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REVIEW OF SOUTH ASIAN SISORID CATFISH GENERA  
*GAGATA* AND *NANGRA*, WITH DESCRIPTIONS OF A NEW  
GENUS AND FIVE NEW SPECIES

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The sisorid catfish genera *Gagata* and *Nangra* are endemic to southern Asia. The greatest concentration of species of these genera occurs in the Ganges basin, including four species of *Gagata*, all named previously, and four of *Nangra*, three of which are newly described here. *Gagata gagata* (Hamilton), *G. sexualis* (Tilak), *G. youssoufi* (Ataur Rahman), *Nangra bucculenta* n. sp., *N. carcharhinoides* n. sp., and *N. ornata* n. sp. are known only from the Ganges basin, while *Gagata cenia* (Hamilton) and *Nangra nangra* (Hamilton) also occur in the Indus basin, along with the endemic *Nangra robusta* Mizra and Awan. *Gagata itchkeea* (Sykes) is known only from peninsular India. Two species of *Gagata* from Myanmar, previously identified as Gangetic species are described as *G. melanopterus*, n. sp., from the Irrawaddy, Rangoon, Sittang, and lower Salween basins, and *G. gasawynh*, n. sp., from the Irrawaddy, Salween and Tenasserim basins. The Gangetic species previously reported as *Gagata* (or *Nangra*) *viridescens* (Hamilton) does not belong in either of these genera and is placed in a new genus, *Gangra*. Once this monotypic genus is recognized, *Nangra* and *Gagata* are readily diagnosed as natural groups of the Nangrina. *Nangra punctata* Day, 1877, is a junior synonym of *Gangra viridescens*. A neotype is designated for *Nangra nangra* to stabilize the name according to current usage.

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Asian catfishes of the family Sisoridae have undergone an impressive radiation and include some of the most highly modified catfishes found in tropical Asia. Even relatively generalized sisorids have highly specialized osteological features. With the notable exception of Mahajan's (1963–1967) excellent series of papers on *Sisor rabdophorus* Hamilton, 1822, and Tilak's (1963) comparative study, relatively little work has been done on sisorid osteology until quite recently. Consequently, many sisorid genera are poorly delimited and difficult to identify. The South Asian genera *Gagata* Bleeker, 1858, and *Nangra*

Day, 1877, have been associated in ichthyological works since 1911, when they appeared as the first two genera in a dichotomous key to sisorid genera (Regan 1911). They are closely related, as confirmed by de Pinna (1996), despite pronounced differences in overall appearance. Herein, we present revised diagnoses of *Gagata* and *Nangra*, review the included species and describe five new species. We propose a new generic name, *Gangra*, for *Pimelodus viridescens* Hamilton, 1822. Contrary to previous studies, that species does not appear to be

more closely related to species of either *Gagata* or *Nangra*.

*Gagata*, *Nangra*, and *Gangra* share a number of derived characters for sisorids that indicate the formation of a natural group. De Pinna (1996) uncovered six characters that were diagnostic of a group consisting only of species of these genera. At least one species of each of the three genera also have a nearly complete bony encapsulation of the swim bladder by the parapophyses of the 4th and 5th vertebral centra. Anterior and posterior medial cranial fontanels are present in all species of the three genera, but the posterior fontanel is greatly reduced in *Gangra viridescens* and *Gagata itchkeea* (Sykes, 1839). *Gagata* and *Nangra* (but not *Gagata itchkeea*) have paired cranial fontanels. In addition, these three genera share a number of characteristics that are summarized here. The dorsal fin usually has six soft rays (up to nine in some *Nangra*) and the dorsal-fin spine is not serrated. The pelvic fin has one unbranched and five branched rays. The caudal fin is more or less deeply forked, and has 17 principal rays.

This study resulted from our independent fieldwork and research on freshwater fishes of South and Southeast Asia. We each obtained specimens of *Gagata* during fieldwork in Myanmar and initially identified them as *G. gagata* (Hamilton, 1822) and *G. cenia* (Hamilton, 1822). Comparison of Gangetic material of *G. gagata* and *G. cenia* with our specimens from Myanmar quickly revealed that the specimens from Myanmar represented undescribed species. The genus *Nangra* was also well represented in recent collections made by the first author in India and Bangladesh, including *Nangra nangra* (Hamilton, 1822) and two new species, bringing the total number of *Nangra* species to five (three endemic to the Ganges drainage, one to the Indus, and *Nangra nangra* reported from both). Also included in samples from India and Bangladesh were numerous specimens of a species identified by various authors as *Gagata* (or *Nangra*) *viridescens*, treated here as the sole representative of our new genus *Gangra*.

#### MATERIALS AND METHODS

Materials examined are deposited in the following institutions: AMS, Australian Museum, Sydney; AMNH, American Museum of Natural

History, New York; BMNH, The Natural History Museum, London; CAS and CAS(SU), California Academy of Sciences, San Francisco; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; NRM, Swedish Natural History Museum, Stockholm; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden; SRS/ZSI, Southern Regional Station of the Zoological Survey of India, Madras; UMMZ, University of Michigan Museum of Zoology, Ann Arbor; and USNM, National Museum of Natural History, Smithsonian Institution, Washington.

Specimen measurements are given as standard length. Specimens were prepared for skeletal examination following Taylor and Van Dyke (1985). Most observations of teeth and gill rakers were made from cleared and stained specimens.

Gill raker counts include all elements on the outer edge of the first gill arch that have a bony core. Counts are given as a range for upper limb, separated by a plus (+) sign from those of the lower limb. Vertebral counts include four elements for the Weberian complex (the fifth centrum is sutured to the complex centrum, but recognizable) and the hypural complex counted as a single element. The posterior-most abdominal vertebra is defined here as the last vertebra with its hemal spine lying entirely anterior to the anterior-most pterygiophore of the anal fin. All vertebrae posterior to this are referred to as postabdominal, following Roberts (1983). We begin a count just after the Weberian apparatus, either with vertebra 5 (identified by its greatly enlarged parapophysis) or vertebra 6 (identified as the first rib-bearing vertebra).

Species distributions are plotted on Lambert azimuthal equal area projections of South and Southeast Asia. Country boundaries are represented by dotted lines; rivers by solid lines. Rivers of Southeast Asia have been omitted. Plotted distributions represent specimens actually examined, along with unconfirmed literature reports for which the stated locality was sufficiently precise to place on the map.

The extensive synonymies listed in Day (1877), Hora and Law (1941) and Misra (1976) are not repeated here.

KEY TO GENERA OF THE *NANGRINA*  
DE PINNA, 1996

- 1a. Pectoral girdle with rugose coracoid process covered with thin skin; outer and inner mental barbels widely separated, origin of inner mental barbels anterior to origin of outer mental barbels; lateral cranial fontanel absent; live specimens with viridescent or silvery supraopercular mark . . . . .  
. . . . . *Gangra* new genus
- 1b. Pectoral girdle with coracoid process not visible externally; outer and inner mental barbels close together, their origins in a transverse row; lateral cranial fontanel generally present (absent in *G. itchkeea*); supraopercular mark absent. . . . . 2
- 2a. Body terete; head depressed, eye dorso-lateral; snout elongate, depressed; maxillary barbel extends at least to pelvic-fin base; palatal teeth present; premaxilla expanded, firmly attached to correspondingly-expanded ventral plate of mesethmoid; caudal-fin base usually with a vertically elongate elliptical mark *Nangra* Day, 1877
- 2b. Body compressed; head compressed, eye lateral; snout compressed, short; maxillary barbel extending only to level of pectoral-fin base; palatal teeth absent; mesethmoid strongly projecting anteroventrally, without lateral processes or expanded ventral plate; caudal-fin base without elliptical mark . . . . .  
. . . . . *Gagata* Bleeker, 1858

SYSTEMATIC ACCOUNTS

***Gagata* Bleeker, 1858**

*Gagata* Bleeker, 1858:204, 206 (Type species: *Pimelodus gagata* Buch. [= Hamilton, 1822], by absolute tautonymy). Gender masculine.

*Callomystax* Günther, 1864:218 (Type species: *Pimelodus gagata* Hamilton, 1822; unneeded replacement name for *Gagata* Bleeker, 1858). Gender masculine.

DIAGNOSIS. — Summaries of counts of vertebrae, fin rays, and gill rakers are presented in Tables 1–3. Head and body compressed; eyes large, lateral; mouth inferior, relatively small and narrow; mesethmoid bone highly modified, strongly curved downward in front of snout, with laterally compressed, ventromedian projection to

which ascending process of premaxilla attached only by soft tissue; premaxilla with dorsomedial ascending process; jaw teeth finely conical, in few rows, absent from upper jaw in some species; palate toothless; branchiostegal membrane broadly joined to isthmus; dorsal fin with 6 branched rays; caudal fin with 17 principal rays; pectoral girdle with coracoid process covered with thick skin and not visible externally.

COMMENTS. — Although the species of *Gagata* are similar in overall appearance and share a number of derived characteristics that indicate that they form a natural group, they exhibit great variation in the structure of the bony capsules of the swim bladder. Tilak (1963) described and illustrated the complex, somewhat incomplete, capsule of *Gagata gagata*. In that species, the swim bladder has a large dorsal bony roof and an incompletely ossified floor with finger-like processes, but is otherwise uncovered by bone. In *Gagata itchkeea* bony investment of the swim bladder consists only of a large dome-like roof over the dorsomedial half of the swim bladder. The other species for which we have examined cleared and stained specimens have complete bony capsules. That is, the lateral wing of the swim bladder is entirely enclosed in a bony tube except at its open distal end which abuts the membranous tympanum. De Pinna (1996, fig. 24) provided an excellent illustration of the fully encapsulated swim bladder of *Gagata gasawiyuh* n. sp., under the name *G. gagata*. In the two species which do not exhibit fully encapsulated swim bladders, *G. gagata* and *G. itchkeea*, the swim bladder and the tympanum are proportionally much larger than in the other species of *Gagata*.

The seven species of *Gagata* appear to represent an extraordinary instance of progressive reduction of jaw teeth and gill rakers, possibly related to suctorial, fine particle detritivory. Maximum development of teeth and rakers occurs in *G. gagata* and *G. melanopterus* n. sp. In these two species, the upper and lower jaws have fine, close-set teeth for their full extent and relatively numerous, long, gill rakers on all gill arches. The first gill arch has rakers on the leading and trailing edge in *G. gagata* but only on the leading edge only in *G. melanopterus*; the second through fourth arches have rakers on leading and trailing edges; and the fifth arch has rakers on the





leading edge. Except for the somewhat larger rakers on the leading edge of the first gill arch, rakers on the remaining arches are nearly of the same size and number. The least development of jaw teeth and gill rakers occurs in *G. youssoufi*. In this species the jaws are edentulous, except for a few tiny teeth near the symphysis of the lower jaw. The leading edge of the first gill arch has a few tiny gill rakers, but its trailing edge and the remaining gill arches are entirely without rakers. This reduction in jaw teeth and gill rakers is not accompanied by a corresponding decrease in pharyngeal teeth. Teeth in the upper and lower pharyngeal tooth plates are well developed throughout the genus. The condition of the jaw teeth and gill rakers is intermediate in *G. cenia* and *G. gasawiyuh* n. sp. These species have no upper jaw teeth, reduced lower jaw dentition, and fewer gill rakers than in *G. gagata* and *G. melanopterus*.

*Gagata youssoufi* (and two specimens identified as *G. sexualis* by Tilak 1970) exhibit another interesting modification of the gill arches. A single row of 8 to 10 slender teeth is present on the fourth gill arch. These teeth, which are restricted to the middle of the lower limb of the fourth gill arch, oppose the upper pharyngeal tooth plate and appear to be associated directly with the ceratobranchial. De Pinna (1996) reported the presence of tooth plates on the fourth ceratobranchial of *Bagarius*, another genus of sisorid catfish. In the specimens of *Bagarius* reported on by de Pinna, as well as those examined by us (CAS 96580), the dentition of the fourth ceratobranchial is different from that of *Gagata youssoufi*. The teeth in *Bagarius* are located in a cluster, in an elevated part of the bone that appears to be a tooth plate that is fused to the underlying ceratobranchial. In *Gagata youssoufi* the teeth appear to be ankylosed directly to the ceratobranchial element and the teeth form a single row.

