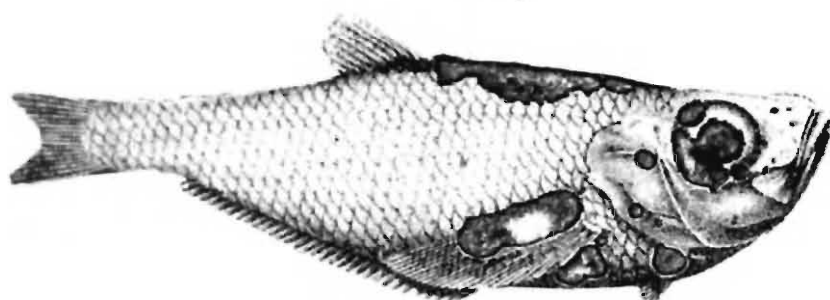
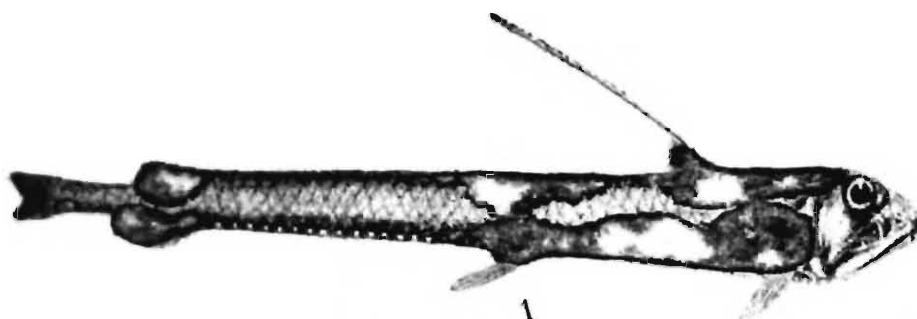


PLATE X

Lateral view of *Bathypterois (Hemipterois) guentheri* Alcock
(After A. Alcock)

PLATE X.

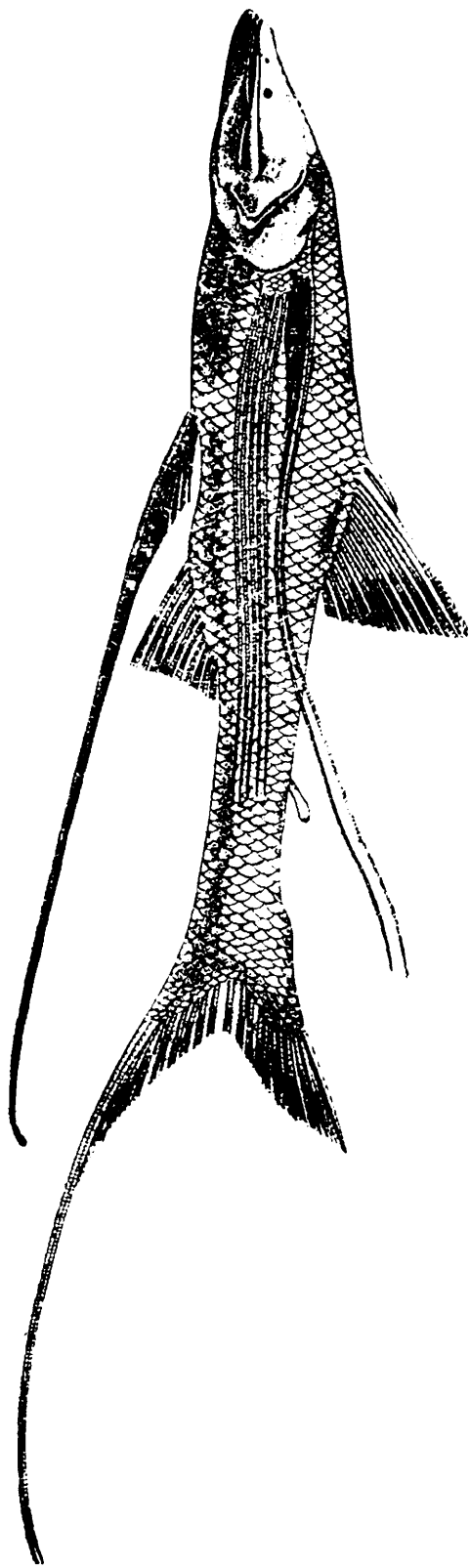


PLATE XI

- FIG. 1. Photograph of the illustration of the type specimen of *Bathypterois* (*Bathypterois*) *atricolor* Alc. (After A. Alcock)
- FIG. 2. Photograph of the illustration of the type specimen of *Bathypterois* (*Bathypterois*) *insularum* Alc. (After A. Alcock)
- FIG. 3. Photograph of the illustration of the type specimen of *Ateleopus indicus* Alc. (After A. Alcock)
- FIG. 4. Photograph of the illustration of *Malacosteus indicus* (nec. Günther) [= *M. niger* Ayres] (After A. Brauer)
- FIG. 5. Photograph of the illustration of *Idiacanthus fasciola* Ptrs. (After A. Brauer)
- FIG. 6. Photograph of the illustration of the dorsal base of *Idiacanthus fasciola* Ptrs. showing short, curved, spine-like processes.

PLATE XI

