

Order SILURIFORMES

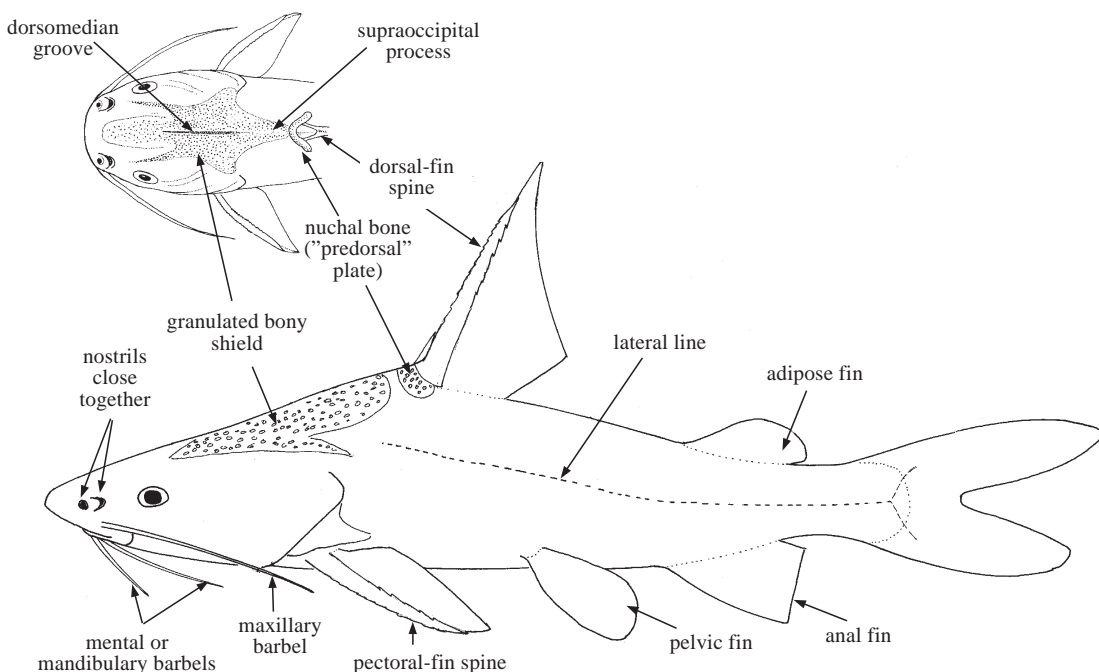
ARIIDAE

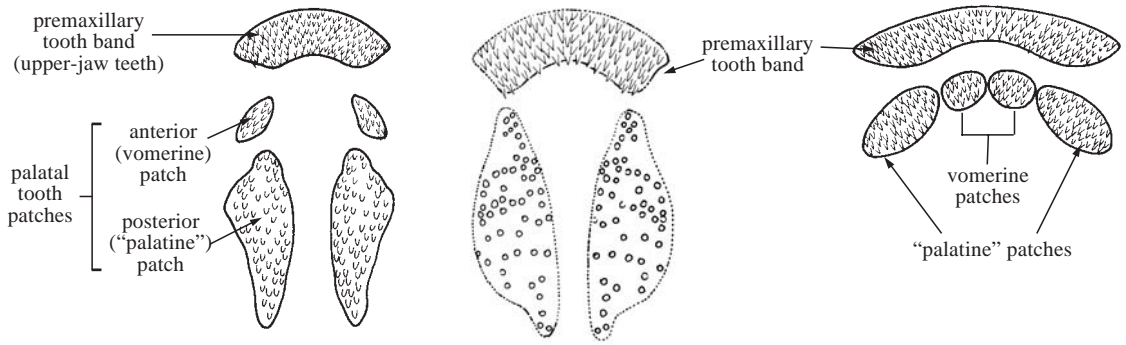
(= TACHYSURIDAE)

Sea catfishes (fork-tailed catfishes)

by P.J. Kailola

Diagnostic characters: Medium to large fishes (to 180 cm); body elongate, robust. Head conical to rounded, depressed. **A bony shield covering part of dorsal surface of head, well visible beneath thin skin in most species, concealed by thick skin and muscle tissue in others; smooth, rugose, striate, or granular; in most species, posterior portion (= supraoccipital process) of bony shield extends backwards to meet the predorsal (nuchal) plate.** A dorsomedian groove or "fontanel" often apparent, extending from nostrils to supraoccipital process. Eye usually free, rarely covered by skin, and not free in its orbit. **Front and rear nostrils close together on each side of snout; rear (posterior) nostril more or less covered by a flap of skin.** Mouth terminal to inferior; teeth fine, wedge-shaped, conical and sharp, or granular. Jaw teeth arranged into narrow and broad bands; teeth on palate (= roof of mouth), when present, grouped into large and small patches (patches may be reduced in brooding male fish); teeth sometimes present on parasphenoid bone. **Mouth surrounded by 2, 4, or 6 barbels:** 1 pair of maxillary barbels (absent in *Batrachocephalus*), 1 pair of mandibular barbels (absent in *Bagre* and *Osteogeneiosus*), and 1 pair of mental barbels (absent in *Batrachocephalus* and *Osteogeneiosus*). **Gill membranes joined together, attached to isthmus anteriorly**, and with posterior margin free or attached to isthmus (gill openings therefore variously wide or restricted). **Branchiostegal rays 5 to 7.** Total gill rakers on anterior aspect of first arch ranging from about 9 to more than 50; rakers always present along posterior aspect of third and fourth arches, sometimes on first and second arches. Dorsal fin situated before midlength of body, consisting of **a long, hard, usually serrated spine preceded by a very short, broad spine or buckler, and followed by 7 branched rays**; anal fin with 14 to 33 rays; pectoral fins low-set, with a usually long and hard serrated spine and 9 to 13 branched rays; **pelvic fins with 6 branched rays and no spine**; shape of inner pelvic-fin ray often modified in mature females; **caudal fin deeply forked, with 15 principal rays**, 13 of them branched (i, 6 + 7, i). **Adipose fin always present above anal fin.** **Body naked.** Lateral line well developed, terminating at tail base by turning upwards or bifurcating over caudal-fin lobes. **Swimbladder usually ovate and sack-like**, but much depressed in some species, and with posterior chamber in others. **Colour:** upper 2/3 of body dark brown to charcoal through dark and pale blue and brown; usually with blue, green, violet, or coppery lustre, rarely blotched dark or with a silvery lateral stripe; lower body paler: yellow, cream, white, or silvery, frequently finely stippled brown; fins dusky yellow, frequently with dark (bluish) margins or proximal patches, especially on dorsal aspect of paired fins; barbels dark brown to white; peritoneum and buccopharyngeal cavity may be dusky or charcoal-coloured.





examples of tooth patches on palate (= roof of mouth) and upper jaw

Habitat, biology, and fisheries: Ariids occur in marine, brackish, and fresh waters of warm-temperate and tropical regions of the world. Most are confined to coastal and marine habitats, but some are found also in fresh-water rivers, streams, and lakes. Ariids are locally abundant in mangrove areas, large river estuaries, and turbid waters, as well as in fully marine waters (to 150 m) and clear fresh waters. Some species live in coastal to fresh water (e.g. Sahul Shelf species *Arius leptaspis* and *A. graeffei*) and this preference for a range of habitats may be common. On the other hand, adults of the subgenus *Netuma* (*A. thalassinus*, *A. bilineatus*) inhabit fully marine waters. Other ariids are confined to fresh water (e.g. the genus *Cephalocassis* Bleeker in Southeast Asia; the subgenera *Brustiarius* Herre and *Pachyula* Ogilby in New Guinea; individual *Arius* species).

Their diet varies from omnivorous to specialized, larger individuals often feeding solely on large crustaceans, molluscs, and teleosts. These fishes are renowned for their method of reproduction, the females producing few, large (to 25 mm diameter) eggs which the male incubates in his buccal cavity after fertilisation until the young hatch and the yolk sack is resorbed. Many ariids have high economic value because of their large size, local abundance, hardiness, and flesh quality. They are captured using a variety of gear (mainly demersal trawl, gill nets, and seines), and are sold fresh, smoked, and brined. From 1990 to 1995, FAO's Yearbook of Statistics reports a range of yearly catch of sea catfishes of around 49 600 to 72 900 t from the Western Central Pacific.

Remarks on nomenclature

1. The **genus *Arius*** Valenciennes, 1840 (type, *Pimelodus arius* Hamilton) is not monophyletic, and its correct composition is presently unresolved. It is an unnatural group of species.
2. The 5 species which are provisionally included here under "***Arius***" belong to a recognizable group of species for which the appropriate generic name has not yet been determined. Synonyms are *Arius* non Valenciennes in Cuvier and Valenciennes, 1840 (type, *A. arius*), and *Ariodes* non Müller and Troschel, 1849 (type, *A. arenarius*).

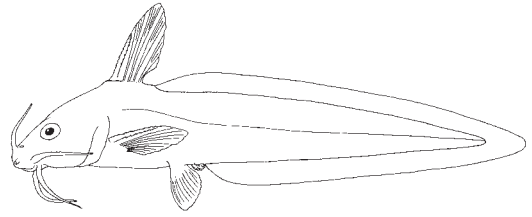
Remarks on species status

Between 1985 and 1989, a phylogenetic study was conducted on all Australo-Papuan and some Southeast Asian, Indian, and American ariids which revealed the correct relationships of most of those taxa. However, the remaining ariid taxa have not yet been studied to the same extent. Hence the generic position of some Southeast Asian species treated here is tentative, and so is the status of some nominal species. Species in the second category are those which are based on small individuals (and therefore probably juvenile fish) and those of which the writer had only the description at hand (i.e. no type material could be examined).

Uncertainties and tentative placements are indicated throughout the present contribution and it is stressed that **these placements are not final**. They are best treated as a guide or suggestion to the identity of certain taxa, hoping to save later workers time and effort. Ariid systematics is only revealed after a full understanding is achieved of many characters on plentiful specimens of different sizes from the whole distributional range of the family and species.

Similar families occurring in the area

Plotosidae (fresh water and marine): usually 4 pairs of barbels; no adipose fin; anal fin and second dorsal fin confluent with caudal fin.



Plotosidae

Remarks on terminology

1. In literature, the **lateral tooth plates** on the palate (= roof of mouth) in many ariid species are frequently referred to as “**palatine tooth patches**”. This is incorrect, as they are not attached to the palatine or any other bone(s), but are “free” (or autogenous). Furthermore, these autogenous tooth plates may be present yet bear no, or few, teeth.
2. The **dorsomedian head groove** is frequently referred to as the **fontanel(-elle)** in literature, a term probably more appropriate to the skeletal feature.

Identification note

Many morphological characters used to distinguish ariid species change with age and stage of maturity. This refers largely to the dentition on the palate (= roof of mouth), where the form and number of the tooth patches change, and, in some species, the teeth of brooding males are shed. Even though recognizing the indefinite nature of many characters, construction of a dichotomous key to the family and species descriptions is forced to rely on them. Valid ariid species rarely can be clearly defined, simply because of the nature of the family (see above). Some genera are best defined by internal (mainly osteological) characters. For practical reasons, the use of those characters is avoided as far as possible in the present field guide, although the distinction between those genera and higher groups may not be optimal.

In particular, variation is most frequently seen in the following characters:

1. The pelvic fins of males are usually shorter than those of females.
2. Palatal teeth (= teeth on the roof of mouth): the male of those ariid species with granular palatal teeth often shed teeth when they are brooding, particularly from the anterior patch. In all brooding males, the epithelium of the palate often becomes soft and villose, and the teeth “sink into” the soft tissue.
3. In most species (but not all) females develop a thickening of the inner pelvic-fin rays as maturity approaches. A hook-like protuberance may develop on the inner, thickened ray.
4. As with many other fish species, the eye is relatively larger in juvenile ariids, and the barbels are relatively longer.