NOTE ON GENDER. — The gender of *Gagata* was not indicated by Eschmeyer and Bailey (in Eschmeyer 1990:154), and has not been clearly established before now. *Gagata* is a Bengali name presumably of masculine gender. The first use of a Latin species name in connection with *Gagata* in which gender is unequivocal is that of Bleeker (1863). Bleeker proposed the name *Gagata typus* as a replacement for *Gagata gagata*

(Hamilton), a combination that he used when he first proposed *Gagata* as a generic name (Bleeker 1858). As with *Gagata gagata*, virtually all of the species names originally placed by Bleeker in *Gagata* were names Hamilton (1822) adopted from Bengali. Three species names placed in *Gagata* that were Latinized: *Gagata pusillus*, *G. anisurus* and *G. indicus*, were only tentatively included in the genus, and subsequently placed elsewhere. As with *Gagata typus*, these names are also masculine. We follow the precept that gender of names that are not of Greek or Latin origin is determined by a species name of unequivocal gender (ICZN 1985, art. 30d), and treat *Gagata* as masculine following Bleeker (1863). However, *Sundagagata* Boeseman, 1966, is treated as feminine.

KEY TO SPECIES OF *GAGATA*

- 1a. Dorsum of body with 4 or 5 dark saddles; caudal fin with dark markings . . . . . 4
- 1b. Body without dark saddles, although faint saddles sometime present; caudal fin immaculate, or with fine black margin. . . . . 2
- 2a. Pectoral, pelvic, and anal fins not black distally; dorsal fin with filamentous extension . . . . . *Gagata dolichonema* He, 1996.
- 2b. Pectoral, pelvic, and anal fins black distally; dorsal fin without filamentous extension. . . 3
- 3a. Dorsal fin relatively large, extending at least to adipose-fin origin when depressed; pelvic fin reaches anal-fin origin . . . . . *G. gagata* (Hamilton, 1822)
- 3b. Dorsal fin relatively small, falling far short of adipose fin when depressed; pelvic fin does not reach anal-fin origin. . . . . *G. melanopterus*, new species
- 4a. Caudal fin with single dark submarginal lunulate mark; head and body with four saddles . . . . . *G. gasawiyuh*, new species
- 4b. Caudal fin with square or round spot on each lobe; head and body with five saddles . . . . 5
- 5a. Snout tip acutely pointed in lateral profile, with distinct notch anteriorly . . . . . *G. cenia* (Hamilton, 1822)
- 5b. Snout tip broadly rounded in lateral profile, without notch . . . . . 6
- 6a. Dorsal fin with filamentous extension in males. . . . . *G. sexualis* Tilak, 1970
- 6b. Dorsal fin without filamentous extension . . 7

- 7a. Anal fin with 8 to 10 branched rays; body depth equal to head length. . . . .  
 . . . . . *G. itchkeea* (Sykes, 1839)
- 7b. Anal fin with 11 to 14 branched rays; body depth much less than head length. . . . .  
 . . . . . *G. youssoufi* Ataur Rahman, 1976

***Gagata cenia*** (Hamilton, 1822)

(Figs. 1, 2)

*Pimelodus cenia* Hamilton 1822:174, 376, pl. 31, fig. 57 (type locality: rivers in the northern part of Bengal).

*Gagata cenia*, Day 1877:492 (partim; specimens illustrated by Day as *G. cenia* are here reidentified as *G. gagata* and *G. gasawyyuh*). Hora and Law 1941:21, pl. 1, figs. 5, 6. Jayaram 1981:240 (partim, excluding Burma), Ataur Rahman 1990:220, fig. 130 (Bangladesh).

*Nangra viridescens*, Day 1877:494, pl. 115, fig. 7.

MATERIAL EXAMINED. — 159 specimens, 26–80 mm. BANGLADESH. CAS 95540 (3, 41–48 mm), Tangail District, Gala Khal, 02-08-92 [sic]. CAS 95541 (4, 33–41 mm), Ganges basin, Sylhet district, Kushiara River at Saidpur, 16 May 1996, T. R. Roberts. CAS 95542 (20, 40–55 mm), Ganges basin, North Central Region, Tangail district, 1992, Bangladesh Govt.

INDIA. BMNH 1858.8.15:116–117 (2, 41–46 mm), Ganges, Waterhouse. BMNH 1870.7.12:4 (1, not measured), Orissa. F. Day. BMNH 1889.2.1:2613 (1, 33 mm), Calcutta, F. Day. BMNH 1889.2.1:2623 (1, 66 mm), Poonpore River, F. Day. BMNH 1889.2.1:2624–2625 (9, 39–43 mm), Sind, F. Day. BMNH 1889.2.1:2619–2622 (4, 56–80 mm), R. Jumna, F. Day. BMNH 1889.2.1:2616–2618 (3, 41–55 mm), Darjeeling, F. Day. BMNH 1889.2.1:2626–2631 (5, 42–49 mm), Orissa, F. Day. BMNH 1954.5.20:19–20 (2, 51–52 mm), Hooghly River (West Bengal) at Tribence Ghat, 8-11-53 [sic], A. K. Datta. CAS 54538 (1, 43 mm), Assam State, Tezpur, B. Prashad. CAS 95539 (78, 36–72 mm), Ganges River at Patna, April–May 1996, T. R. Roberts. CAS(SU) 34841 (1, 59 mm), Bengal State, Hugli [= Hooghly] River, 11 April 1937, A. Herre. MCZ 4258 (4of 9:48–51 mm), Uttar Pradesh, Allahabad, F. Day.

PAKISTAN. BMNH 1872.1.30:4 (10, 28–39 mm), Indus, Beavan. CAS 24248 (10, 26–35 mm), Sind, 325 miles north of Karachi (i.e., 5 miles north of Sukkur), 1 Nov. 1968, E. S. Herald and party.

DIAGNOSIS. — A small species of *Gagata* maturing at less than 70 mm and reaching to about 100 mm. Dorsum of body with dark saddles ex-

tending ventrally only to lateral line. Caudal fin with transverse black bar across peduncle and round or square black spot on middle of each lobe. Dorsal fin with black spot on distal part of anterior rays. Upper jaw toothless; lower jaw with few small conical teeth in pocket or depression near symphysis. Fourth ceratobranchial without teeth. Snout tip acutely pointed in lateral profile, tip separated from rest of snout by distinct notch.

COUNTS. — Dorsal fin with spinelet, spine and 6 (rarely 7) branched rays; pectoral fin with spine and 8 (rarely 9) rays; anal fin with 4 or 5 simple rays and 9 to 11 branched rays. Vertebral column with 18 to 20 abdominal and 16 to 18 post abdominal vertebrae, total 35 or 36. First gill arch with 5–7 tiny rakers, nearly indistinguishable from surrounding tissue.

DISTRIBUTION. — *Gagata cenia* is distributed widely in the Ganges basin, the Indus River system, and the Mahanadi River (Fig. 3). We have made a cursory examination of specimens from the Indus River, most of which are in poor condition, and we were unable to find any differences between them and the Gangetic specimens. Shrestha (1994) reports this species from Terai, Nepal. Therein, *G. cenia* is reported to reach 100 mm, which is substantially larger than any specimen examined by us.

COMMENTS. — There has been considerable confusion in identification of *G. cenia* (Fig. 2). This is due, in part, to the relative rarity of Hamilton's published monograph on Gangetic fishes (Hamilton 1822) and to the absence of type specimens for his species. But the real difficulties lie in the work of his successor Francis Day, whose interpretations of Hamilton were sometimes in error. As an example, Day (1877) published two figures of specimens he identified as *Gagata cenia*, one of which was said to be an adult and the other a juvenile. The adult is *Gagata gagata*, as previously pointed out by Hora and Law (1941). The juvenile appears to be based on a specimen of our new species *G. gasawyyuh* (identified by diagnostic color features including disposition of five saddle-marks on head and body and distinctive lunate mark on caudal fin). The specimen illustrated as the juvenile of *G. cenia* reportedly was collected in Delhi. We have not been able to examine any specimens of *G. cenia* from that locality, but the caudal-fin color pattern is unlike that of any specimen of *Gagata cenia*



FIGURE 1. *Gagata cenia*, 47 mm, CAS 95539; India, Ganges River at Patna.

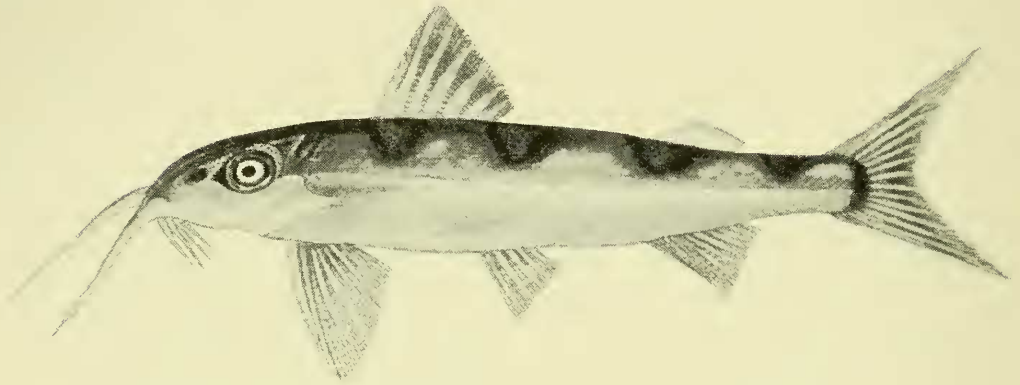


FIGURE 2. *Gagata cenia*, illustration from Hamilton (1822), plate 31, figure 57, originally 72 mm.

that we have examined. In fact, that pattern is characteristic of specimens of *Gagata gasawuyuh*, from Myanmar, and we believe that Day's specimen is most likely from there.

#### *Gagata dolichonema* He, 1996

*Gagata dolichonema* He 1996:380, fig. 1 (type locality: Daojieba [24°41'N, 99°10'E], Baoshan County, Yunnan Province, China).

MATERIAL EXAMINED. — None.

DIAGNOSIS (after He). — A species of *Gagata* with a median longitudinal groove that extends to end of occipital process; maxillary barbel longer than head; dorsal-fin spine produced into long filament; pectoral-fin spine without filamentous projection; eye diameter shorter than snout length; dorsal part of thoracic region of body with four black stripes; and isthmus without finger-like projections.

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8 branched rays; anal fin with 3 simple and 11 (10 mentioned in English summary) branched rays (from He, 1996; vertebral formula and gill rakers counts not stated).

DISTRIBUTION. — Known only from the type locality, which is in the upper reaches of the Nu (= Salween) River drainage (Fig. 3).

COMMENTS. — *Gagata dolichonema* is one of three species now recognized from the Salween River drainage. The two new species described in this paper (*G. gasawuyuh* and *G. melanopterus*) are found in lower parts of the Salween River and its tributaries (as part of much wider distributions for each of these species), whereas *G. dolichonema* is known only from much further up river. *Gagata gasawuyuh* is readily distinguished from this species by its distinctive color pattern, the absence of a filamentous extension of the dorsal spine, and in having an orbital diameter that is greater than the length of the snout. *Gagata melanopterus* lacks a filamentous



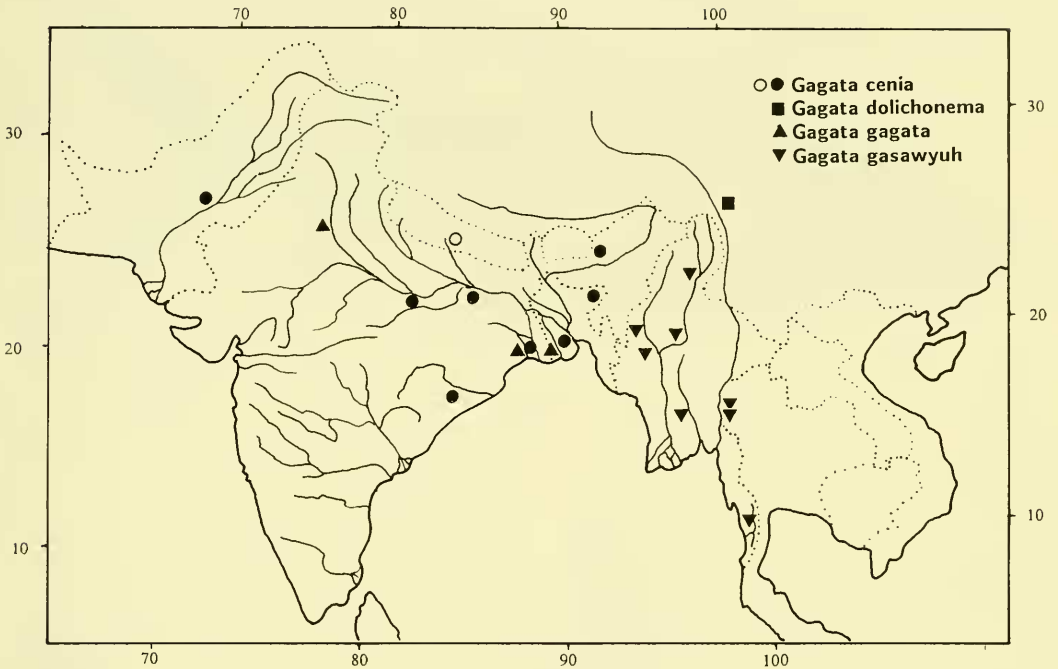


FIGURE 3. Distribution of *Gagata cenia*, *G. dolichonema*, *G. gagata*, and *G. gasawuyuh*. Open circles represent unverified literature records of *Gagata cenia*. Distribution of *Gagata dolichonema* is an approximation, based on stated type locality.

extension of the dorsal fin and has a distinctive color pattern that is not mentioned in the description of *G. dolichonema*. In addition to the above, both *G. gasawuyuh* and *G. melanopterus* typically have nine branched pectoral-fin rays, rather than the eight listed for *G. dolichonema*.

#### ***Gagata gagata* (Hamilton, 1822)** (Figs. 4, 5)

*Pimelodus gagata* Hamilton 1822:197, 379, pl. 39 fig. 65 (type locality: fresh water rivers and estuaries of Bengal).

*Gagata typus* Bleeker 1863:90 (replacement name for *Pimelodus gagata* Hamilton 1822).

*Gagata cenia*, Day 1877 (partim; pl. 115, fig. 4 of specimen from Delhi); Jayaram 1981, fig. 129 (after Day 1877).

*Gagata gagata*, Hora and Law 1941:15, pl. 1 figs. 1–2 (partim, Ganges and Brahmaputra rivers only); Tilak 1970:214 (key); Aatur Rahman 1990:218, fig. 218 (Bangladesh: Meghna River, near Chandpur).

MATERIAL EXAMINED. — 9 specimens, 40–97 mm. BANGLADESH. CAS 95543 (1, 40 mm, cleared and

stained), Ganges basin, Khulna markets, May 1996, T. R. Roberts.

INDIA. BMNH 1880.2.2:95 (1, 78 mm), Jamu, F. Day. BMNH 1889.2.1:2611–2612 (2, 90–97 mm), Calcutta, F. Day. BMNH 1858.8.15:113–115 (3, 85–97 mm), Ganges, Waterhouse. CAS 54541 (1, 95 mm), West Bengal State. Manirampur, Pulta Water Works. MCZ 36074 (1, 88 mm), West Bengal, Calcutta, F. Day.

DIAGNOSIS. — A large species of *Gagata*, achieving at least 100 mm. Head and body silvery overall, without pattern. Fins, except caudal fin, black distally, with clear basal portions; caudal fin entirely clear. Dorsal-spine tip extending well past adipose-fin origin when adpressed. Premaxilla with four rows of teeth.

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 7 to 9 (modally 9) rays; anal fin with 5 or 6 simple and 11 branched rays. Vertebral column with 18 or 19 abdominal and 19 or 20 postabdominal vertebrae, total 38 or 39. First gill arch with 10 to 13 long, slender rakers.

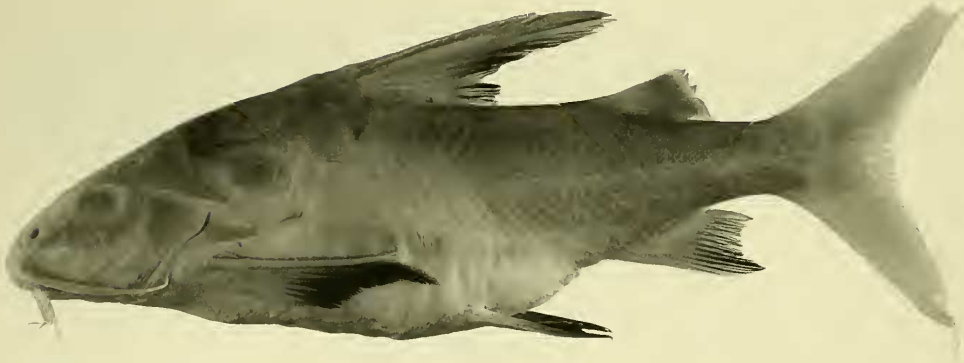


FIGURE 4. *Gagata gagata*, 97 mm, BMNH 1855.8.15:113; Ganges River.

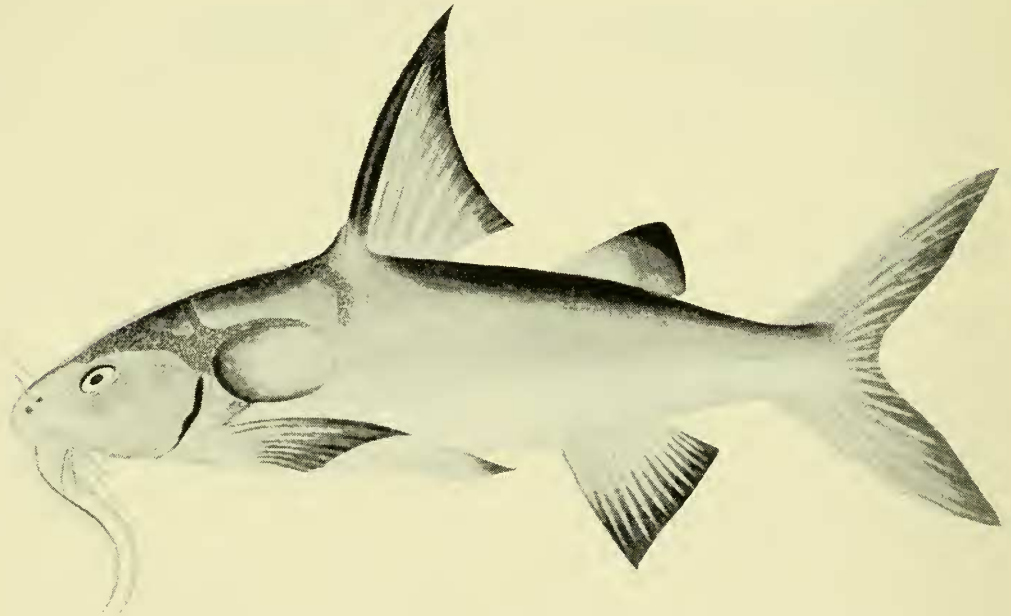


FIGURE 5. *Gagata gagata*, illustration from Hamilton (1822), plate 39, figure 65; originally 162 mm.

DISTRIBUTION. — *Gagata gagata* is known only from the Ganges basin of India and Bangladesh (Fig. 4).

COMMENTS. — Identification of the material reported here as *Gagata gagata* is based on the description and figure published by Hamilton (1822), reproduced here as Figure 5. Our specimens agree with the account and illustration of Hamilton, except on two points: 1) according to Hamilton, the species “grows to about a foot [= approx. 300 mm] in length, and is pretty com-

mon both in the fresh waters and estuaries of Bengal.” and 2) the illustration shows a second dorsal-fin spine that appears proportionally much stouter than that of any of our specimens. We suspect the species is no longer as common as it was in the early 1800s, which may explain why we have not seen specimens, or reports of specimens, much larger than 100 mm. Hora and Law (1941) examined a specimen from Allahabad that was 102 mm. They also reported on specimens up to 143 mm, but from an unknown

locality. Among the specimens they examined was at least one specimen of *Gagata melanopterus*, from Myanmar. Thus, the specimens without associated locality information might be either of the two species. The largest specimen known to us is one reported by Aatur Rahman (1990) of 193 mm from the Gangetic delta region. As for the much stouter dorsal-fin spine figured in Hamilton (1822), the spine may become disproportionately stout in large individuals or its stoutness might have been exaggerated by the illustrator. We have not been able to examine a specimen as large as that illustrated in Hamilton, so we cannot choose between these two explanations. There remains, of course, the possibility that the Gangetic specimens we identified as *G. gagata* are not conspecific with Hamilton's *G. gagata*.

Specimens from The Natural History Museum, London, registered under the number BMNH 1858.8.5:113–117, are listed as types of *Gagata gagata*. We see no reason to consider these specimens types, as Hamilton clearly indicated that he did not save any specimens (see Hora, 1929, for discussion). In addition, the specimens that are identified by us as *Gagata gagata* (BMNH 1858.8.5:113–115) were mixed together with two specimens of *Gagata cenia* (now BMNH 1858.8.5:116–117), another Hamilton species. It is unlikely that Hamilton would have lumped together these two readily distinguishable species. The designation of these specimens as types can be traced back at least as far as Günther (1864:218), although without explanation of why type status was conferred upon them.

*Gagata gagata* is most similar to *G. melanopterus*, n. sp., from Myanmar, in coloration and in having the highest gill raker counts among *Gagata* species. It differs from that species in the length of the dorsal fin: that of *G. gagata* extending posteriorly when depressed beyond adipose origin (vs. falling far short of adipose fin), and in having four rows of teeth on the premaxilla (vs. 2 rows in *G. melanopterus*). The structure of bony capsule of swim bladder differs between these two species (see discussion in diagnosis of *Gagata*). For further distinctions between *G. gagata* and *G. melanopterus*, see the account of the latter species.

The unusual coloration of *Gagata gagata* is nearly identical to that of *G. melanopterus*. All other species of *Gagata* have prominent dark

saddles on the dorsum of the body, and bands or spots on the caudal fin. Faint saddles have been observed in some specimens of *G. melanopterus*, but not in *G. gagata*.

### *Gagata gasawuyh* new species

(Figs. 6, 7)

? *Gagata cenia*, Day 1877, pl. 115, fig. 5 (specimen purportedly from Delhi).

*Gagata cenia*, Vinciguerra 1890:121 (partim; Rangoon, Mandalay, Bhamo); Smith 1945:394 (Thailand: Salween River, Ta Ta Fang)

*Gagata gagata*, de Pinna 1996:7 et seq., figs. 3, 15, 24, 27, 44, 45, 47 (anatomical discussion).

MATERIAL EXAMINED. — 107 specimens, 20–130 mm. Holotype: CAS 95544, 88 mm, MYANMAR, Tenasserim River mainstream upstream from Kita (or Htee-tah), gill-nets on steep sand bank, 8–9 March 1992, T. R. Roberts.

Paratypes: MYANMAR. *Irrawaddy basin*. AMNH 8358 (3, 77–97 mm), Chindwin River, April 1923, B. Brown. AMNH 13776 (1, 68 mm), Chindwin River, April 1923, B. Brown. CAS 88614 (3, 42–58 mm), Mandalay market, 21 April 1996, C. J. Ferraris, D. Catania and Myint Pe. CAS 88899 (4, 65–93 mm), Myitkyina market, 21 April 1996, C. J. Ferraris, D. Catania and Myint Pe. CAS 88906 (22, 20–54 mm), Nyaung-U market (near Bagan), 13 April 1996, C. J. Ferraris and D. Catania. NRM 26667 (3, 46–99 mm), Dhweli Kyaung River, February 1935, R. Malaise. CAS 95546 (16, 21–41 mm), Myit-tha River (Pinda River) at Pinda Village, Sagaing Division, 23°11'01"N, 94°05'32"E, 12 November 1996, C. J. Ferraris, Myint Pe and village fishermen. CAS 95547 (6, 53–73 mm), Mandalay Division, Nyaung-U market, 8 Nov. 1996, C. J. Ferraris and Myint Pe. CAS 95548 (6, 69–102 mm), Mandalay markets, 13–25 April 1993, T. R. Roberts. NRM 42002 (3, 75–130 mm), Myitkyina market, 4–8 November 1997, C. J. Ferraris. USNM 345150 (2, 76–77 mm), Mandalay, 1885, L. Fea. *Sittang basin*. USNM 345151 (5, 47–85 mm), Bago Division, Taungoo Market, 7 April 1996, C. J. Ferraris and D. Catania. *Tenasserim basin*. CAS 95545 (1, 99 mm), (taken with holotype) Tenasserim River mainstream upstream from Kita or Htee-tah, gill-nets on steep sand bank, 8–9 March 1992, T. R. Roberts. CAS 95549 (2, 95–108 mm), Tenasserim River and tributaries between Kita (or Htee-tah) and Baowasung, March 1992, T. R. Roberts. CAS 95550 (4, 55–64 mm), Tenasserim River mainstream, 3 hrs upstream from Hteetah (1st fishing village), seine and gillnet in sandbank, 7–8 March 1992, T. R. Roberts.