Keys to the marine and brackish-water species of Ariidae occurring in the area

Note: for practical reasons, the ariids in the area are subdivided into 3 “identification groups”. The first group covers all species having granular teeth on the palate (roof of mouth). Some of them occur throughout the WCP area while others are confined to the Sunda Shelf (“Asian”, approximately west of Wallace’s Line). The second and third “identification groups” comprise species having sharp, fine or conical teeth on the palate: the one group confined to the Sunda Shelf and the other to the Sahul Shelf (“Australasian”, approximately east of Wallace’s Line). Three identification keys (A, B, and C) to the species of these 3 groups are presented below. As *Arius bilineatus* and *A. thalassinus* occur throughout the WCP area they are included in both keys B and C.

- 1a. Teeth on palate moderate in number and **granular** [teeth peg-like, or short and conical with blunt tips, or molariform/globular; individual teeth may be lost; axis of larger tooth patches roughly longitudinal on palate, (i.e. long axes running front to back)] **Key A**
- 1b. Teeth on palate **sharp**^{1/} (villiform or pointed-conical) → **2**
- 2a. Endemic Sahul Shelf species (New Guinea, northern Australia) **Key B**
- 2b. Endemic Sunda Shelf species (India, Myanmar, Thailand, Malay Peninsula, Cambodia, Viet Nam, Sumatra, Philippines, Borneo, Java, Madura, Bali) **Key C**

^{1/} Palatal teeth absent in *Arius* species 4 (Sahul Shelf species).

A. Key to marine and brackish-water species with granular teeth on the palate

- 1a. Two patches of teeth on each side of palate; anterior patch rounded and considerably smaller than posterior patch (which may be placed well back on palate) → 2
- 1b. One patch of teeth on each side of palate (which may be placed well back on palate) → 6

- 2a. Sides of swimbladder creased and scalloped internally and externally; palate with teeth often missing from anterior tooth patches (Fig. 1a); mouth subterminal or inferior; caudal peduncle deep and short, its depth 1.3 to 2.1 (mean 1.7) in its length “*Arius*” *argyropleuron*^{2/}
- 2b. Sides of swimbladder creased internally and smooth externally; palate with some teeth always present on anterior tooth patches; caudal peduncle moderately slender, its mean depth 1.9 or more in its length → 3

- 3a. Posterior patches of palatal teeth broadly oval, long axis running obliquely along palate so that patches tend to converge posteriorly (Fig. 1b); palatal teeth rounded, low, granular (Fig. 1b); sides and apex of supraoccipital process convex, and process more oblong than triangular (Fig. 2a); lower limb of first gill arch with 6 to 9 gill rakers; anal-fin rays 18 to 20 “*Arius*” *crossocheilus*
- 3b. Posterior patches of palatal teeth elongate and parallel, running roughly along palate or slightly diverging posteriorly → 4

- 4a. Supraoccipital process triangular in young, expanding with age and assuming a rounded shield shape (Fig. 2b); apex of process convex; long axes of posterior tooth patches on palate usually diverging posteriorly (Fig. 1c); posterior caudal-fin margin distinctly sublunate; dorsal-fin spine with internal transverse partitions; lower limb of first gill arch with 9 gill rakers; anal-fin rays 14 to 17 “*Arius*” *nella*
- 4b. Supraoccipital process more or less triangular or oblong; apex of process truncate or emarginate (Fig. 2c, d); posterior caudal-fin margin not sublunate. → 5

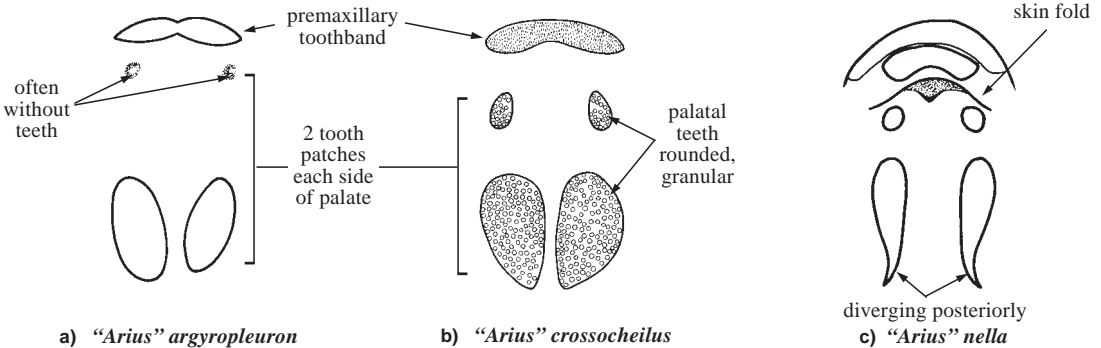


Fig. 1 upper tooth patches

- 5a. Sides of triangular supraoccipital process irregularly convex anteriorly (Fig. 2c); median keel of process low; lateral ethmoid slightly prominent before eye; head length 29 to 33% (mean 31%) of standard length; mouth width 26 to 39% (mean 34%) of head length; adipose fin with brown margin; lower limb of first gill arch with 8 to 11 gill rakers; anal-fin rays 15 to 20 “*Arius*” *polystaphylodon*
- 5b. Sides of supraoccipital process straight (Fig. 2d); median keel of process strong (“sharp”); lateral ethmoid prominent before eye in larger individuals; head length 22 to 28% (mean 26%) of standard length; mouth width 36 to 44% of head length; adipose fin with large dark spot; lower limb of first gill arch with (probably) 10 to 12 gill rakers; anal-fin rays 14 to 18. “*Arius*” *dussumieri*

^{2/} Species keyed out twice.

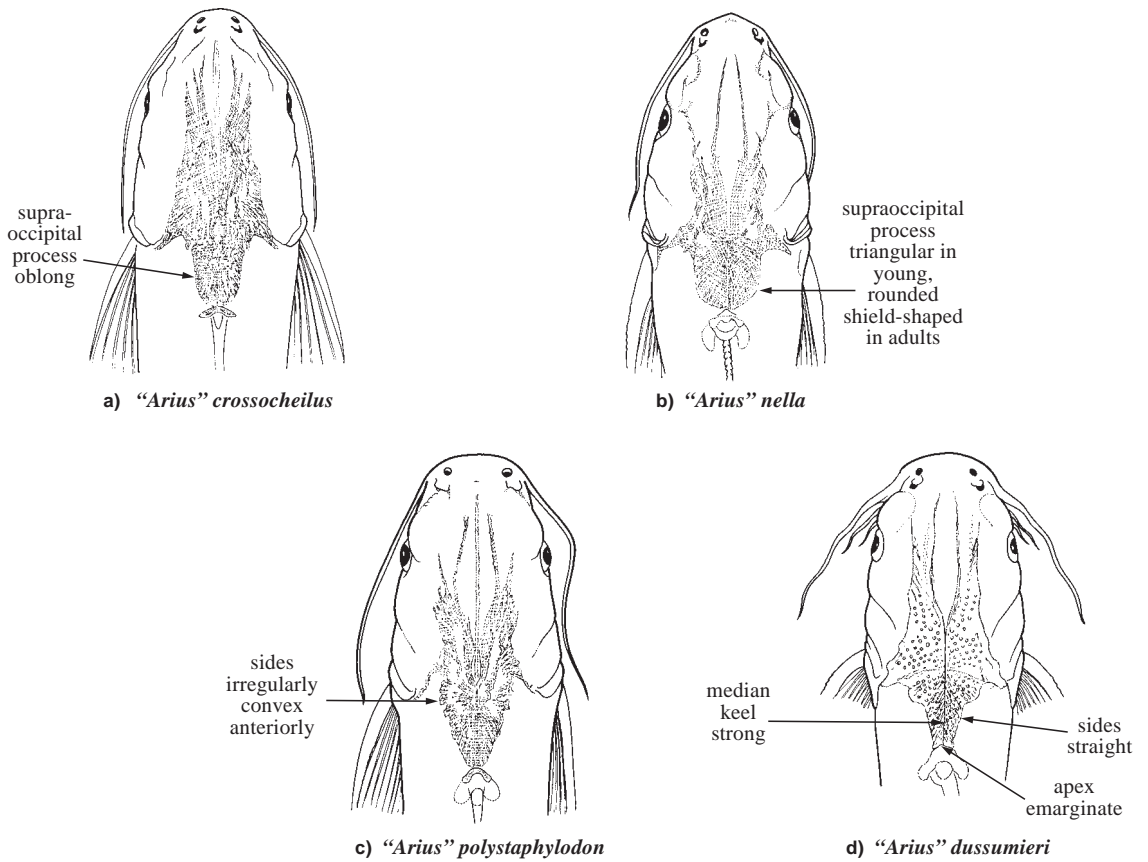


Fig. 2 dorsal view of head

- 6a. Palatal tooth patches oval, placed well back on palate, their long axes parallel or converging posteriorly (Figs 1a and 3a) → 7
- 6b. Palatal tooth patches placed well forward, or commencing well forward, their origin not far behind band of premaxillary teeth (Fig. 3b-e) → 8
- 7a. Gill rakers present on hind aspect of all gill arches; total gill rakers on first gill arch 17 to 21; adipose dorsal fin with large black spot *Arius maculatus*
- 7b. No gill rakers on hind aspect of first 2 gill arches; total gill rakers on first gill arch 10 to 16; adipose dorsal fin dusky but without distinct black spot "*Arius*" *argyropleuron*
- 8a. Predorsal profile convex, head scarcely wider than high; mouth small, its width about 1/3 of head length; palatal tooth patches ovate, placed well forward; individual teeth large: globular, smooth, and low (Fig. 3b) *Arius microcephalus*
- 8b. Predorsal profile straight, at most slightly convex on nape, head noticeably wider than high; mouth moderately wide, its width about 36 to 38% of head length → 9
- 9a. Dorsal-fin spine always bearing a filament and spine 2/3 to 4/5 of head length *Arius arius*
- 9b. Dorsal-fin spine only bearing a filament in young fish; spine stout, 1/2 to 2/3 of head length → 10

- 10a.** Snout rounded, upper-jaw teeth scarcely exposed when mouth closed; palatal tooth patches more elongate than oval (Fig. 3d); black spot on adipose fin. *Arius gadora*
- 10b.** Snout acute, most upper-jaw teeth exposed when mouth closed; palatal tooth patches more oval than elongate, elliptical in young (Fig. 3e); adipose fin dark with narrow pale border but never a distinct black spot *Arius manillensis*