THAILAND. *Salween basin*. BMNH 1992.3.10:1 (1, 89 mm). Salween mainstream, 1988, T. R. Roberts. CAS 95551 (6, 58–85 mm), sandy beach and sheltered

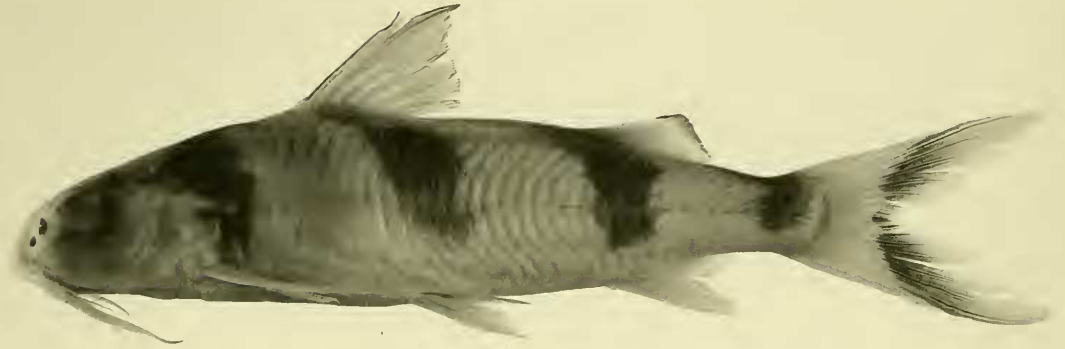


FIGURE 6. *Gagata gasawuyuh* new species, holotype, 88 mm, CAS 95544; Myanmar, Tenasserim River above Keta (or Hee-tah).

bay with shallow muddy backwater on Salween mainstream, about midway between Mae Sam Lap and Paleh, 20 March 1989, T. R. Roberts. CAS 95552 (12, 65–98 mm), Salween mainstream, 20 km upriver from Mae Sam Leap, 21 April 1989, T. R. Roberts. CAS 95553 (1, 73 mm), Salween mainstream, about 5 km upstream from mouth of Menam Moei, 18–19 March 1989, T. R. Roberts. CAS 95554 (1, 58 mm), sheltered backwater of Salween mainstream 20 km upstream from Mae Sam Leap, 21 April 1989, T. R. Roberts. CAS 95555 (2, 75–85 mm) and UMMZ 233234 (2, 81–87 mm), rocky side channel of Salween mainstream about 40 km upriver from Mae Sam Leap, 20 April 1989, T. R. Roberts.

**DIAGNOSIS.** — A large species (exceeding 100 mm) distinguished from all other species of *Gagata* by two color features: four distinct saddles on dorsum of body, usually extending ventrally on the sides of the body well below the lateral line, and dark marks on caudal fin lobes forming a single, continuous lunate mark in the middle of the caudal fin.

**COUNTS.** — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 9 (rarely 8 or 10) rays; anal fin with 4 to 6 simple rays and 10 or 11 (rarely 9 or 12) branched rays. Vertebral column with 20 to 22 abdominal and 17 or 18 postabdominal vertebrae, total 38 or 39. First gill arch with 3 + 7–9 long slender rakers.

**DESCRIPTION.** — Body elongate, slender; compressed in cross section at abdomen, somewhat more compressed posteriorly. Skin smooth, without tubercles or ridges. Vent located just anterior to tip of adpressed pelvic fin. Lateral line complete, terminating at hypural-plate margin; canal running along lateral myoseptum, with

pores emanating from short, ventrally directed oblique branches.

Dorsal-fin origin above posterior half of adpressed pectoral-fin spine, its posterior insertion at vertical through pelvic-fin origin; dorsal fin with short spinelet preceding first fin ray; first ray a stout, sharply pointed, smooth spine; spine laterally compressed, its anterior margin a sharp keel; fin margin nearly straight, each branched ray slightly shorter than preceding ray; last fin ray without membranous attachment to body; tip of adpressed dorsal fin not reaching adipose-fin origin.

Interval between dorsal fin and adipose fin  $1\frac{1}{2}$ –2 times length of dorsal-fin base; adipose-fin base approximately equal to that of anal fin; its origin slightly in advance of anal-fin origin.

Caudal fin deeply forked, lobes pointed, symmetrical; outer principal rays nearly three times length of middle rays; procurrent rays of upper and lower lobes symmetrical, not extending far anteriorly.

Anal-fin base short, approximately equal to that of adipose-fin base; first branched ray longest, fin margin slightly concave, last ray without membranous attachment to body.

Pelvic-fin origin at vertical through posterior insertion of dorsal fin; fin margin obtusely pointed, first branched ray longest; adpressed fin reaches to vertical through adipose-fin origin, but not to anal-fin origin.

Pectoral fin with a stout spine, with sharply-pointed tip; anterior margin smooth; posterior margin feebly serrated; serrae restricted to middle of spine, their length less than interval between successive serrae; fin margin concave



FIGURE 7. *Gagata gasawiyuh* new species, Tenasserim River (specimen not retained).

anteriorly, then convex; first pectoral-fin ray markedly longer than remaining rays; adpressed spine extending past vertical through middle of dorsal fin, but not reaching its posterior insertion.

Head compressed; snout bluntly rounded in profile, nearly flat ventrally; dorsal profile nearly straight from dorsal spine base to anterior margin of orbit; broadly convex anterior of eye; dorsal surface of head with broad medial groove, extending from level of nasal barbel to base of occipital process; eye lateral, above middle of head; dorsal margin of orbit contributing to dorsal profile of head; orbital diameter approximately  $1\frac{1}{2}$  times interorbital width, and similarly larger than snout length; eye covered with thin skin, no free orbital margin.

Mouth inferior, near snout tip; oral opening transverse, entirely ventral to nares; upper lip with single series of tiny finger-like lobes; lower lip free lateral to inner mental-barbel origin, lip bilobed, lateral lobe longer; upper jaw edentulous, oral surface covered with fine parallel rows of plicae; lower jaw with single row of 2 to 5 widely-separated conical teeth; teeth not discernible through plicae covering oral surface, except in skeletal preparations; palate edentulous.

Barbels in four pairs: nasal barbel tiny, extending from fleshy flap that divides anterior and posterior nares and not reaching to anterior margin of orbit; maxillary barbel connected to snout by very narrow sheet of membranous tissue that attaches to head at corner of mouth; membrane nearly indistinct on barbel; maxillary barbel reaching pectoral fin origin, or slightly beyond; mental barbels originate in transverse row, just posterior to lower jaw; for most of their length, mental barbels rest in shallow groove in isthmus skin; outer mental barbel extends to opercular

margin, ventral to pectoral spine; inner mental barbel shorter. In addition, one pair of tiny, rounded, fleshy barbel-like flaps present between lower-jaw symphysis and inner mental-barbel base.

Gill openings wide, branchiostegal membranes attached to isthmus at vertical through posterior margin of orbit. Isthmus with deep, longitudinal groove that meets paired oblique grooves just posterior to base of inner mental barbel.

COLORATION. — Body covered with fine dark pigment, concentrated above lateral line; pigment absent from head and body ventral to level of pectoral-fin spine and pigment generally absent from sides of body below lateral line; pigment forming series of distinct saddles across head and body, as follows: 1) head at eyes, approximately as wide as orbital length and extending to below lower margin of orbit; 2) nape, across occipital process and extending to pectoral-fin base; 3) posterior half of dorsal-fin base, extending obliquely to slightly above middle of adpressed pelvic fin; 4) anterior extent of adipose fin, extending obliquely towards, but not reaching, middle of anal-fin base; and 5) caudal peduncle, narrower than preceding saddles and extending ventrally to below lateral line. Indistinct saddle sometimes present across dorsal-fin origin. Barbels without pigmentation. Dorsal fin with fine dark line along anterior margin of spine, and broad marginal band across margin; adipose fin with fine, sharply delimited terminal band; caudal fin with broad submarginal lunate band; anal fin with dusky spot near margin of middle rays, spot sometimes extending onto posterior rays; pectoral and pelvic fins with few, scattered,

tiny spots on dorsal surface, ventral surfaces clear.

DISTRIBUTION. — *Gagata gasawyuh* is known from the Irrawaddy, Salween, and Tenasserim basins of Myanmar (Fig. 3).

COMMENTS. — In all other *Gagata* with dark markings on the caudal fin, the marks consist of a square or round spot on the outer principal rays of each lobe and the inner rays are immaculate. In *G. gasawyuh*, each lobe has an elongate oblique mark that extends from the middle of the outer principal rays to the distal margin of the middle rays.

The five saddle marks that extend over the dorsum of the head and body of *Gagata gasawyuh* are characteristic of this species. In other species of *Gagata* with distinct dark saddles, the saddles extend ventrally only to the lateral line and, instead of one distinct saddle across the dorsal-fin base, there is one at the dorsal-fin origin and one behind the posterior insertion of the dorsal fin.

*Gagata gasawyuh* is substantially larger than any other species of *Gagata* characterized by distinct saddles. The largest specimen we examined was 130 mm and specimens greater than 90 mm are not uncommon, whereas the largest specimen of *G. cenia*, the next largest species, we examined was only 80 mm. Shrestha (1994), however, indicated that specimens of *G. cenia* in Nepal reach 100 mm.

The extensive anatomical illustrations listed as *Gagata gagata* in de Pinna (1996) are clearly based on specimens of this species, the only species known from the Chindwin River basin.

As noted in the comments in the account of *Gagata*, there is considerable variation in the form of the swim bladder encapsulation and the lack of upper jaw dentition, two of the characters mentioned in de Pinna's account. In both characters, the descriptions and illustrations in de Pinna (1996) fit *G. gasawyuh* and not *G. gagata*.

ETYMOLOGY. — The species name is based on the Karen name "niya gasawyuh." Informants to the senior author indicate the derivation of the name as follows: *niya*, the Karen language prefix for fish; *gasaw*, elephant, and *yuh*, to respect or fear (meaning "the fish that elephants are afraid to step on").

***Gagata itchkeea*** (Sykes, 1839)  
(Fig. 8)

*Phractocephalus itchkeea* Sykes 1839:164 (type locality: Dukhun [=Deccan]). Sykes, 1841:373, pl. 67, fig. 1 (Becma River, near Pairgaon [= Bhima River (?), a large tributary of the Krishna River]).

*Gagata itchkeea*, Misra 1976:227 (partim, excluding Burma).

*Gagata itchkeea*, Day 1877:492, pl. 115, fig. 1; Hora and Law 1941:18 (rivers of Deccan); Tilak 1970:214 (key).

*Nangra itchkeea*, Jayaram 1979:13 (review).

*Nangra itchkeea*, Jayaram 1981:241 (key); Talwar and Jhingran 1991:675.

*Nangra viridescens*, Jayaram 1979, fig. 10b; Jayaram 1981, fig. 131b; Talwar and Jhingran 1991, fig. 216.

MATERIAL EXAMINED. — 8 specimens, 32–54 mm. INDIA. CAS 62080 (7, 32–54 mm; 2, 36–38 mm, cleared and stained), Karnataka State, Tungabhadra River and Reservoir at Hospet and Hampi, 28 Jan.

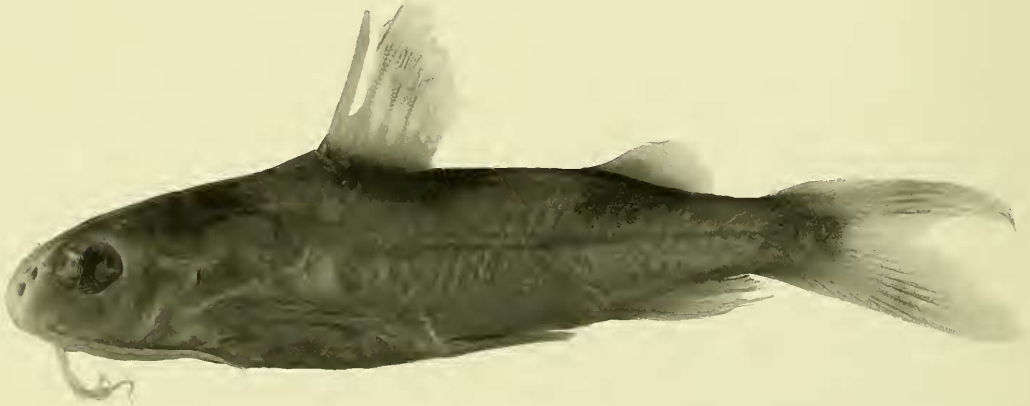


FIGURE 8. *Gagata itchkeea*, 52 mm, CAS 62080; India, Karnataka State, Tungabhadra River.