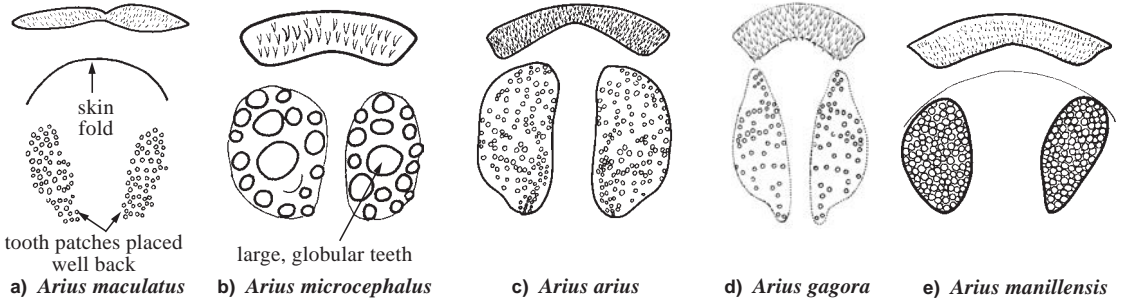


Fig. 3 upper tooth patches

B. Key to marine and brackish-water species endemic to the Sahul Shelf (New Guinea, northern Australia)

- 1a.** Mature females without pads on pelvic fins; either gill rakers on first arch very numerous (more than 40), or gill opening restricted and gill rakers on first arch less than 20 → 2
- 1b.** Mature females with pads on pelvic fins; other characters not as above → 3
- 2a.** Mouth wide, 50 to 62% of head length; barbels long, maxillary barbel about 1/2 standard length; anal-fin rays 29 to 33; gonad appearing as 1 (i.e. not bilobate). . *Nedystoma novaeguineae*
- 2b.** Mouth small, 27 to 31% of head length; barbels moderately long, reaching posteriorly to level of base of dorsal-fin spine (about 1/3 standard length); anal-fin rays 17 to 19; gonad bilobate *Cinetodus froggatti*
- 3a.** No teeth on palate; total number of gill rakers on first arch 28 to 37; longitudinal furrows on "shoulder" in adults; branchial chamber sometimes purplish or dark grey *Arius* species 4
- 3b.** Teeth always present on palate. → 4
- 4a.** Palatal teeth grouped into 3 patches on each side of palate (Fig. 4a, b); if tooth patches coalesce, patches form 1 large triangular patch on each side (Fig. 4a, b). → 5
- 4b.** Palatal teeth grouped into 2 patches or 1 patch on each side of palate; if 2 tooth patches on each side coalesce, patches form a rectangular patch on each side. → 7

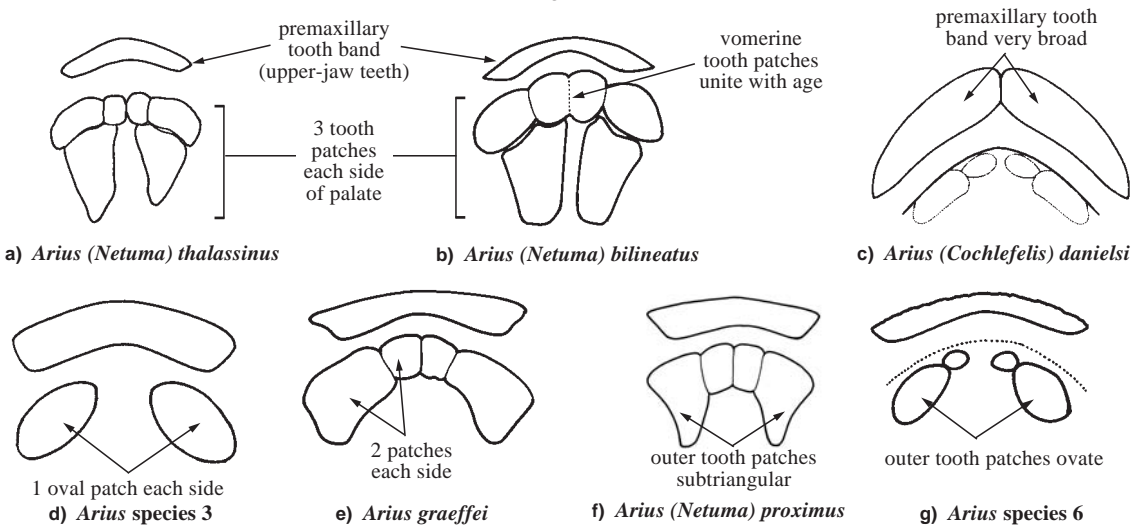
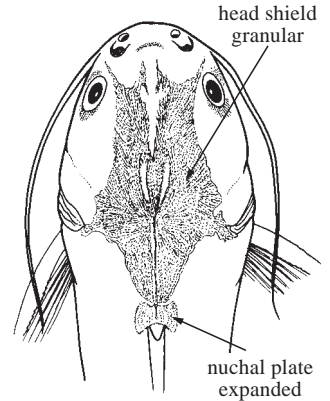


Fig. 4 upper tooth patches

- 5a. Nuchal ("predorsal") plate expanded with age (Fig. 5); borders of dorsomedian head groove not raised posteriorly; head depressed, head shield granular; peritoneum dark; caudal-fin lobes moderately broad *Arius (Hexanematchthys) mastersi*
- 5b. Nuchal plate always narrow; borders of dorsomedian head groove raised posteriorly to form a "V"; head not depressed; peritoneum always pale; caudal-fin lobes moderately slender, scythe-like. → 6



dorsal view of head

Fig. 5 *Arius (Hexanematchthys) mastersi*

- 6a. Snout prominent and somewhat pointed; mouth inferior; anal-fin rays 14 to 17; paired inner (vomarine) tooth patches always separated at palate midline (Fig. 4a); body iridescence coppery or golden *Arius (Netuma) thalassinus*
- 6b. Snout rounded, not prominent; mouth subterminal; anal-fin rays 17 to 21; paired inner (vomarine) tooth patches unite across palate midline as fish ages (Fig. 4b); body iridescence bronze *Arius (Netuma) bilineatus*
- 7a. Snout spatulate; jaw teeth in broad bands, premaxillary band largely exposed (Fig. 4c); barbels long, maxillary barbels to below dorsal fin, 1/4 to 2/5 of standard length; lips narrow; anal-fin rays 21 to 27 *Arius (Cochlefelis) danielsi*
- 7b. Snout not spatulate; jaw teeth not in broad bands → 8
- 8a. Snout shark-like; jaw teeth strong, caniniform, fixed; head shield often smooth. → 9
- 8b. Snout not shark-like; jaw teeth more or less depressible → 10
- 9a. Eye free from head skin; fin spines robust and half-chambered (internally); snout long, 32 to 41% of head length; swimbladder heart-shaped, with scalloped sides; maxillary barbels 15 to 25% of standard length. *Arius (Hemiaris) species 1*
- 9b. Eye covered with head skin; fin spines thin and not chambered; snout length 28 to 32% of head length; swimbladder very large, flat, and ovate; maxillary barbels 11 to 16% of standard length *Arius (Hemiaris) species 5*
- 10a. Gill rakers present along posterior face (aspect) of all gill arches (may be only a few on first gill arch) → 11
- 10b. Gill rakers largely absent from posterior face of first and second gill arches (but present on third and fourth gill arches). → 12
- 11a. One oblique, oval patch of low, conical teeth on each side of palate (Fig. 4d); strong serrae along inner margin of pectoral-fin spine; dorsal and pectoral fins and inner lobes of caudal fin with dark margins *Arius species 3*
- 11b. Two (rarely 1) square or oval patches of villiform teeth on each side of palate (Fig. 4e), or vomarine patches united to form 1 large patch medially; serrae on pectoral-fin spine moderate; fin margins not distinctly darker; juveniles may bear a crescentic groove between anterior nostrils *Arius graeffei*
- 12a. Gill rakers on first gill arch 10 to 14; outer patches of palatal teeth much larger (2 to 4 times) than inner (vomarine) patches (Fig. 4f, g) → 13
- 12b. Gill rakers on first gill arch 13 to 22; outer patches of palatal teeth 1.5 to 2 times larger than inner (vomarine) patches. → 14
- 13a. Adipose fin small-based and situated over posterior 2/3 of anal fin; adipose fin mostly black; snout curved or acute; outer patches of palatal teeth subtriangular (Fig. 4f); triangular supraoccipital process moderately slender *Arius (Netuma) proximus*
- 13b. Adipose fin large-based and situated over all of anal fin; adipose fin dusky; snout fleshy, overhanging mouth; outer matches of palatal teeth ovate (Fig. 4g); triangular supraoccipital process short and very broad *Arius species 6*

- 14a. Jaw teeth barely depressible; chin-barbel bases well separated and staggered; jaws elevated at symphysis; dorsomedian head groove deep posteriorly (Fig. 6); anal-fin rays 22 to 25; short filament on fin spines at all ages . . . *Arius armiger*
- 14b. Jaw teeth clearly depressible; chin-barbel bases not well separated, only slightly staggered; jaws not noticeably elevated at symphysis; dorsomedian head groove very shallow; anal-fin rays 16 to 22 → 15
- 15a. Caudal-peduncle depth 6 to 8% of standard length; head low, its height 1.0 to 1.5 (mean 1.2) in its width; head skin thin; eye situated slightly before midhead length and visible from above *Arius utarus*
- 15b. Caudal-peduncle depth 7 to 10% of standard length; head height 1.2 to 2.4 (mean 1.5) in its width; head skin moderately thick; eye situated well before midhead length and just visible from above *Arius leptaspis*

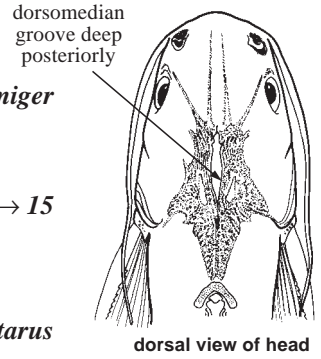


Fig. 6 *Arius armiger*

C. Key to marine and brackish-water species endemic to the Sunda Shelf with sharp teeth on the palate (India, Myanmar, Thailand, Malay Peninsula, Cambodia, Viet Nam, Sumatra, Philippines, Borneo, Java, Madura, Bali)

Note: a single species, *Arius doriae*, could not be accommodated into this key (see couplet 6)

- 1a. A single pair of barbels → 2
- 1b. Three pairs of barbels. → 3
- 2a. Pair of mandibular barbels, very small *Batrachocephalus mino*
- 2b. Pair of maxillary barbels, long and stiff *Osteogeneiosus militaris*
- 3a. Mouth opening wide, extending behind eye; single series of incisor-like teeth in each jaw. *Ketengus typus*
- 3b. Mouth opening not extending behind eye; jaw teeth conical and sharp, often fine, in few to many series. → 4
- 4a. Eye margin not free; some dorsal-fin rays extended as filaments *Arius (?) intermedius*
(nominal species, status uncertain)
- 4b. Eye margin free; dorsal-fin rays not filamentous → 5
- 5a. Gill openings restricted (closed across isthmus from just below pectoral-fin bases) although gill cover free; eye 7 to 11 times in head length; no rakers on hind aspect of first 2 gill arches *Arius truncatus*
- 5b. Gill openings not restricted, extending well forward on isthmus → 6
- 6a. Rakers usually absent from hind aspect of first 2 gill arches. → 7
- 6b. Rakers present on hind aspect of all gill arches → 11
(character state not known for *Arius doriae*)
- 7a. Anal-fin rays 22 to 25; palatal teeth arranged into 2 oblong patches, 1 on each side of palate (Fig. 7a) *Arius bleekeri*
(distribution unknown, possible Indonesia)
- 7b. Anal-fin rays 14 to 21; palatal teeth arranged into 4 or 6 patches, 2 or 3 on each side of palate (Figs 4a, b and 7b, c) → 8

- 8a. Palatal teeth grouped into 3 patches on each side of palate (Fig. 4a, b); if tooth patches coalesce, patches form 1 large triangular patch on each side → 9
- 8b. Palatal teeth grouped into 1 or 2 patches on each side of palate; if 2 tooth patches on each side coalesce, patches form a rectangular patch on each side (Fig. 7b, c). → 10