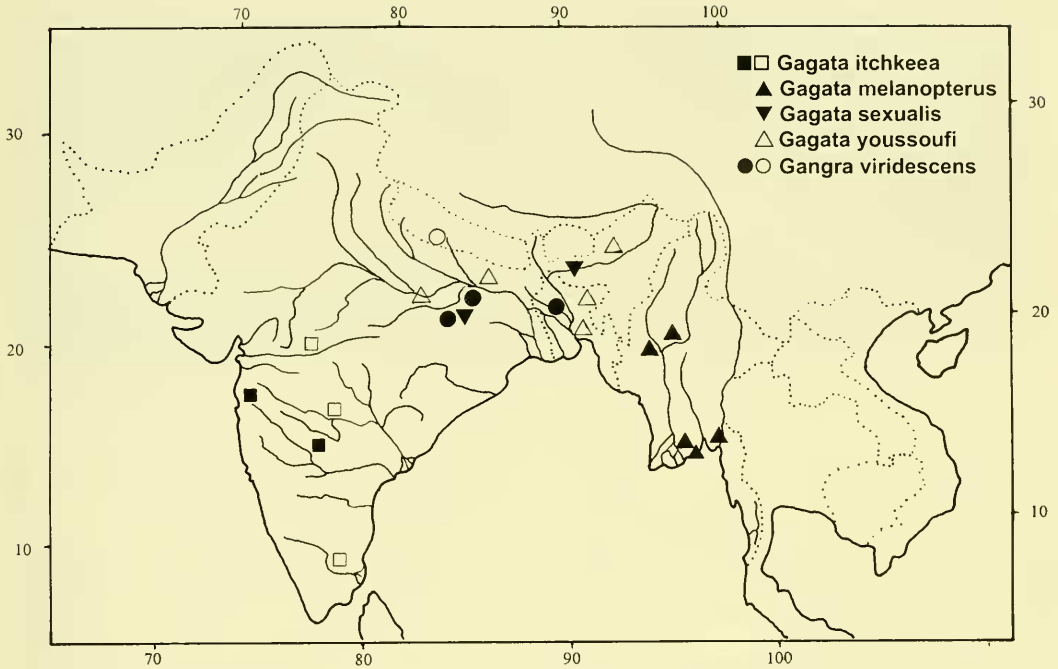


FIGURE 9. Distribution of *Gagata itchkeea*, *G. melanopterus*, *G. sexualis*, *G. youssoufi*, and *Gangra viridescens*. Open circles and squares represent unverified literature records.

1985, Tyson Roberts. CAS(SU) 34842 (1, 37 mm), Maharashtra State, Deolali, Bombay, 15 Oct. 1935, A. G. L. Fraser.

**DIAGNOSIS.** — Apparently a small species, largest specimen examined 54 mm. Body deep, approximately equal to head length. Eye very large, greater than snout length. Snout blunt; mesethmoid greatly enlarged, more strongly projecting ventrally than in any other species of *Gagata*. Tympanum large, its width equal to eye diameter; swim bladder chamber with greatly expanded dorsal bony roof but no ventral bony enclosure. Jaws with well-developed conical teeth in several irregular rows. Cranial roofing bones more superficial than in any other *Nangrina*, and covered with thin skin; cranial surface rugose. Posterior cranial fontanel very small, less than one-third length of anterior fontanel; lateral fontanels absent; subtemporal fossa absent.

**COUNTS.** — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8 (rarely 9) rays; anal fin with 4 or 5 simple and 8 to 10 branched rays. Vertebral column with 17 to 19 abdominal and 16 to 18 postabdominal verte-

brae, total 34 or 35. First gill arch with 2 or 3 + 8 to 11 short, slender gill rakers.

**DISTRIBUTION.** — *Gagata itchkeea* is restricted to peninsular India (Fig. 9) and has been reported from the Narmada, Krishna and Cauvery basins (Hora and Law 1941). It has not been reported from the Ganges basin. Jayaram's (1981:241) statement that the species occurs in Myanmar was not supported by specimens, and we believe it to be in error.

**COMMENTS.** — Inclusion of this species in *Gagata* is somewhat problematic. The species lacks the lateral cranial fontanel that otherwise characterizes *Gagata*, and it is the only species with almost no evidence of swim bladder ossification. On the other hand, *G. itchkeea* is quite similar in appearance to other species of *Gagata*, and shares characteristics such as the compressed head and large lateral eye that we consider diagnostic for the genus.

We have not had the opportunity to study a large number of specimens from the various river systems from which this species has been reported. Therefore we are not sure whether all the reports refer to this species, and we cannot rule

out the possibility that more than one species exists on peninsular India.

Recent publications on Indian fishes have added some unfortunate confusion about the identity of this species. Jayaram (1979, 1981) and Talwar and Jhingran (1991) provide a perfectly recognizable illustration of *Gagata itchkeca*, but in each case, the figures are labeled *Nangra viridescens*.

***Gagata melanopterus* new species**  
(Fig. 10)

*Gagata cenia*, Vinciguerra 1890:121 (partim, Mandalay).

*Gagata gagata*, Hora and Law 1941:15 (partim; Prome, Burma).

MATERIAL EXAMINED. — 518 specimens, 16–158 mm. Holotype: USNM 348852 (99 mm), Myanmar, Yangon Division, Hlaing River, 16°53'41"N, 96°05'28"E. 31 October 1997, C. J. Ferraris, Mya Than Tun, and local fishermen.

Paratypes: MYANMAR. AMNH 223191 (15, 38–69 mm); CAS 99694 (300, 16–84 mm); MZUSP uncat. (35, 16–77 mm); NRM 42001 (10, 65–82 mm); and USNM 348851 (100, 37–76 mm), taken with holotype. CAS 99695 (15, 45–94 mm), Yangon Division, Yangon River mouth at Mee Pya, 16°25.9'N, 96°26'E, 29 October 1997, C. J. Ferraris et al. CAS 91569 (1, 83 mm), Mandalay markets, 23 April 1996, C. J. Ferraris, D. Catania and Myint Pe. CAS 91570 (1, 64 mm), Nyaung-U fish market (near Bagan), 13 April 1996, C. J. Ferraris and D. Catania. CAS 95556 (1, 86 mm) and CAS 95557 (5, 82–91 mm), Mandalay markets, 13–25 April 1993, T. R. Roberts. CAS 95558 (3, 41–50 mm), Yangon Division, Thanlyin market, 28 November 1996, C. J. Ferraris and Myint Pe. CAS 95559 (3, 46–64 mm), and USNM 344658 (22, 36–70 mm), Yangon markets, 10–11 April 1996, C. J. Ferraris, D. Catania and Myint Pe. NRM 26668 (4, 75–158 mm), Moulmein, 11 November 1934, R. Malaise. NRM 14893 (1, 81 mm), Mandalay, September 1935, Malaise. USNM 44755 (1, 86 mm), Mandalay, 1885, L. Fea.

DIAGNOSIS. — Body silvery, either without marking or with faint saddles. Dorsal, anal, pectoral, and pelvic fins blackened at least distally; caudal fin without markings. Dorsal-spine tip not reaching to adipose-fin origin when adpressed. Premaxilla with 2 rows of teeth. Gill rakers 16 or more on outer face of first arch. Adpressed anal fin fails to reach first lower procurrent caudal-fin rays.

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 9 (rarely 8 or 10) rays; anal fin with 4 to 6 simple and 10 to 12 branched rays. Vertebral column with 19 or 20 abdominal and 20 or 21 postabdominal vertebrae, total 39 to 41. First gill arch with 6 or 7 + 10 or 11 rakers.

DESCRIPTION. — Body elongate; triangular in cross section at abdomen, highly compressed posteriorly. Skin smooth, without tubercles or ridges. Lateral line complete, midlateral, with irregularly distributed, short, ventrally-directed oblique branches; on caudal-fin base, lateral line curves dorsally, but does not extend onto fin rays.

Dorsal-fin origin above posterior half of adpressed pectoral-fin spine, posterior insertion at vertical through pelvic-fin origin; dorsal fin with short spinelet preceding first fin ray; first ray a stout, sharply pointed, smooth spine; spine laterally compressed, its anterior margin a sharp keel; fin margin straight, each branched ray slightly shorter than preceding ray; last fin ray without membranous attachment to body; tip of adpressed dorsal fin not reaching adipose-fin origin.

Interval between dorsal fin and adipose fin approximately 2 times length of dorsal-fin base; adipose-fin base approximately equal to that of anal fin; its origin in line with anal-fin origin.

Caudal fin deeply forked, lobes pointed, symmetrical; outer principal rays nearly three times length of middle rays; procurrent rays of upper and lower lobes symmetrical, not extending far anteriorly.

Anal-fin base short, approximately equal to that of adipose-fin base; first branched ray longest, fin margin concave, last ray without membranous attachment to body.

Pelvic-fin origin at vertical through posterior insertion of dorsal fin; fin margin obtusely pointed, first branched ray longest; adpressed fin reaching past vertical through tip of adpressed dorsal fin, but not to anal-fin origin.

Pectoral fin with a stout spine, sharply pointed at tip; anterior margin of spine keeled, smooth; posterior margin heavily serrated; serrations longest at middle of spine, absent on distal quarter; fin margin straight, first ray markedly longer than remaining rays; adpressed spine extending past vertical through posterior insertion of dorsal fin, and past pelvic-fin origin.





FIGURE 10. *Gagata melanopterus* new species, 99 mm, holotype, USNM 348852; Myanmar, Hlaing River, Yangon.

Head compressed, triangular; snout bluntly pointed in lateral profile, nearly flat ventrally; dorsal profile of head nearly straight from snout tip to base of occipital process, slightly convex thereafter; head with broad mid-dorsal groove, extending from snout to tip of occipital process; eye lateral, slightly above middle of head; orbital diameter greater than interorbital width, and only slightly less than snout length; eye covered with thin skin, no free orbital margin.

Mouth inferior, near snout tip; oral opening transverse, entirely ventral to nares; free lips absent; upper jaw with two rows of slender, needle-like teeth; lower jaw with three irregular rows of shorter conical teeth; palate edentulous.

Barbels in four pairs; nasal barbel tiny, extending from fleshy flap on anterior margin of posterior naris and not reaching to anterior margin of orbit; maxillary barbel connected to snout by broad sheet of membranous tissue that attaches to short groove at corner of mouth; membrane extends along medial surface of barbel, for at least half its length, becoming progressively more slender distally; maxillary barbel reaches at least to pectoral-fin origin; mental barbels originate in transverse row, just posterior to lower jaw; outer mental barbel extends to opercular margin, ventral to pectoral spine; inner mental barbel shorter.

Gill openings wide, branchiostegal membranes attached to isthmus at vertical through posterior margin of orbit. Vent located just anterior to tip of adpressed pelvic fin.

**COLORATION.** — Body covered with fine dark pigment, somewhat more concentrated above lateral line; pigment absent from head and body

ventral to level of pectoral-fin spine; pigment forms narrow dark saddle behind head; lateral process of dorsal-spine pterygiophore darkly pigmented; in some individuals, indistinct saddles cross dorsal fin and adipose-fin bases and extend below lateral line; barbels without pigmentation; dorsal fin with dark pigment concentrated on spine and distally on fin membrane, as broad marginal band; adipose fin with marginal band similar to that on dorsal fin; caudal fin with widely scattered pigment, nearly indistinct; in some individuals, caudal fin with very fine dark marginal band; pectoral fin heavily pigmented on dorsal and ventral surfaces of spine and fin, except for basal parts of posterior rays; pelvic fin heavily pigmented for distal half, or more, of fin; anal fin darkly pigmented on distal part of all but posterior-most rays; width of anal-fin pigmentation variable, limited to fine marginal band in some individuals but covering distal half of fin in others.

**DISTRIBUTION.** — *Gagata melanopterus* is known from the Irrawaddy, Rangoon, Sittang and lower Salween basins of Myanmar (Fig. 9).