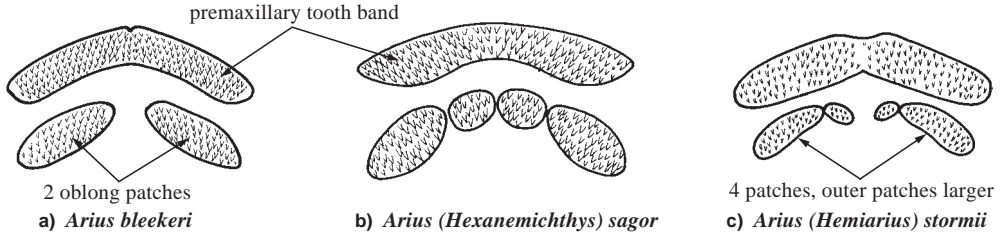


Fig. 7 upper tooth patches

- 9a. Snout prominent and somewhat pointed; mouth inferior; anal-fin rays 14 to 17; paired inner (vomeric) tooth patches always separated at palate midline (Fig. 4a); body iridescence coppery or golden *Arius (Netuma) thalassinus*
- 9b. Snout rounded, not prominent; mouth subterminal; anal-fin rays 17 to 21; paired inner (vomeric) tooth patches unite across palate midline as fish ages (Fig. 4b); body iridescence bronze *Arius (Netuma) bilineatus*

- 10a. Supraoccipital process short, hemispherically rounded (Fig. 8a); snout rounded *Arius (Hexanemichthys) sagor*
- 10b. Supraoccipital process triangular (Fig. 8b); snout shark-like *Arius (Hemiaris) stormii*

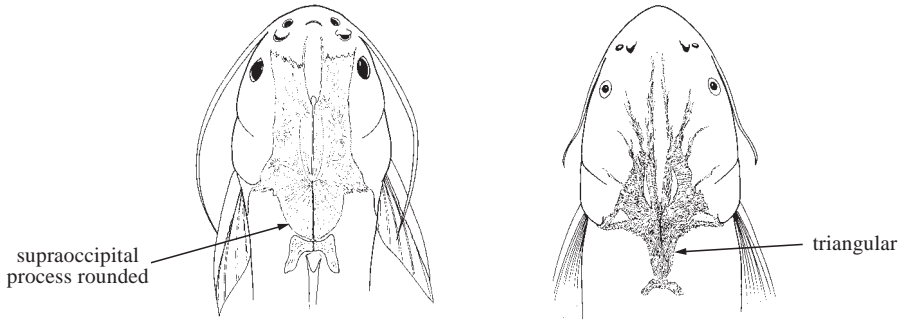


Fig. 8 dorsal view of head

- 11a. Teeth on palate in 2 patches on each side, arranged across palate or following curve of mouth (Fig. 9a, b) → 12
- 11b. Teeth on palate in 1 patch on each side (or appearing as 2 patches; Fig. 9h), arranged longitudinally or obliquely on palate (Fig. 9c-h) → 13

- 12a. Outer patch of palatal teeth triangular with emarginate hind margin and very much larger than inner (vomeric) patch (Fig. 9a); palatal teeth conical and sharp; eye 6 to 9 times in head length; fin spines strong *Arius sona*
- 12b. Outer patch of palatal teeth crescentic, its size 3 to 4 times size of inner patch (Fig. 9b); palatal teeth conical and short, sharp or blunt ("granular"); eye 4 to 5 times in head length; fin spines moderately slender *Arius harmandi*

- 13a. Dorsal- and pectoral-fin spines much thickened basally, compressed, very granulated and rough on leading edge and sides → 14
- 13b. Dorsal- and pectoral-fin spines not especially thick and granulated → 15

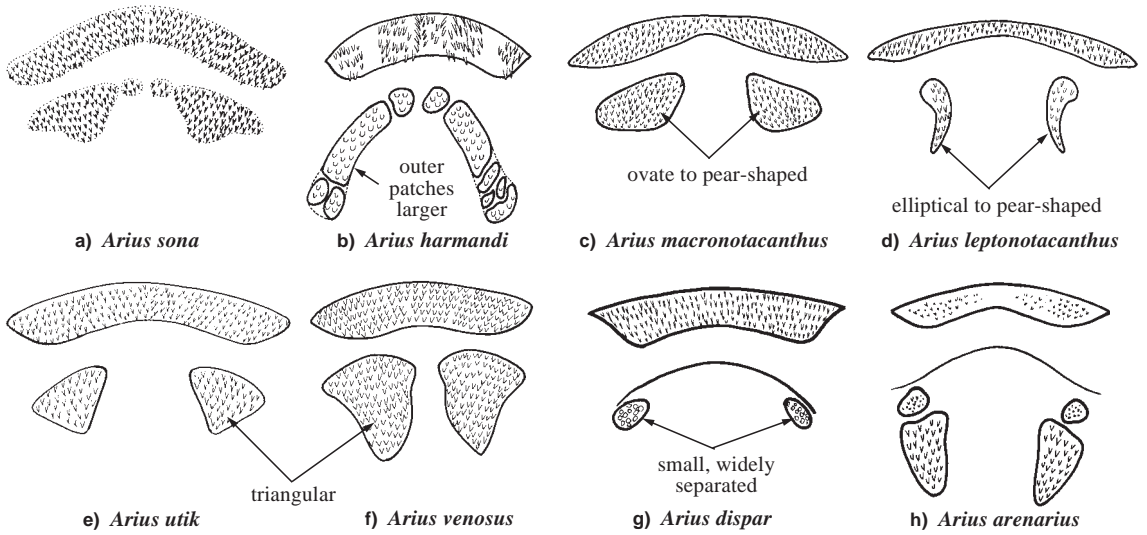


Fig. 9 upper tooth patches

- 14a.** Palatal tooth patches distinctly triangular, their long axes at about 70° to curve of mouth . . . *Arius nenga*
- 14b.** Palatal tooth patches more ovate or pear-shaped than triangular, their long axes at about 20 to 30° to curve of mouth (Fig. 9c) *Arius macronotacanthus*
- 15a.** Pectoral- and dorsal-fin spines about equal in length; serrae on hind margin of pectoral-fin spine distinct and numerous, either strong or moderately strong; 13 to 16 gill rakers on first gill arch → **16**
- 15b.** Serrae on hind margin of pectoral-fin spine not especially distinct and numerous; 17 to 19 gill rakers on first gill arch → **18**
- 16a.** Head shield striated anteriorly, rugose or granular posteriorly; palatal tooth patches elliptical or pear-shaped, long axes parallel or diverging posteriorly (Fig. 9d); supraoccipital process short and with a high keel *Arius leptotacanthus*
- 16b.** Head shield venulose or smooth anteriorly, rugose or granular posteriorly; palatal tooth patches triangular, their inner margin straight or slightly emarginate (Fig. 9e, f) → **17**
- 17a.** Eye dorsolateral, 4.6 to 5.3 times in head length; head 3 to 3.6 times in standard length; dorsal-fin spine 2/3 to 3/4 of head length; dorsomedian head groove short, deeper anteriorly *Arius utik*
- 17b.** Eye lateral, 4.2 to 5 times in head length; head 4 to 5 times in standard length; dorsal-fin spine 3/4 to 4/5 of head length; dorsomedian head groove long, shallow. *Arius venosus*
- 18a.** Palatal tooth patches small, widely separated, 1 on each side of palate; patches ovate-triangular (Fig. 9g); snout prominent and acute; lips thick; sides of supraoccipital process slightly convex *Arius dispar*
- 18b.** Palatal tooth patches moderately large, not noticeably well spaced; outer (posterior) patches oval-triangular, their apex directed posteriorly (Fig. 9h); snout rounded; lips not especially thick; sides of supraoccipital process straight *Arius arenarius*

List of the marine and brackish-water species occurring in the area

The symbol is given when species accounts are included.

- Arius arenarius* Müller and Troschel, 1849
- "*Arius*" *argyropleuron* Valenciennes in Cuvier and Valenciennes, 1840
- Arius arius* (Hamilton, 1822)
- Arius armiger* De Vis, 1884
- Arius* (*Netuma*) *bilineatus* Valenciennes in Cuvier and Valenciennes, 1840

- ? *Arius bleekeri* Popta, 1900^{3/}
- "Arius" *crossocheilus* Bleeker, 1846
- *Arius (Cochlefelis) danielsi* Regan, 1908
- *Arius dispar* Herre, 1926
- *Arius doriae* Vinciguerra, 1880^{4/}
- "Arius" *dussumieri* Valenciennes in Cuvier and Valenciennes, 1840
- *Arius gagora* (Hamilton, 1822)
- *Arius graeffei* Kner and Steindachner, 1866
- *Arius harmandi* (Sauvage, 1883)
- *Arius (?) intermedius* (Vinciguerra, 1880)^{5/}
- *Arius leptaspis* (Bleeker, 1862)
- *Arius leptanotacanthus* Bleeker, 1849
- *Arius macronotacanthus* Bleeker, 1846
- *Arius maculatus* (Thunberg, 1792)
- *Arius manillensis* Valenciennes in Cuvier and Valenciennes, 1840
- *Arius (Hexanematichthys) mastersi* Ogilby, 1898
- *Arius microcephalus* Bleeker, 1855
- "Arius" *nella* Valenciennes in Cuvier and Valenciennes, 1840
- *Arius nenga* (Hamilton, 1822)
- "Arius" *polystaphylodon* Bleeker, 1846
- *Arius (Netuma) proximus* Ogilby, 1898
- *Arius (Hexanematichthys) sagor* (Hamilton, 1822)
- *Arius sona* (Hamilton, 1822)
- *Arius (Hemiaris) stormii* (Bleeker, 1858)
- *Arius (Netuma) thalassinus* (Rüppell, 1837)
- *Arius truncatus* Valenciennes in Cuvier and Valenciennes, 1840
- *Arius utarus* Kailola, 1990
- *Arius utik* Bleeker, 1846
- *Arius venosus* Valenciennes in Cuvier and Valenciennes, 1840
- *Arius (Hemiaris) species 1* [Kailola, 1990]
- *Arius species 3* [Kailola, 1990]
- *Arius species 4* [Kailola, 1990]
- *Arius (Hemiaris) species 5* [Kailola, 1990]
- *Arius species 6* [Kailola, 1990]
- *Batrachocephalus mino* (Hamilton, 1822)
- *Cinetodus (Cinetodus) froggatti* (Ramsay and Ogilby, 1886)
- *Ketengus typus* Bleeker, 1847
- *Nedystoma novaeguineae* (Weber, 1913)
- *Osteogeneiosus militaris* (Linnaeus, 1758)

References

- Bleeker, P. 1862. *Atlas ichthyologique des Indes Orientales Néerlandaises, publié sous les auspices du Gouvernement colonial néerlandais, 2: Siluroïdes, Chacoïdes et Heterobranchoides*. Amsterdam, Frederic Müller, 112 p.
- Chandy, M. 1953. A key for the identification of the catfishes of the genus *Tachysurus* Lacèpede, with a catalogue of the specimens in the collection of the Indian Museum (Zool. surv.). *Records of the Indian Museum*, 51:1-18.
- Day, F. 1878. *The fishes of India: being a natural history of the fishes known to inhabit the sea and fresh waters of India, Burma and Ceylon*. London, 2 vols, 778 p.
- Kailola, P.J. 1986. Ariidae systematics: comparison of the giant sea catfishes *Arius thalassinus* and *A. bilineatus* of the Indo-Pacific. In *Proceedings of the Second International Conference on Indo-Pacific Fishes, Tokyo, July-August 1985*, edited by T. Uyeno, R. Arai, T. Taniuchi, and K. Matsuura. Tokyo, pp. 540-549.
- Weber, M. and L.F. de Beaufort. 1913. *The fishes of the Indo-Australian Archipelago*. 2. Leiden, E.J. Brill, 404 p.

^{3/} Distinct species, but distribution unknown. Possibly occurs in Indonesia.

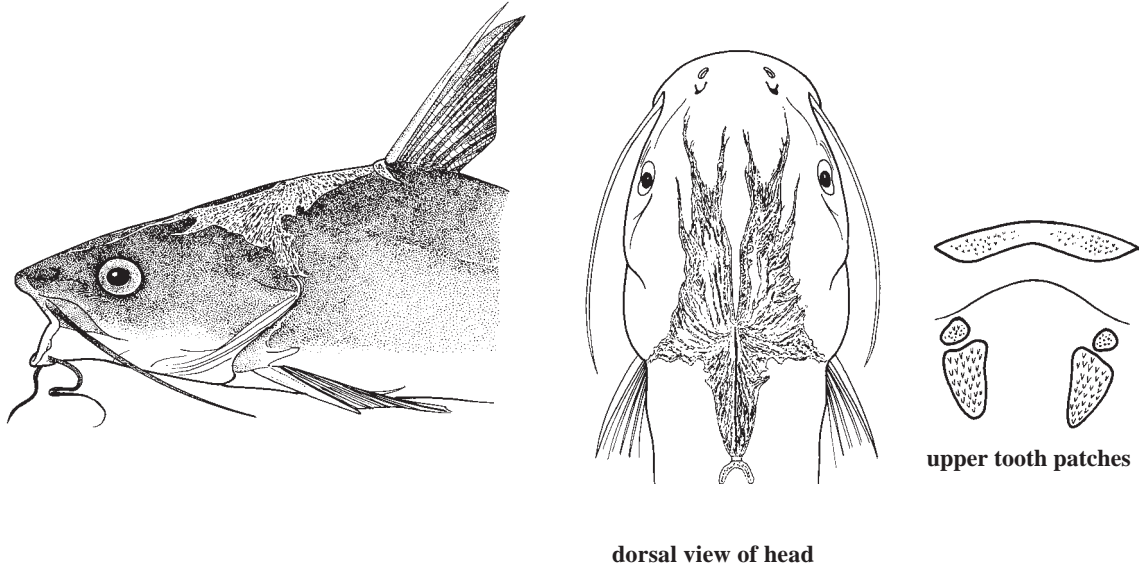
^{4/} Recorded from Sarawak and Kalimantan. The status of this nominal species is unknown and no material was examined by the writer. The eye size as stated is smaller than in possibly identical valid species of comparable size. Otherwise, it appears allied to *Arius venosus* and *A. utik*.

^{5/} Known only from the types (collected in Sarawak, Borneo) which were not examined by the writer. It may not be an ariid, as it is said to have filaments on some dorsal-fin rays, a feature not present in other ariids; but other features appear to be consistent with the family's characteristics.

Arius arenarius Müller and Troschel, 1849

Frequent synonyms / misidentifications: None / None.

FAO names: En - Sand catfish.

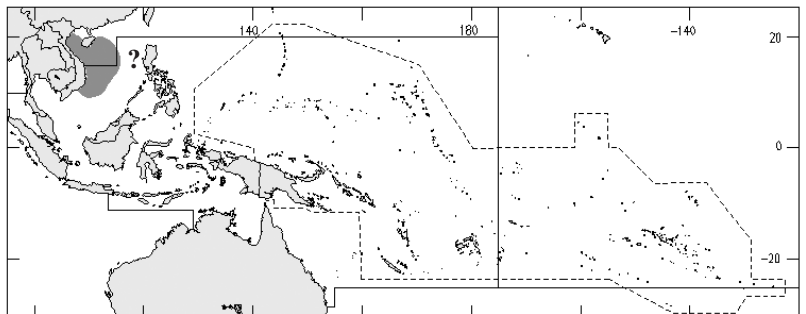


Diagnostic characters: Head shield extensive, very granular; granules fine and arranged in series posteriorly and over supraoccipital process. Eye 5.8 to 7.8 times in head length. Snout rounded. Mouth subterminal, gape 34 to 40% of head length. **Palatal teeth in 2 patches (or 4 patches, contiguous, anterior patch round), 1 on each side of palate, patches oval-triangular, their apex directed posteriorly, long axes parallel or tending to converge posteriorly; patches situated well forward on palate;** palatal teeth mainly fine and conical with sharp or blunt tips, some low and molariform. **Maxillary barbel short, 20 to 24% of standard length.** Total gill rakers on first gill arch 17; **rakers present on hind aspect of all gill arches.** Dorsal- and pectoral-fin spines moderately stout, hind borders with low serrae; dorsal-fin spine 1/2 to 2/3 of head length; anal-fin rays 19. Adipose-fin base 1/2 to 4/5 of dorsal-fin base. **Caudal-peduncle depth 1.9 to 2.4 in its length. Lateral line turns upwards only at tail base. Colour:** body bluish brown above, white below; fins and barbels dusky to brown; dorsal and inner caudal-fin lobes edged darker.

Size: Maximum standard length 29 cm.

Habitat, biology, and fisheries: Coastal waters. Diet unknown.

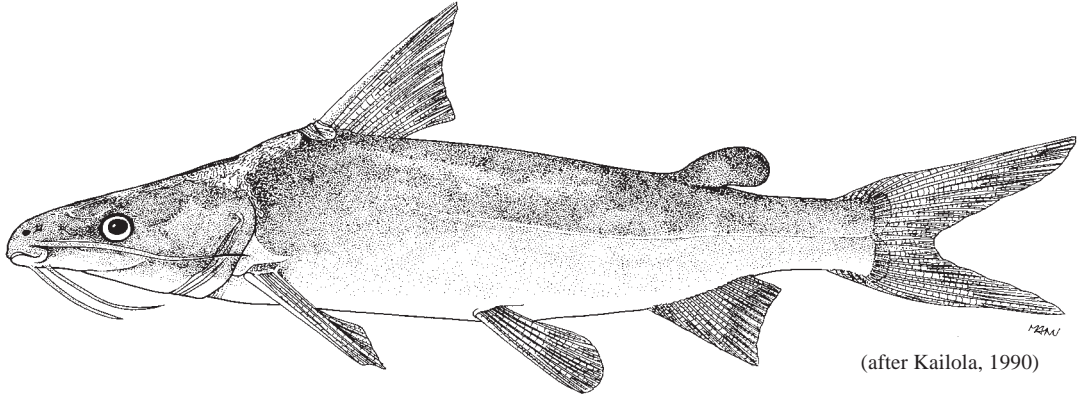
Distribution: Southern China and Taiwan Province of China, possibly extending to the Philippines or further south.



“*Arius*” *argyropleuron* Valenciennes in Cuvier and Valenciennes, 1840

Frequent synonyms / misidentifications: *Arius argyropleuron* Valenciennes in Cuvier and Valenciennes, 1840; *A. acutus* Bleeker, 1846; *A. hamiltonis* Bleeker, 1846; *A. macrocephalus* Bleeker, 1846; *A. schlegelii* Bleeker, 1863 (in part); *A. layardi* Günther, 1866 (probable); *Tachysurus broadbenti* Ogilby, 1908; *Hemipimelodes colcloughi* Ogilby, 1910; *Arius satparanus* Chaudhuri, 1916 (probable) / *Arius macrocephalus* Bleeker, 1846.

FAO names: En - Longsnouted catfish.



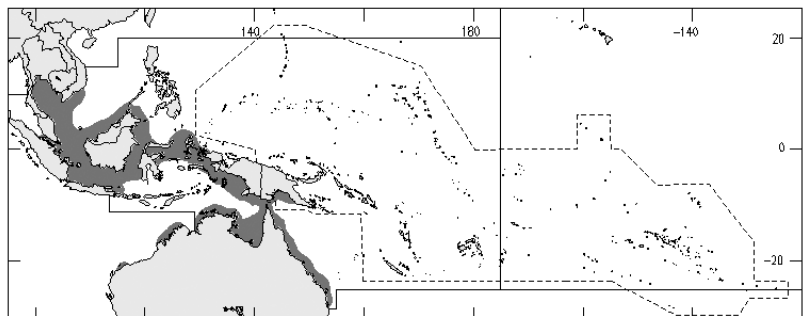
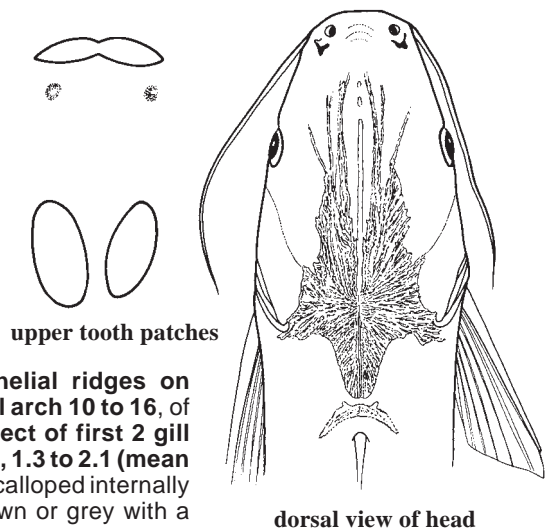
(after Kailola, 1990)

Diagnostic characters: Head depressed, elongate, 27 to 36% (mean 32%) of standard length. Exposed head shield very striate or sharply granular; dorsomedian head groove lanceolate; supraoccipital process narrow, always keeled. Eye low-set. Snout long. Mouth small, its width 24 to 40% (mean 31%) of head length, subterminal to inferior; lips and palate creased. Granular teeth in 2 patches on each side of palate, longitudinally arranged, posterior patches oblong-ovate, parallel or with long axes slightly converging distally; palate teeth moderately large, globular or conical, and blunt-tipped (peg-like); all teeth in anterior patch frequently missing, and individual teeth sometimes lacking on all patches. Posterior epithelial ridges on palate run transversely. Total gill rakers on first gill arch 10 to 16, of which 7 to 11 on lower limb; no rakers on hind aspect of first 2 gill arches. Anal-fin rays 14 to 21. Caudal peduncle deep, 1.3 to 2.1 (mean 1.7) in its length. Sides of swimbladder creased and scalloped internally and externally. **Colour:** body variable shades of brown or grey with a reddish to silvery yellow wash; adipose fin dusky.

Size: Maximum fork length 50 cm.

Habitat, biology, and fisheries: Coastal waters and lower estuaries. Diet consists of detritus, prawns, soft-bodied organisms, and mud.

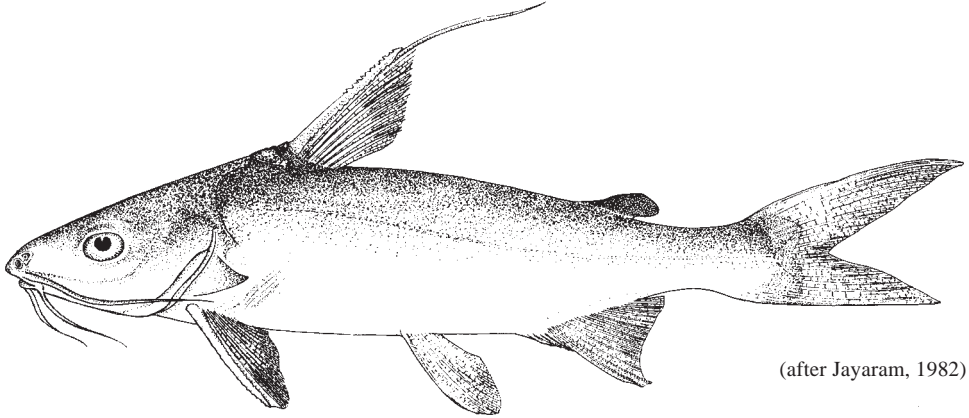
Distribution: East coast of India through neighbouring eastern coastal Indian states, Thailand, Indonesia, Malaysia, possibly the Philippines, southern coast of New Guinea, and north coast of Australia from Dampier (Western Australia) to Moreton Bay (Brisbane, Queensland).