**COMMENTS.** — *Gagata melanopterus* differs from *G. gagata* in having (a) a dorsal-fin spine that fails to reach adipose-fin origin (vs. depressed dorsal-fin spine extending to, and often well past, adipose-fin origin), (b) a smaller pelvic fin that fails to reach anal-fin origin (vs. reaching anal-fin origin), (c) the last anal-fin ray fails to reach first lower procurrent caudal-fin rays (vs. extending posteriorly to origin of lower procurrent caudal-fin rays); (d) complete bony encapsulation of the swim bladder (vs. incomplete).

and (e) two rows of teeth on the premaxilla (vs. four rows).

This distinctive new species is known from lowland regions of Myanmar. It was most often encountered in lower reaches of rivers, or in markets near the coast. In one collection from the Hlaing River, it was the most abundant of the more than 40 species taken. Although the distribution of this species broadly overlaps that of *Gagata gasawyuh* in the Irrawaddy and Sittang rivers, *G. melanopterus* has not been taken in the Tenasserim basin, the Salween River above the vicinity of its mouth, the Irrawaddy River above Mandalay or the Chindwin River.

ETYMOLOGY. — The species name “melanopterus,” a masculine adjective, is from the Greek, *melas*, black, and *pteron*, fin, wing, or feather.

### *Gagata sexualis* Tilak, 1970

*Gagata sexualis* Tilak 1970:207, figs. 1–6 (type locality: [India] North Koel River at Daltonganj [Chotanagpur]).

MATERIAL EXAMINED. — 3 specimens, 39–52 mm. INDIA: RMNH 26072 (2, 39–40 mm), Ganga River, H. Chapra, 28 June 1967. NRM 40591 (1, 52 mm), Dibrugarh market, Brahmaputra drainage, F. Fang and A. Roos, 20 January 1998.

DIAGNOSIS. — A small *Gagata* with filamentous extension of dorsal-fin spine in males that reaches to adipose-fin base. Mouth located at level of anterior margin of orbit. Snout bluntly rounded in lateral profile without notch anteriorly. Upper jaw toothless; lower jaw with single row of teeth (diagnosis after Tilak 1970).

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8 branched rays; anal fin with 4 or 5 simple rays, followed by 12 to 14 branched rays, posterior two rays very close together. Vertebral column with 19 or 20 abdominal and 17 or 18 postabdominal vertebrae, total 36 to 38. Gill rakers not countable on examined specimens.

DISTRIBUTION. — *Gagata sexualis* is known only from the Ganges basin, including the Brahmaputra River (Fig. 9).

COMMENTS. — *Gagata sexualis* was described from a small series of specimens that were said to exhibit pronounced sexual dimorphism in the shape of the head and the length of filamentous extensions of the dorsal and pectoral

fins. In addition to the type series of seven specimens, two specimens from the Ganges River (RMNH 26072) were determined by Tilak (1970) to be conspecific with his new species. We have examined these two specimens and agree that they represent a distinct species of *Gagata* somewhat similar in appearance to *Gagata cenia*. The two species differ in a number of characters as outlined in Tilak (1970). In addition, they differ in anal-fin ray count, a distinction not mentioned in the original description of *G. sexualis*. Although the two RMNH specimens were said to be male and female, we were unable to see the sexually dimorphic characteristics indicated in the original description. The specimen from the Brahmaputra River system (NRM 40591) exhibits pronounced dorsal and pectoral fin filaments that Tilak indicated to be sexually dimorphic characteristics of males. The gonads of NRM 40591 appear to be testicular, although histological examination was not conducted.

The distinction between *G. sexualis* and *G. youssoufi* is more problematic and is discussed in detail in the account of the latter species.

### *Gagata youssoufi* Aatur Rahman, 1976 (Fig. 11)

*Gagata youssoufi* Aatur Rahman 1976:5, fig. 1 (type locality: Old Brahmaputra River near Mymensingh, Bangladesh); Aatur Rahman 1990:221, fig. 131 (Bangladesh).

MATERIAL EXAMINED. — 120 specimens, 19–50 mm. BANGLADESH. CAS 95563 (27, 19–41 mm), Tangail district, FAP 17 fisheries survey, 1992.

INDIA. BMNH 1889.2.1:2615 (1, 50 mm), Assam, F. Day. CAS 55560 (1, 35 mm), Assam State, Tezpur, B. Prashad. CAS 95561 (85, 36–48 mm, 10 cleared and stained), Ganges River at Patna, April–May 1996, T. R. Roberts. MCZ 4258 (5 of 9, 41–48 mm), Uttar Pradesh, Allahabad, F. Day.

DIAGNOSIS. — A small species of *Gagata*, to 50 mm. Body with five dark saddles. Snout broadly rounded in lateral profile, without notch. Teeth absent from upper jaw, limited to small symphyseal patch on lower jaw. Gill rakers few in number and nearly indiscernible, except in skeleton preparations. Fourth gill arch with single row of teeth on lower limb.

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8



FIGURE 11. *Gagata youssoufi*, 38 mm, CAS 95561; India, Ganges River at Patna.

rays (rarely 7 or 9); anal fin with 4 or 5 simple rays and 11 to 13 (rarely 14) branched rays. Vertebral column with 14 (rarely 15) abdominal and 18 or 19 (rarely 17) postabdominal vertebrae, total 37, rarely 38. First gill arch with 1 + 3 or 4 tiny rakers.

**DISTRIBUTION.** — *Gagata youssoufi* is known only from the Ganges basin (Fig. 9).

**COMMENTS.** — *Gagata youssoufi* closely resembles the poorly known *G. sexualis*, except that it lacks a filamentous extension of the dorsal fin, which is said to characterize the latter species and it does not show the pronounced sexual dimorphism figured in Tilak's description of *G. sexualis*. Our specimens from India and Bangladesh typically have only 12 or 13 branched anal-fin rays, while two of the three specimens of *G. sexualis* examined by us have 14. Whether *G. sexualis* really is a sexually dimorphic species, and whether *G. sexualis* and *G. youssoufi* are different species are matters that we are unable to resolve with the material we examined and must be left for further study. Until then, we choose to recognize both species as valid. Should the names *G. sexualis* and *G. youssoufi* represent but a single species, the name *G. sexualis* has priority.

A single specimen that was brought to our attention just before this paper went to press may shed some light on the status of the name *Gagata youssoufi*. The specimen (NRM 40591) was obtained at the Dibrugarh market, Assam, and said to be taken from the Brahmaputra River. The specimen appears to be an adult male *Gagata sexualis*, as it exhibits the elongate dorsal and pectoral filaments that characterize that males of that species. However, it has only 12 pectoral fin rays, which we found to be the typical number for *Gagata youssoufi*, but not that of *G. sexualis*. At 52 mm, the specimen is larger than any speci-

men of *Gagata youssoufi* examined by us. It is possible that the elongate filaments are either exhibited only seasonally, or only in individuals larger than 50 mm. The original description of *Gagata sexualis* indicates the length of only one of the four males examined by Tilak (1970), which was that of the 55 mm holotype. Although we continue to reserve judgment until more material becomes available, it appears more likely that *Gagata youssoufi* may ultimately be a synonym of *G. sexualis*.

### **Gangra** new genus

Type species: *Pimelodus viridescens* Hamilton 1822.  
Monotypic.

**DIAGNOSIS.** — Summaries of counts of vertebrae, fin rays, and gill rakers are presented in Tables 1–3. Head, mouth and jaws broad, jaws with several rows of conical teeth. Mesethmoid not greatly expanded, its dorsal profile slightly convex, Y-shaped anteriorly. Palate toothless. Barbels short, slender, and round in cross section; nasal barbel very short, extending posteriorly only to end of posterior naris; maxillary and mental barbels not extending posteriorly beyond head; maxillary-barbel membrane absent or greatly reduced; maxillary bone inside maxillary barbel very short; outer and inner mental barbels evenly and widely separated. Paired lateral cranial fontanel absent. Branchiostegal membranes free from isthmus.

**COMMENTS.** — *Gangra viridescens* (Hamilton) has historically been a problematic species from the standpoint of its identity and relationships. The large number of primitive sisorid characters exhibited by this taxon has caused researchers to place it variously with *Nangra* or *Gagata* by focusing on shared primitive charac-



FIGURE 12. *Gangra viridescens*, 56 mm, CAS 95570; India, Ganges River at Patna.

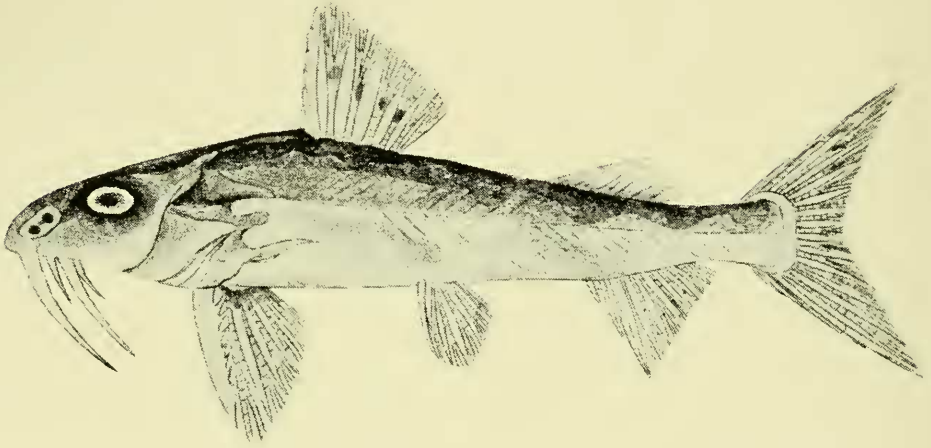


FIGURE 13. *Gangra viridescens*, illustration from Hamilton (1822), plate 11, figure 56; originally 56 mm.

ters. It seems to us that the difficulty in assigning *G. viridescens* unambiguously to either of those two genera was the primary reason for the use of a single generic name for all of the species discussed here (e.g., Misra 1976; Burgess 1989; Aatur Rahman 1990). Although we concur with de Pinna's (1996) conclusion that all of these species form a natural group, we think that treating them as a part of a single genus obscures the diversity of form exhibited by this group and overshadows the clear species groups of *Nangra* and *Gagata*. By placing *Gangra viridescens* into a separate genus, both of these other genera become readily diagnosable entities.

ETYMOLOGY. — *Gangra* is a hybrid word coined from *Gagata* and *Nangra*. Gender masculine.

***Gangra viridescens*** (Hamilton, 1822) new combination  
(Figs. 12, 13)

*Pimelodus viridescens* Hamilton 1822:173, 376, pl. 11, fig. 56 (type locality: rivers of the northern parts of Bengal).

*Nangra punctata* Day 1877:494, pl. 115, fig. 8 (type locality: Sone River at Bheer Bhoom, Bengal).

*Gagata viridescens*, Hora and Law 1941:24, pl. 1, figs. 7, 8; Tilak 1970:214 (key); Misra 1976:229; Aatur Rahman 1990:219 (Bangladesh); Shrestha 1994:58, fig. 90 (Nepal).

*Gagata (Nangra) viridescens*, Mahajan 1967:298 et seq., figs. 3, 12, 14 (osteology of axial skeleton, caudal fin).

*Nangra viridescens*, Jayaram 1979:14 (review); Jayaram 1981:241 (key); Shrestha 1994:142 (Nepal).

MATERIAL EXAMINED. — 59 specimens, 30–72 mm. BANGLADESH. CAS 95571 (28, 32–55 mm), Tangail district, FAP 17 fisheries survey, 1992; CAS 95572 (2, 30–31 mm), Tangail District, N. Dhaleswari River, FAP 17 fisheries survey, 9 Oct. 1992.

INDIA. AMS B.7566 (1, 49 mm, syntype of *Nangra punctata*), Sone River, F. Day. BMNH unreg. (1,

37 mm), Bengal, Tirpoot, Gordon Dalglish. BMNH 1871.4.17:2 (4, not measured), N. E. Bengal, Jerdon. CAS 95570 (23, 44–72 mm), Ganges River at Patna, April–May 1996, T. R. Roberts.

DIAGNOSIS. — Same as for *Gangra*.

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8 branched rays; anal fin with 4 to 6 simple rays and 7 to 9 branched rays (typically 5 + 8). Vertebral column with 18 or 19 abdominal and 15 or 16 postabdominal vertebrae, total 33 or 34. First gill arch with 5 or 6 rakers.

COLORATION. — *Gangra viridescens* is pale greenish or grayish overall, with a vivid, almost iridescent, horizontal silvery mark in the membrane connecting the opercle to the side of the cranium. These supraopercular marks are obvious, viewed from the side or especially when viewed from above. Similar marks do not occur in any other sisorid.