Arius arius (Hamilton, 1822)

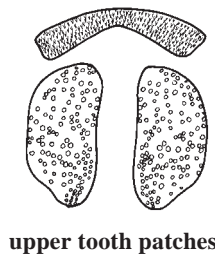
Frequent synonyms / misidentifications: *Arius falcarius* Richardson, 1844; *A. cochinchinensis* Günther, 1864; *A. boakeii* Turner, 1866. Synonyms recorded in literature: *Bagrus crinalis* Richardson, 1846; *Pimelodus mong* Richardson, 1846; *Arius buchhanani* Day, 1877 / *Arius maculatus* (Thunberg 1792); *A. gabora* (Hamilton, 1822).

FAO names: En - Threadfin sea catfish; Fr - Mâchoiron fouet; Sp - Bagre filamentoso.

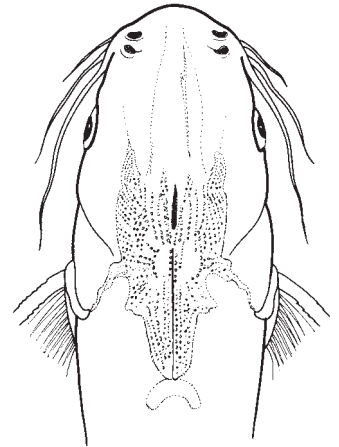


(after Jayaram, 1982)

Diagnostic characters: Head shield smooth anteriorly, a series of granules and rugae posteriorly; dorsomedian head groove shallow, narrow, and deeper posteriorly. Eye 4 to 6 (mean 5.1) times in head length. Snout rounded to acute, about twice eye diameter. Mouth gape 36 to 42% (mean 37.4%) of head length. **Teeth on palate in 2 oval-elliptical patches, 1 on each side, placed well forward on palate and usually parallel to each other, patches extensive in larger fish; palatal teeth molariform, peg-like, and blunt or globular and short, up to about 120, but usually less;** band of upper jaw teeth 4 to 6.5 (mean 5) times longer (across mouth) than broad (width of band). Maxillary barbels usually extending past head, 24 to 37% (mean 28.7%) of standard length. **Total gill rakers on first gill arch 14 to 17; rakers present on hind aspect of all gill arches.** Dorsal-fin spine $\frac{3}{4}$ to $\frac{4}{5}$ of head length, **a filament at its tip;** pectoral-fin spine subequal to and slightly stronger than dorsal-fin spine; anal-fin rays 17 to 22. Adipose-fin base $\frac{2}{3}$ to $\frac{4}{5}$ of dorsal-fin base. **Lateral line bifurcates at tail base. Caudal peduncle moderately deep, 1.5 to 2.1 (mean 1.8) in its depth. Colour:** bluish brown above, white below; fins yellow, pectoral- and dorsal-fin margins dark, **adipose fin with large black spot.**



upper tooth patches

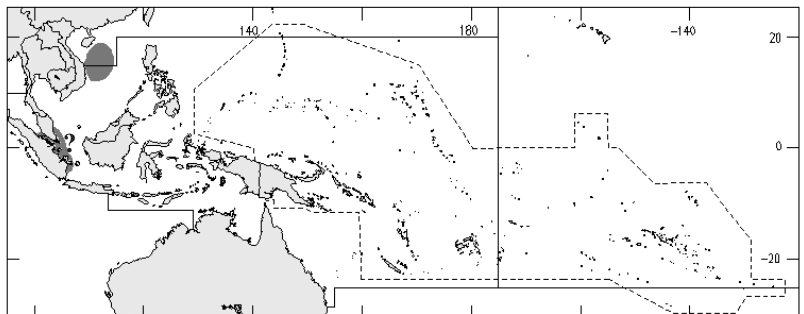


dorsal view of head

Size: Maximum standard length possibly 40 cm.

Habitat, biology, and fisheries: Estuaries and inshore waters. Diet unknown.

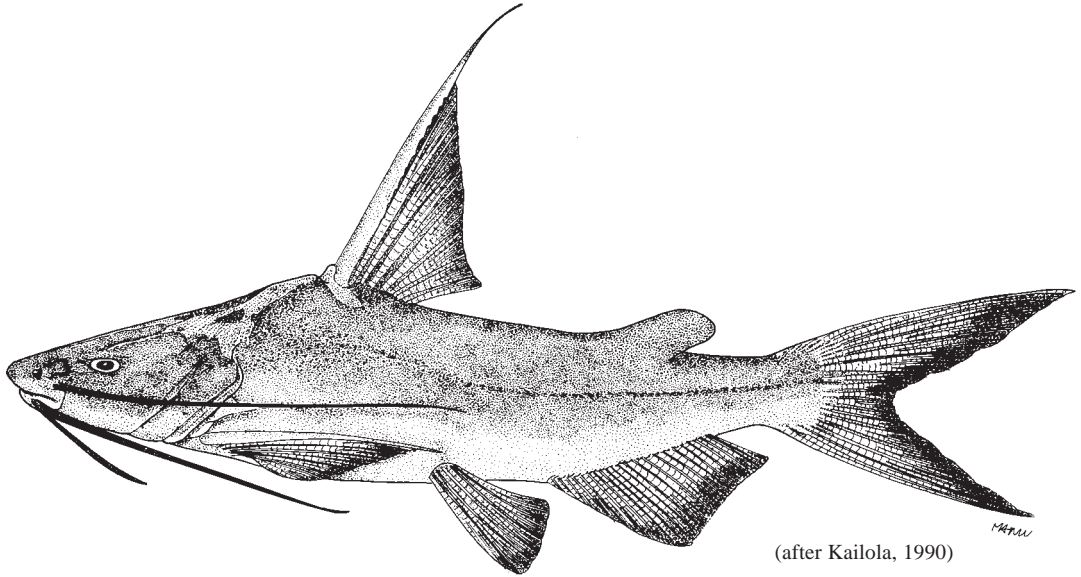
Distribution: India through neighbouring coastal states to Singapore, South China Sea, and possibly Sumatra.



Arius armiger De Vis, 1884

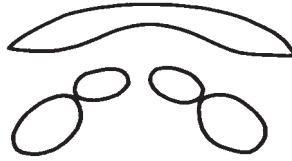
Frequent synonyms / misidentifications: *Arius stirlingi* Ogilby, 1898 / *Arius* species 1 [Kailola, 1990].

FAO names: En - Copper catfish.

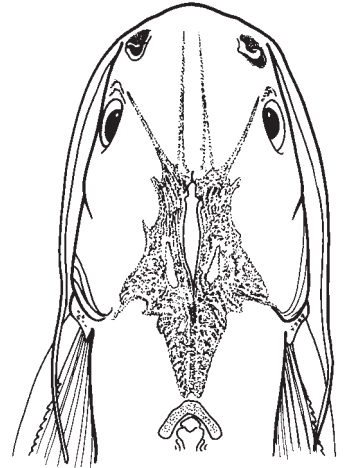


(after Kailola, 1990)

Diagnostic characters: Dorsomedian head groove deep and elliptical posteriorly. Eyes small. Mouth sub-terminal; jaws strong, their symphyses elevated. Jaw teeth barely depressible; **4 ovate patches of teeth arranged across palate**, 2 patches on each side, inner (vomerine) patches well separated, outer autogenous ("palatine") patches larger; palatal teeth small and sharp, or conical and blunt. **Barbels long, maxillary pair 30 to 56% of standard length; chin-barbel bases well separated and staggered. Total gill rakers on first 2 gill arches to 22; rakers largely absent from hind aspect of first 2 gill arches**, these arches having thick fleshy pads posterodorsally. Fin spines slender, dorsal-fin spine longer than pectoral-fin spine; **short filament on fin spines at all ages; anal-fin rays 22 to 25**. Swimbladder with smooth, unnotched sides. **Colour: body coppery, golden-brown**, bronze or greyish pink, creamy below; barbels, fin margins, and filaments blackish or charcoal; underside of paired fins cream.



upper tooth patches

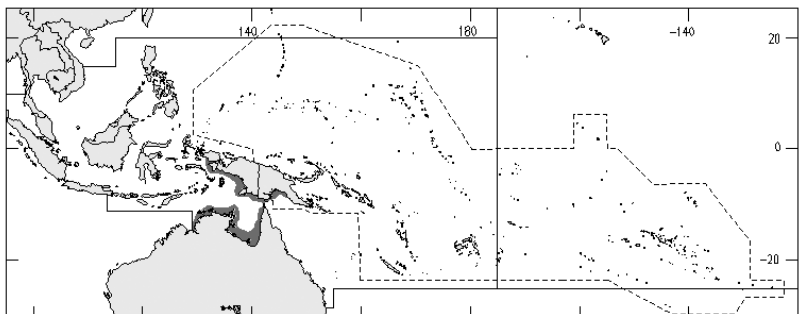


dorsal view of head

Size: Maximum fork length 36 cm.

Habitat, biology, and fisheries: Coastal waters and estuaries, river deltas and rivers within tidal influence. Diet mainly consists of prawns with other crustaceans, fish, aquatic insects, plant material, and fish scales taken opportunistically.

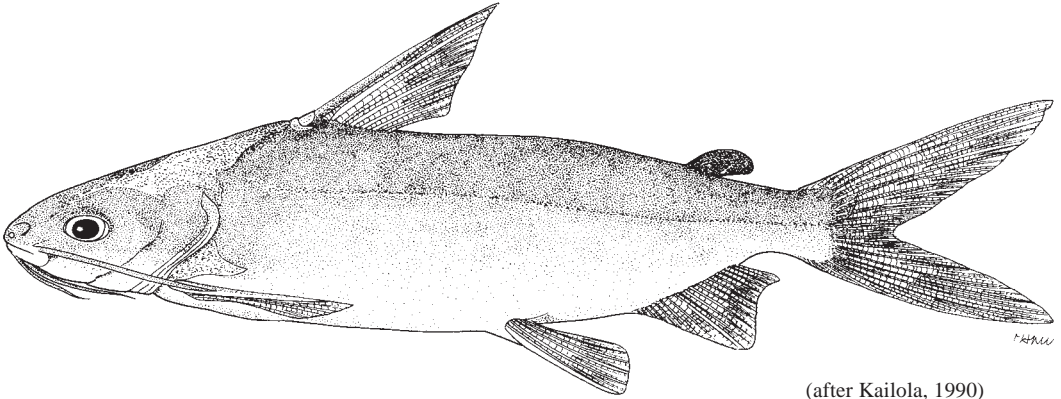
Distribution: Southern New Guinea and northern Australia.



Arius (Netuma) bilineatus Valenciennes in Cuvier and Valenciennes, 1840

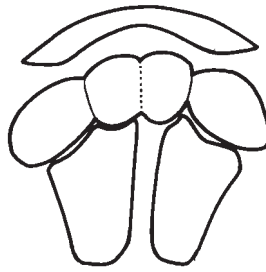
Frequent synonyms / misidentifications: *Bagrus rhodonotus* Bleeker, 1846; *Arius andamanensis* Day, 1871 (in part); *A. serratus* Day, 1877 (in part); *Netuma osakae* Jordan and Kanazawa in Jordan and Hubbs, 1925; *Arius dayi* Dmitrenko, 1974 / *Arius thalassinus*: non Rüppell.

FAO names: En - Roundsnout sea catfish.