DISTRIBUTION. — *Gangra viridescens* occurs throughout lowland parts of the Ganges-Brahmaputra system (Fig. 9).

### *Nangra* Day, 1877

*Nangra* Day 1877:493 (Type species: *Pimelodus nangra* Hamilton, 1822, by absolute tautonymy). Gender feminine.

DIAGNOSIS. — Summaries of counts of vertebrae, fin rays, and gill rakers are presented in Tables 1–3. Body elongate, slender. Head depressed; snout slightly to considerably spatulate, with ventral portion flat and more or less markedly projecting anterior to jaws. Eyes small, dorsolateral. Mesethmoid a large flattened plate; premaxilla immovably fixed to mesethmoid. Jaws well toothed. Palatal teeth present on bone tentatively identified as endopterygoid; tooth patch single, elongate and widely separated across midline; teeth few in number but present in all specimens of *Nangra* examined by us for this character. Branchiostegal membranes free from isthmus. Barbels very long, maxillary barbel extending at least to pectoral spine tip and usually beyond pelvic fins; nasal barbel extending at least to eye. Maxillary barbel membrane well developed. Maxillary bone inside maxillary

barbel very long, extending posteriorly nearly to end of head or beyond.

NOTE ON GENDER. — Although *Nangra*, like *Gagata*, presumably is masculine in Bengali, Day and other ichthyologists have treated *Nangra* as feminine (e.g., *Nangra punctata* Day, 1877; *Nangra robusta* Mirza and Awan, 1973). The feminine gender of *Nangra* is recognized by Eschmeyer and Bailey (in Eschmeyer 1990:258).

COMMENTS. — The composition of *Nangra*, as used here, differs from all previous uses. We believe that the combination of depressed body, elongated spatulate snout, and toothed palate are indications of a natural group of sisorids. The snout is supported by a broadly expanded plate on the ventral surface of the mesethmoid cornua, a feature not otherwise seen in sisorids. Similarly, palatal teeth are typically absent in sisorids, although they have been reported in *Glyptothorax cous* (as *Eucliptosternon cous*) by Günther (1864) and Regan (1911).

### KEY TO SPECIES OF *NANGRA*

- 1a. Nasal barbel extends to margin of head or beyond; dorsal fin typically with 8 (rarely 7 or 9) branched rays . . . . . *Nangra nangra* (Hamilton, 1822)
- 1b. Nasal barbel extends no further than posterior margin of orbit; dorsal fin with 6 or 7 branched rays . . . . . 2
- 2a. Dorsal fin and pectoral fin with long filament extending from first ray . . . . . 3
- 2b. Dorsal fin and pectoral fin with little or no filamentous extension . . . . . 4
- 3a. Pectoral fin with 10 or 11 branched rays, dorsal fin with 7 branched rays . . . . .  
     . . . . . *Nangra robusta* Mirza and Awan, 1973
- 3b. Pectoral fin with 8 branched rays, dorsal fin with 6 branched rays . . . . .  
     . . . . . *Nangra carcharhinoides*, new species
- 4a. Dorsal fin with 7 branched rays and dark semicircular spot on base of middle rays, maxillary barbel extends to anal-fin origin . . . . . *Nangra ornata*, new species
- 4b. Dorsal fin with 6 branched rays and without dark markings; maxillary barbel extends only to tip of adpressed pectoral-fin spine . . . . .  
     . . . . . *Nangra bucculenta*, new species



FIGURE 14. *Nangra bucculenta* new species, holotype, 28 mm, CAS 95564; Bangladesh, Tangail District.

***Nangra bucculenta* new species**  
(Fig. 14)

Holotype: CAS 95564 (28 mm), Ganges River delta, Tangail District, North Central Region, Bangladesh, FAP 17 fisheries survey, 1992.

Paratypes: CAS 95565 (10, 15–34 mm; 3, 20–23 mm, cleared and stained), same collection data as holotype.

DIAGNOSIS. — Possibly a very small species, largest known specimen only 34 mm. Snout moderately projecting; cheeks relatively expanded, head terete. Anterior naris very near snout tip (distance between naris and snout tip less than eye diameter). Nasal barbel extending to eye; maxillary barbel extending only to end of pectoral fin; maxillary-barbel membrane broadly attached to head only on cheek; maxillary bone extending posteriorly to midway between eye and end of head. Vent opening directly to exterior; vent and genital papilla located between anterior third of pelvic fins. Dorsal and pectoral fins without filamentous extensions.

COUNTS. — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8 (rarely 7) branched rays; pelvic fin with 1 unbranched and 5 branched rays; anal-fin rays 4 or 5 simple and 7 or 8 branched rays, total 11 to 13. Vertebrae 18 or 19 abdominal and 15 or 16 postabdominal, total 34. First gill arch 2 + 4 or 5 rakers.

DESCRIPTION. — Body elongate, slender; round in cross section at abdomen, progressively compressed posteriorly.

Dorsal-fin origin above middle of adpressed pectoral fin, posterior insertion above pelvic-fin origin; fin with short spinelet preceding first fin ray; first ray a smooth spine for most of its length, flexible distally and not prolonged into filament; fin margin straight, each ray slightly longer than following ray; last fin ray without membranous attachment to body.

Interval between dorsal fin and adipose fin greater than length of dorsal-fin base; adipose fin approximately equal in size to anal fin; its origin above, or just anterior to anal-fin origin.

Caudal fin deeply forked, lobes pointed, lower lobe longer and broader than upper lobe; outer principal rays more than twice length of middle rays; procurrent rays of upper and lower lobes symmetrical, not extending far anteriorly.

Anal-fin base short, approximately equal to that of adipose-fin base; first branched ray longest, fin margin slightly concave, last fin ray without membranous attachment to body.

Pelvic-fin origin at vertical through posterior insertion of dorsal fin; fin margin slightly convex, middle rays longest; adpressed fin not reaching anal-fin origin.

Pectoral fin with stout spine; spine smooth anteriorly, but with 10 to 12 stout serrations on posterior margin; serrations progressively longer distally; spine with short filament extending from tip; fin margin straight or slightly convex, first ray longest; adpressed fin extending to vertical from base of second branched dorsal-fin ray.

Head bluntly conical, somewhat depressed dorsally and nearly flat ventrally; dorsal surface of head with broad medial groove, extending from snout to posterior extent of supraoccipital; groove narrow and shallow on occipital process; eye dorsolateral; eye diameter slightly more than one-half interorbital width or snout length; eye covered with thin skin, no free orbital margin.

Mouth inferior, wide, located near snout tip; oral opening entirely anterior to eye, curved slightly; upper lip absent; lower lip continuous with skin of underside of head, except at corners of mouth. Jaws with several rows of tiny teeth, teeth nearly indistinguishable from surrounding tissue; palatal tooth patch small, oblong, with few irregularly-placed teeth.

Barbels in four pairs. Nasal barbel extends no further posteriorly than anterior margin of orbit. Maxillary barbel attached to head by broad sheet

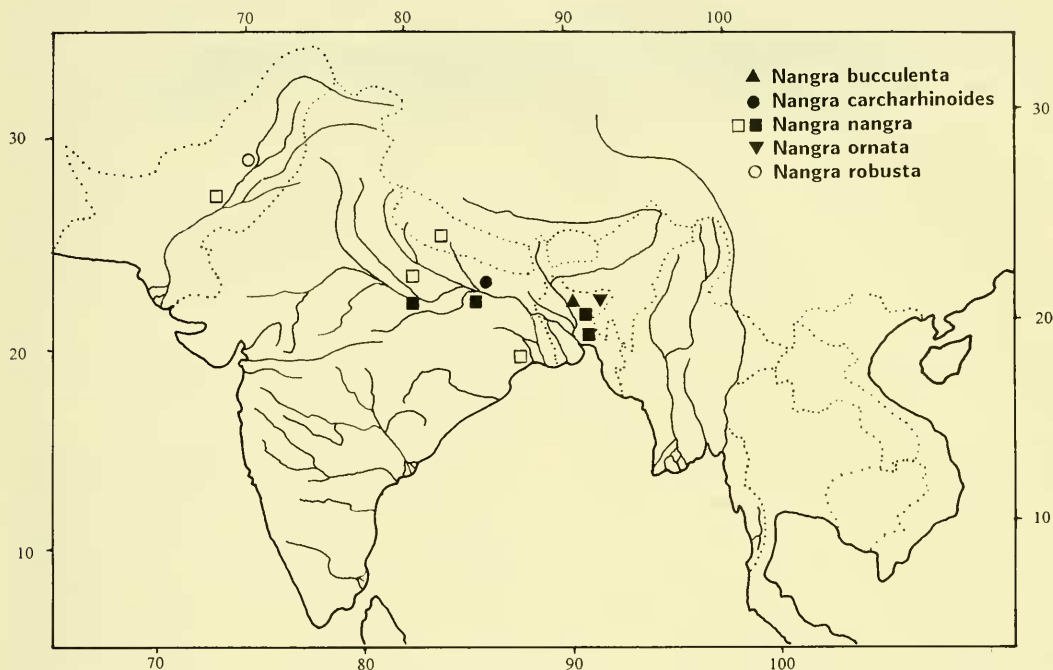


FIGURE 15. Distribution of species of *Nangra*. Open squares represent unverified literature records for *Nangra nangra*. Distribution of *Nangra robusta* based on type locality.

of membranous tissue that extends to level of outer mental-barbel origin; membrane extends along medial surface of barbel, progressively more slender towards barbel tip; maxillary barbel reaches to level of second or third branched dorsal-fin ray. Mental barbels originate just posterior to lower jaw; outer mental barbel reaches pectoral fin-spine base; inner mental barbel somewhat shorter.

Gill openings wide, branchiostegal membranes narrowly attached to isthmus. Vent situated between middle of adpressed pelvic fins. Head and body covered with scattered, elongate, ridged or keeled tubercles; tubercles abundant on dorsal surface of head and body, especially on cheeks and ventral surface of snout; ventral surface of abdomen smooth.

**COLORATION.** — Head and body above lateral line covered with scattered dark flecks, concentrated in three patches middorsally: 1) at dorsal-fin origin, 2) posterior to posterior insertion of dorsal fin, 3) along adipose-fin base; elongate dark spot covers dorsal half of opercle; pigmentation absent below lateral line and on lower half

of head; barbels, pectoral fin, pelvic fin, and anal fin without pigmentation; dorsal fin with pigment on middle of first four branched fin rays, remaining rays and interradiial membranes clear; adipose fin with scattered pigmentation basally; caudal-fin base with small dark triangular spot ending across bases of middle rays; some specimens with faint dark spot on middle of lower caudal-fin lobe.

**DISTRIBUTION.** — *Nangra bucculenta* is known only from the Tangail District of central Bangladesh, a flood plain area between large tributaries in the Ganges delta, about 15 km east of the Jammuna mainstream (Fig. 15). Our specimens were obtained from sites that yielded large numbers of the following other sisorids: *Glyptothorax telchitta* (Hamilton, 1822), *Gagata cenia*, *G. youssoufi*, *Nangra nangra*, *Gangra viridescens*, and *Sisor raddophorus* Hamilton, 1822.

**ETYMOLOGY.** — The name "bucculenta," a feminine adjective, is from the Latin "bucculentus," meaning with expanded cheeks.



FIGURE 16. *Nangra carcharhinoides* new species, holotype, 79 mm, CAS 95566; India, Ganges River at Patna.

***Nangra carcharhinoides* new species**  
(Fig. 16)

? *Nangra nangra* Hamilton 1822 (partim; pl. 11, fig. 63).

Holotype: CAS 95566 (79 mm), INDIA: Ganges River at Patna, April–May 1996, T. R. Roberts.

Paratypes: CAS 95567 (30, 60–92 mm), SRS/ZSI F.4847 (6, 65–87 mm), and UMMZ 233235 (2, 73–82 mm), collected with the holotype.

**DIAGNOSIS.** — A relatively large species of *Nangra*, largest specimen 92 mm. Dorsal fin with 6 branched rays; dorsal and pectoral-fin spines with filamentous extensions. Snout strongly projecting. Nasal barbel reaching only to posterior margin of orbit; maxillary barbel extending to end of pelvic fin or to anal-fin origin; maxillary barbel membrane with narrow attachment to cheek and broad attachment to corner of mouth; mental barbels extending posteriorly to end of head. Vent opens into pouch or pseudovent, with broad membranous opening near pelvic fin tip. Head, body and caudal peduncle slightly more elongate than in other *Nangra*.