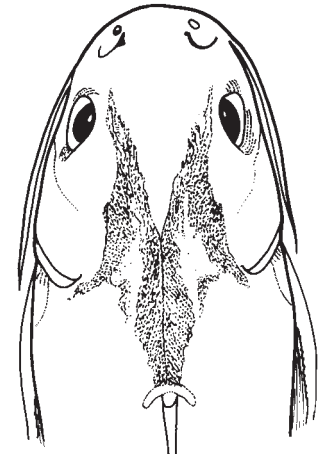


(after Kailola, 1990)

Diagnostic characters: Head shield rugose or granular, coarser over supraoccipital process; **dorsomedian head groove bordered posteriorly by slightly raised frontals and forming a "V"**; supraoccipital process a moderately narrow triangle with straight or convex sides. **Snout rounded or slightly truncate. Mouth subterminal. Fine teeth arranged into 3 patches on each side of palate, generally forming a large triangle, 1 vomerine (inner) and 2 autogenous (outer) patches; patches may coalesce in larger fish, the vomerine patches fused together across palate midline.** Total gill rakers on first gill arch 11 to 16; **usually no rakers on hind aspect of first 2 gill arches. Anal-fin rays 17 to 21; caudal-fin lobes slender and tapered. Adipose fin short-based and situated posteriorly.** Total number of vertebrae 53 to 58 (46 to 52 free). Heart-shaped swimbladder with scalloped sides. **Colour:** body reddish or bluish brown, with bronze iridescence over back and sides; adipose fin dark brown.



upper tooth patches

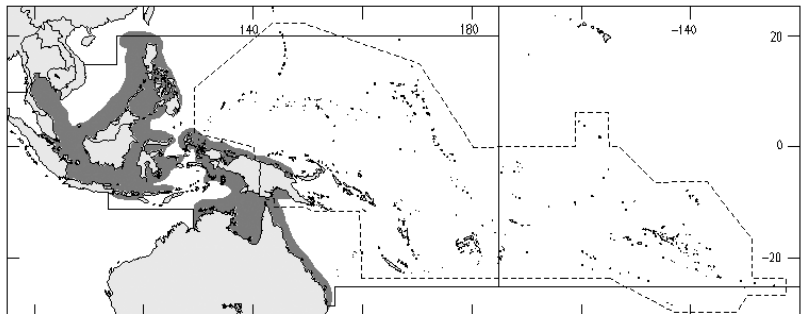


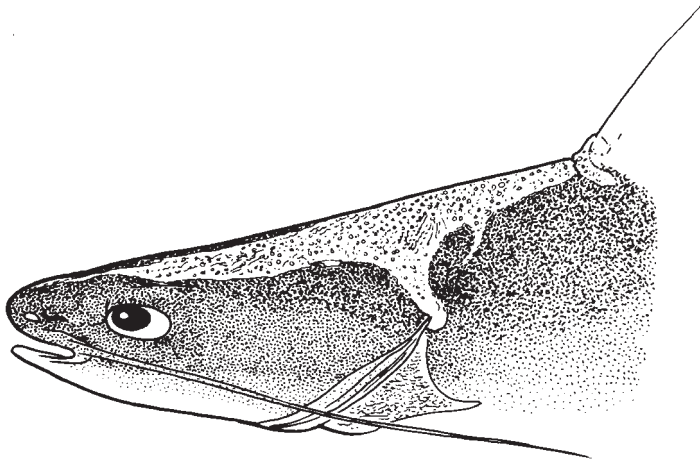
dorsal view of head

Size: Maximum standard length 62 cm.

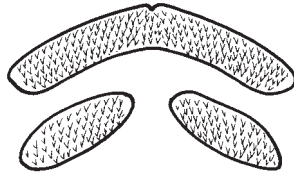
Habitat, biology, and fisheries: Coastal waters from estuaries onto the outer continental shelf. Diet mainly opportunistic and carnivorous, including sea urchins, crustaceans, fish, prawns, loose scales, and detritus.

Distribution: Northwestern Indian Ocean through India and neighbouring coastal states, Thailand, Viet Nam, Malaysia, Indonesia, Philippines, South China Sea, northern and southern coasts of New Guinea, and northern Australia from Shark Bay to southern Queensland.

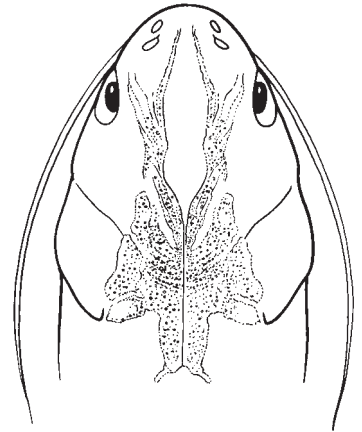


Arius bleekeri Popta, 1900**Frequent synonyms / misidentifications:** None / None.**FAO names:** En - Bleeker's catfish.

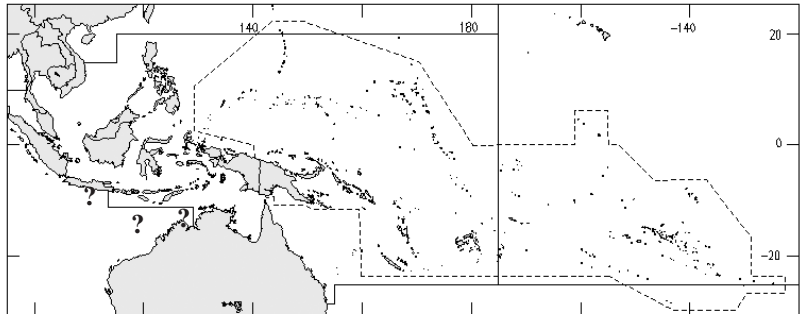
Diagnostic characters: Head shield striated anteriorly, very granular posteriorly; **dorsomedian head groove** shallow and broad, thence **teardrop-shaped, tapering to a point at base of supraoccipital process**; process finely granulated, **keel high**. Eye 5 to 5.1 times in head length. Snout rounded. Mouth very curved, lips thin; **mouth gape 45 to 49% of head length**. **Palatal teeth in a single ovate to rectangular patch on each side of palate**, long axes of patches parallel to curve of mouth; palatal teeth conical, sharp-tipped, and fixed. **Maxillary barbels 38 to 43% of standard length**. Total gill rakers on first gill arch 15 to 16; **no rakers on hind aspect of first 2 gill arches**. Fin spines moderately thickened and serrated on hind borders; **dorsal-fin spine equal to or 4/5 of head length**, pectoral-fin almost as long; **anal-fin rays 22 to 25**. Lateral line turns upward at tail base. **Colour:** body coloration in life unknown.



upper tooth patches



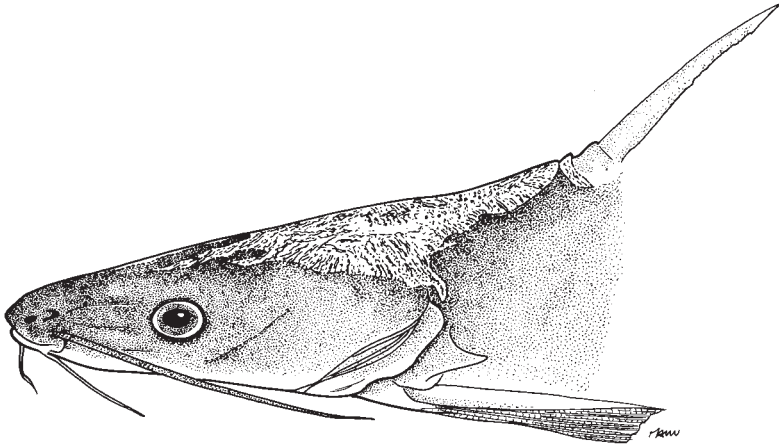
dorsal view of head

Size: Maximum (recorded) standard length 17 cm.**Habitat, biology, and fisheries:** Coastal waters and estuaries. Diet unknown.**Distribution:** Possibly Indonesia; the type locality of this distinct species is unknown.

“*Arius*” *crossocheilus* Bleeker, 1846

Frequent synonyms / misidentifications: *Arius crossocheilus* Bleeker, 1846; *A. tonggol* Bleeker, 1846 / None.

FAO names: En - Roughback sea catfish; Fr - Mâchoiron émeri; Sp - Bagre lija.

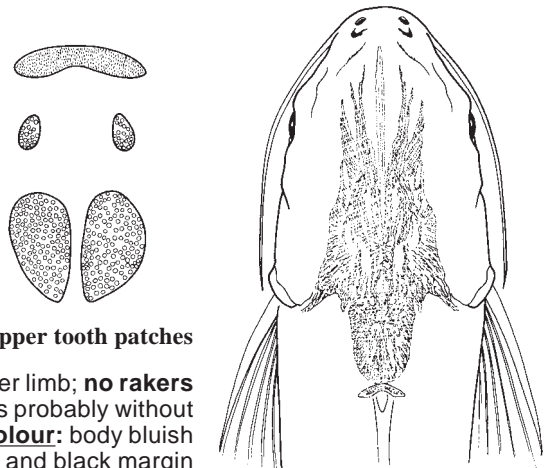


Diagnostic characters: Head length 30 to 31% of standard length. Exposed head shield rugose to granular, striate over supraoccipital process; sides and apex of supraoccipital process convex, and process more oblong than triangular. Snout conical. Mouth width 30 to 34% (mean 32%) of head length. Granular teeth in 2 patches on each side of palate, longitudinally arranged, anterior patches oval; posterior patches broadly oval or pear-shaped, their long axes running obliquely along palate so that patches tend to converge distally; palatal teeth low, rounded, and globular, some bluntly conical, much fewer teeth in anterior patch than in posterior patch; individual teeth may be lost. Total gill rakers on first gill arch 9 to 12, of which 6 to 9 on lower limb; no rakers on hind aspect of first 2 gill arches. Dorsal-fin spines probably without internal transverse partitions; anal-fin rays 18 to 20. **Colour:** body bluish grey above, white below; black patch on adipose fin and black margin to dorsal fin; pectoral and pelvic fins also black or dark.

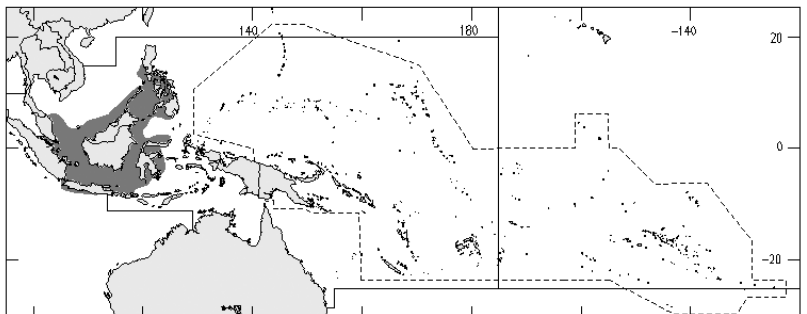
Size: Maximum total length 38 cm.

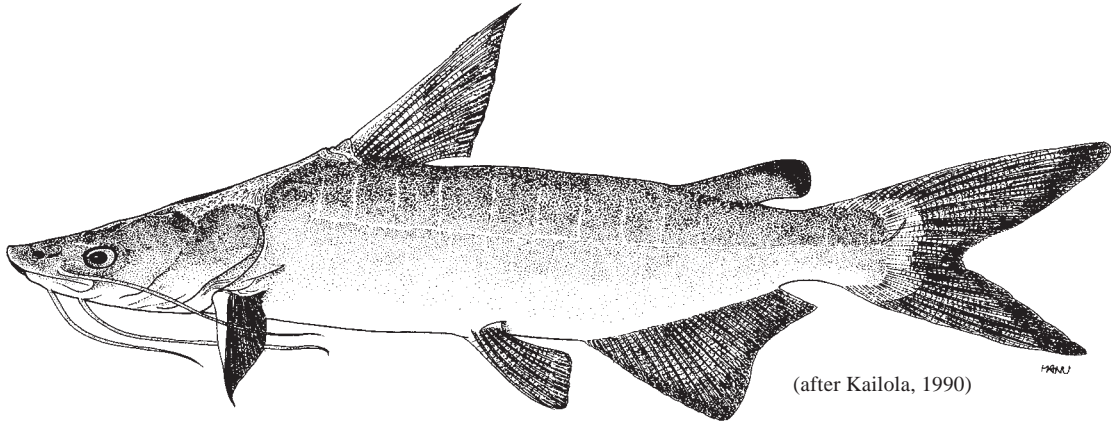
Habitat, biology, and fisheries: Coastal waters estuaries. Diet unknown.

Distribution: From the east coast of India through eastern neighbouring coastal states, Singapore, Indonesia (Sumatra, Java, Celebes), Malaya, and the Philippines.



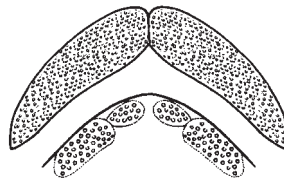
dorsal view of head



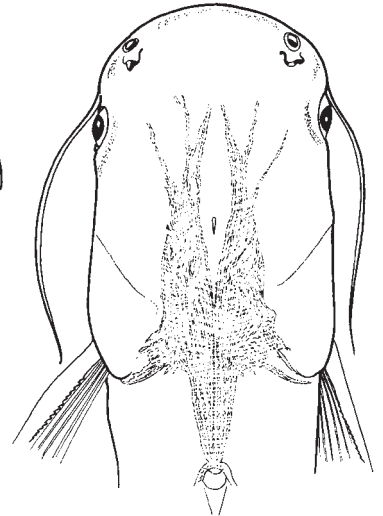
Arius (Cochlefelis) danielsi* Regan, 1908*Frequent synonyms / misidentifications:** None / None.**FAO names:** En - Daniels' catfish.

(after Kailola, 1990)

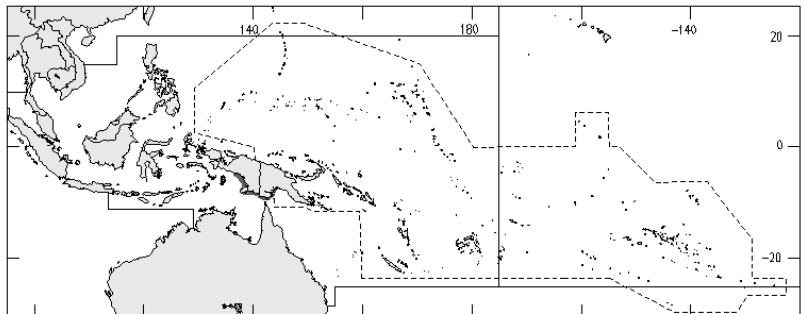
Diagnostic characters: Head depressed; eye lateral. **Mouth very wide, 44 to 59% of head length; snout spatulate with tooth band on jaws (premaxillae) largely exposed;** lips narrow, width of upper lip 1/4 to 1/3 width of eye diameter. **Jaw teeth numerous, in broad bands; jaw and palate teeth conical, tips flattened or spatulate; 4 patches of teeth aligned across front of palate. Barbels long, maxillary barbels reaching to below dorsal fin, 1/4 to 2/5 of standard length.** Total gill rakers on first gill arch 18 to 24; **no rakers on hind aspect of first 2 gill arches.** Anal-fin rays 24 to 27. Adipose-fin base equal to or 2/3 of dorsal-fin base. **Colour:** body bronze or brown above, lilac on midsides, white below; fins dark grey, brown, or blackish on margins; dorsal aspect of pectoral fin dark brown.

Size: Maximum fork length 55 cm.**Habitat, biology, and fisheries:** In river deltas and mangrove habitats, rarely in fresh water. Diet consists of prawns and other crustaceans.**Distribution:** Southern New Guinea.

upper tooth patches



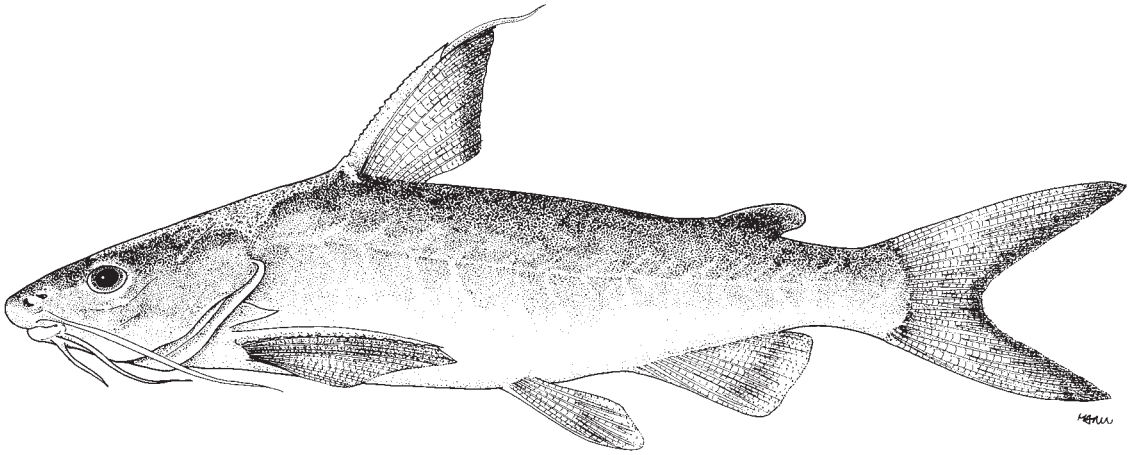
dorsal view of head



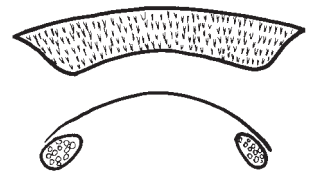
Arius dispar Herre, 1926

Frequent synonyms / misidentifications: None / None.

FAO names: En - Fleshysnout catfish.



Diagnostic characters: Head shield granular, especially supraoccipital process; process with slightly convex sides. Eye 5.5 to 7.3 times in head length. **Snout prominent, fleshy, and broadly rounded**, 2.4 to 2.8 times in head length. Mouth subterminal; lips thick; **mouth gape 34 to 39% of head length**. **Palatal teeth in 2 small ovate-triangular or pear-shaped, widely-separated patches, 1 on each side of palate, long axes of patches converging anteriorly**; palatal teeth conical, some granular, tips blunt or pointed. **Barbels flattened**. Total gill rakers on first gill arch 16 to 19; **rakers present on hind aspect of all gill arches**. Dorsal-fin spine $1/2$ to $3/4$ of head length; **pectoral-fin spine slightly longer, flattened, serrated on hind border**; **short filament to dorsal-fin spine tip**; anal-fin rays 17 to 19. **Colour:** body bluish charcoal above, white below; sides and back with metallic sheen; dorsal and caudal fins with dark margin; upper part of pectoral fin brown; adipose fin blackish brown basally; maxillary barbels dark.

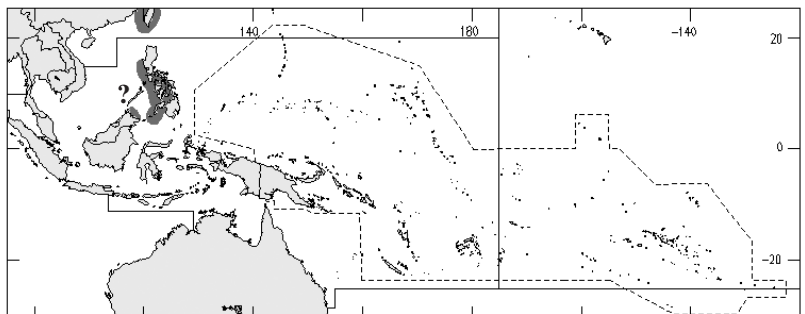


upper tooth patches

Size: Maximum standard length 34 cm.

Habitat, biology, and fisheries: Turbid inshore waters, estuaries, embayments, and brackish water lagoons. Diet unknown.

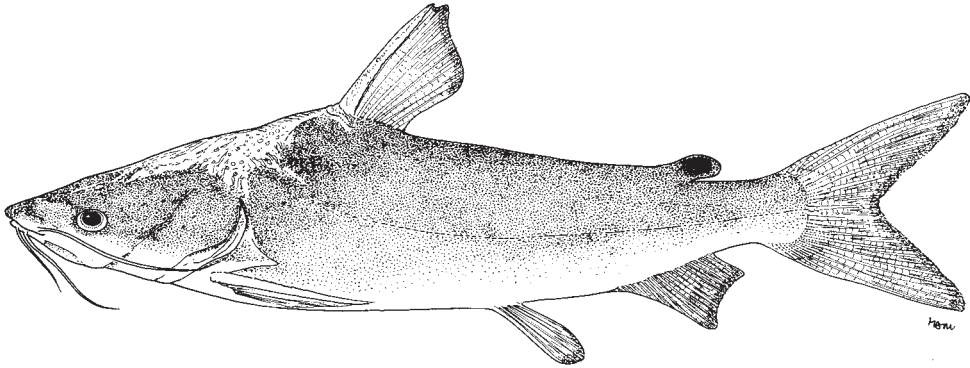
Distribution: Philippines, Taiwan Province of China, and possibly northern Borneo.



“*Arius*” *dussumieri* Valenciennes in Cuvier and Valenciennes, 1840

Frequent synonyms / misidentifications: *Arius goniaspis* Bleeker, 1858 (probable); *A. kirkii* Günther, 1864 / None.

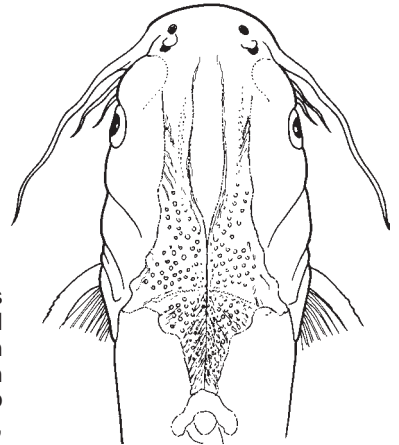
FAO names: **En** - Blacktip sea catfish; **Fr** - Mâchoiron pointes noires; **Sp** - Bagre puntas negras.



Diagnostic characters: Head length 22 to 28% (mean 26%) of standard length. Head shield rugose, slightly granular posteriorly; dorsomedian head groove shallow and narrow, deeper and distinct before supraoccipital process; **process triangular, straight sided, keel strong and sharp**; apex of process truncate or emarginate. **Lateral ethmoid (before eye) prominent in larger fish.** Mouth terminal, its width 36 to 44% of head length. Granular teeth in 2 patches on each side of palate, longitudinally arranged, anterior patch ovate and smaller; **posterior patch elongate and elliptical, long axes parallel or diverging distally**; **palatal teeth conical, stout or peg-like**, their tips blunt or sharp; always present in anterior patch, although individual teeth may be lost from all patches. **Total gill rakers on first gill arch 14 to 16**, of which 8 on lower limb; **no rakers on hind aspect of first 2 gill arches.** Dorsal-fin spines probably with internal transverse partitions; anal-fin rays 14 to 18. **Colour:** body bluish green on back, silvery on sides and below, sometimes stippled brown; fins yellowish to dusky, adipose fin with a black patch, other fins with blackish margins.



upper tooth patches



dorsal view of head

Size: Maximum standard length 62 cm.

Habitat, biology, and fisheries: Coastal waters and estuaries. Diet unknown.

Distribution: From Mozambique and Madagascar to Sri Lanka, the east coast of India, Bangladesh, Myanmar to Sumatra, probably including the Thai-Malay Peninsula.

Remarks: One of the types of *goniaspis*, which is 7.3 cm standard length, was examined for the present study. Although the writer has not examined the type of *dussumieri*, she presently cannot list definable characters to distinguish *goniaspis* from descriptions of *dussumieri*, given the expected differences with growth. The distribution of the nominal forms also supports the proposed synonymy. *Arius goniaspis* of Herre (1926) from the Philippines is almost certainly not this species. It is probably referable to *Arius leptotacanthus*.