**COUNTS.** — Dorsal fin with spinelet, spine and 6 branched rays; pectoral fin with spine and 8 rays; anal fin with 4 or 5 simple rays and 7 to 9 branched rays. Vertebral column with 18 to 20 abdominal and 17 or 18 postabdominal vertebrae, total 35 to 37. First gill arch with 1 or 2 + 5 or 6 long, slender rakers.

**DESCRIPTION.** — Body elongate and slender, round in cross section at abdomen, slightly compressed posteriorly. Skin of head and body covered with scattered, elongate, ridged or keeled tubercles; tubercles more abundant on dorsal sur-

face of head and body, absent on ventral surface of abdomen. Lateral line midlateral, complete.

Dorsal-fin origin above distal fourth of adpressed pectoral-fin spine, posterior insertion posterior to vertical through pelvic-fin origin; fin with short spinelet preceding first fin ray; first ray a smooth spine continued distally as flexible ray, with slender filament extending beyond tip of first branched ray; fin margin slightly concave, each branched ray slightly longer than following ray; last fin ray without membranous attachment to body.

Interval between dorsal fin and adipose fin approximately  $1\frac{1}{2}$  times length of dorsal-fin base; adipose fin approximately equal in size to anal fin; adipose fin origin above anal-fin origin.

Caudal fin deeply forked, lobes pointed; lower lobe slightly longer and broader than upper lobe; outer principal rays twice length of middle rays; procurrent rays of upper and lower lobes symmetrical, not extending far anteriorly.

Anal-fin base short, approximately equal to that of adipose-fin base; first branched ray longest, fin margin concave, last fin ray without membranous attachment to body.

Pelvic-fin origin at vertical through middle of dorsal fin; fin margin obtusely pointed, first branched ray longest; adpressed fin reaching vertical through tip of adpressed dorsal fin, but not to anal-fin origin.

Pectoral fin with stout spine, spine tip blunt. Spine smooth anteriorly, with 12 or more stout serrations along posterior margin; serrations longest at middle of spine; spinous ray continued as long slender filament, filament length only slightly less than length of bony spine; fin margin



concave anteriorly, convex for last two rays; first branched ray markedly longer than remaining rays; spinous portion of first ray extending to vertical from base of second branched dorsal-fin ray; filamentous extension reaching to pelvic-fin origin.

Head triangular with rounded, conical snout tip; head somewhat depressed dorsally and nearly flat ventrally; dorsal surface of head with broad groove, extending from snout on to occipital process, but not to tip of process; eye dorso-lateral; orbital diameter approximately equals interorbital width, but only one-half snout length; eye covered with thin skin, no free orbital margin; anterior naris relatively remote from snout tip, distance between naris and snout tip equals orbital diameter.

Mouth inferior, near snout tip; oral opening entirely anterior to eye, curved slightly; upper lip absent; lower lip continuous with skin of underside of head, except at corners of mouth. Jaws with three irregular rows of small conical teeth; palatal tooth patch tiny, remote from midline of palate, and consisting of 2 or 3 small, irregularly placed teeth.

Barbels in four pairs. Nasal barbel extends posteriorly at least to middle of eye and sometimes to posterior margin of orbit. Maxillary barbel attached to head by broad sheet of membranous tissue that extends to level of corner of mouth; along medial surface of barbel, membrane becomes progressively more slender distally; maxillary barbel reaches at least to tip of adpressed pelvic fin, and often to anal-fin origin. Inner mental barbel reaches to pectoral-spine base. Outer mental barbel originates lateral and posterior to inner mental barbel and extends at least to middle of adpressed pectoral-fin spine.

Gill openings wide, branchiostegal membranes narrowly attached at anterior extent of isthmus. Vent opens into pouch or pseudovent, opening near tip of adpressed pelvic fin.

COLORATION. — Head and body above lateral line covered with scattered dark flecks, concentrated middorsally on body and dorsal to pectoral fin; pigmentation often extends below lateral line, but not reaching ventral surface of head or body; maxillary and mental barbels, pelvic fin, and anal fin without pigmentation; dorsal and caudal fins with pigment on branched fin rays but with clear interradiated membranes; adipose fin with fine, scattered pigmentation; caudal-fin

base dusky without distinct dark basal spot; rays of lower caudal-fin lobe more heavily pigmented than those of upper lobe; pectoral fin with scattered pigment on dorsal surface of spine and basal portion of fin, distal parts of interradiated membranes and rays clear.

DISTRIBUTION. — *Nangra carcharhinoides* is known only from the Ganges near Patna (Fig. 15). At this place the river is very broad, and during the dry season (i.e., at the time of collection) the bottom has a vast extent of fine white sand and seemingly little else. All of the specimens were obtained from markets or local fishermen. Therefore, precise information on the habitat of this species is unavailable.

COMMENTS. — It is possible that Hamilton's (1822) original account of *N. nangra* may have been based in part on *N. carcharhinoides*. Hamilton's figure (Fig. 17) shows only 6 instead of the 8 soft dorsal fin rays mentioned in his diagnosis, and his statement that *N. nangra* attains 3 or 4 inches suggests *N. carcharhinoides*. The nasal barbel is a bit too long for *N. carcharhinoides*, but not long enough for *N. nangra*. The length of the maxillary barbel is too short for *N. nangra*, but it is the right length for *N. carcharhinoides*. The figure does not show the dorsal and pectoral-fin filaments characteristic of *N. carcharhinoides* and seems to be of a less elongate fish. The diagnostic character of 8 dorsal fin rays is a prominent part of Hamilton's account of *Nangra nangra*, and we follow a long tradition of recognizing the only known species with 8 dorsal-fin rays as *N. nangra*.

The filamentous extensions of the dorsal and pectoral-fin spines are composed mainly of unconsolidated actinosts, as many as 20 for the dorsal-spine filament and 15 for the pectoral-spine filaments.

The pseudovent is a unique pouch-like feature observed only in *Nangra carcharhinoides*. The pouch is a little less than an eye diameter in width and up to 2 times the eye diameter in length, with a broad, transverse and strongly concave or semi-circular membranous opening posteriorly. The structure is fully formed in 19 of 24 specimens examined for this character. In four specimens it was more or less collapsed or reduced, and in one specimen it was absent. Collapse or reduction may be partly due to drying of specimens before preservation, and the absence due to injury of the structure during life. In all specimens the vent

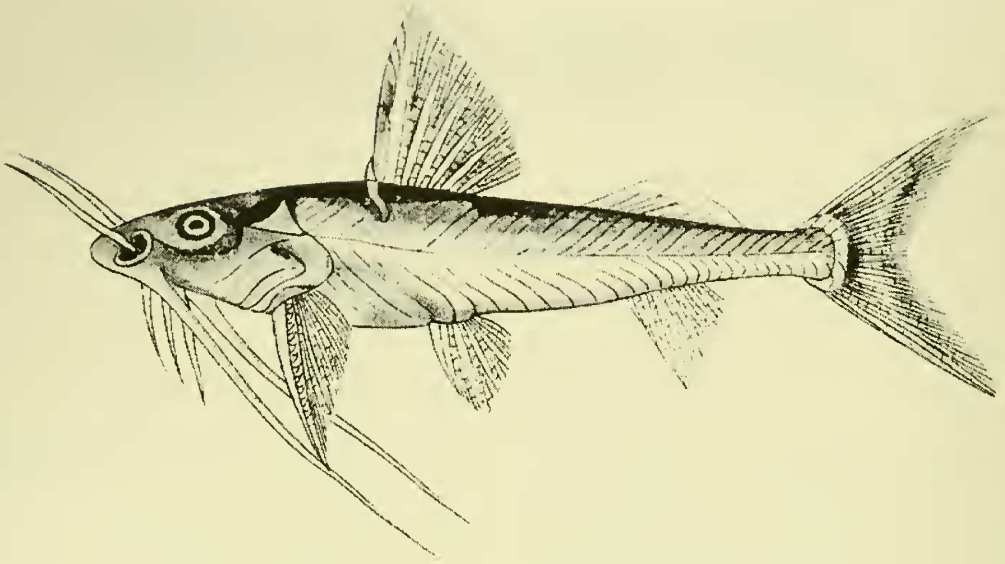


FIGURE 17. *Nangra nangra*, illustration from Hamilton (1822), plate 11, figure 63; originally 52 mm.



FIGURE 18. *Nangra nangra*, neotype, 47 mm. CAS 96626; India, Ganges River at Patna.

itself lies near the tip of the pelvic fin, thus farther posteriorly than in any other species of *Nangra* (possibly excepting *N. robusta*, in which presence or absence of a pseudovent and the position of the vent are unknown).

ETYMOLOGY. — The name “carcharhinoides” (adjective) refers to the shark-like appearance of this species, especially with regards to the shape of the snout.

***Nangra nangra*** (Hamilton, 1822)  
(Figs. 17, 18)

*Pimelodus nangra* Hamilton 1822:193, 378, pl. 11,  
fig. 63. (type locality: Kosi River).

*Nangra buchanani* Day 1877:494, pl. 113, fig. 3. (type  
locality: Ganges, Jumna, and Indus rivers).

*Gagata nangra*, Hora and Law 1941:26, pl. 1, figs.  
9–10 (Ganges, Kosi, Hooghly, Jumna, Indus); Tilak  
1970:214 (key); Ataur Rahman 1990:217, fig. 128  
(Bangladesh).

*Nangra nangra*, Mirza and Awan 1973:149 (Indus  
River); Mirza 1980:26 (Punjab); Jayaram  
1981:241, fig. 131a (key); Talwar and Jhingran  
1991:676, fig. 215; Shrestha 1994:142 (Nepal).

MATERIAL EXAMINED. — 303 specimens, 20–55  
mm. BANGLADESH. CAS 95569 (85, 20–40 mm),  
Ganges basin, North Central Region, Tangail district,  
FAP 17 fisheries survey, 1992. UMMZ 208457 (2,  
23–37 mm), Meghna River just downstream from  
Gazaria, 27 Oct. 1977, W. J. Rainboth et al.

INDIA. BMNH 1889.2.1:2337–2346 (17, 22–35 mm), Allahabad, F. Day. CAS 96626 (1, 47 mm, neotype of *Nangra nangra*), CAS 95568 (190, 37–52 mm), and SRS ZSI F.4846 (10, 37–55 mm), Ganges River at Patna, April–May 1996, T. R. Roberts.

DIAGNOSIS. — A medium-sized species of *Nangra*, reaching 55 mm. Dorsal fin typically with 8 branched rays. Snout moderately projecting; anterior naris origin close to snout tip (distance between anterior naris and snout tip less than eye diameter); nasal barbel extending posteriorly at least to end of head, sometimes reaching to dorsal-fin origin; maxillary barbel extending past adipose-fin origin; maxillary bone long, extending posteriorly almost to end of head; maxillary barbel membrane small, with narrow attachment to cheek only; vent opening directly to exterior. Vent and genital papillae near middle of pelvic fins.

COUNTS. — Dorsal fin with spinelet, spine and 8 (rarely 7 or 9) branched rays; pectoral fin with spine and 8 or 9 (modally 8) rays; anal fin with 3 or 4 simple rays and 9 to 11 (modally 9) branched rays. Vertebral column with 19 to 20 abdominal and 16 or 17 postabdominal vertebrae, total 35 to 37. First gill arch with 7 to 9 rakers.

DISTRIBUTION. — *Nangra nangra* is known from the Gangetic basin and the Indus River (Fig. 15). Mirza (1980) reported that this species was rare in the Punjab of Pakistan.

COMMENTS. — The identity of this species is somewhat problematic in light of conflicting information provided in Hamilton (1822), and the lack of type specimens. As mentioned earlier, Hamilton did not save any types, so we have tried to match Hamilton's description and illustration (Fig. 17) with one of the Gangetic species of *Nangra*. As mentioned in the account of *Nangra*

*carcharhinoides*, discrepancies exist between Hamilton's illustration and text in the number of branched dorsal-fin rays. We choose to associate the name *Pimelodus nangra* Hamilton with the one species that has eight dorsal-fin rays, which is arguably an observation directly made by Hamilton. We cannot know if the lesser number of rays in the illustration is real, or a mistake by the illustrator that went undetected by Hamilton. The decision to retain the name *N. nangra* for the eight-rayed species maintains the usage that has remained stable at least as far back as Day (1877), and continued by Hora and Law (1941) and more recent Indian workers. To maintain this stability, we have selected a specimen of this species (CAS 96626) as neotype for *Nangra nangra*.

Day (1877) proposed *Nangra buchani* as a substitute for *Pimelodus nangra* Hamilton, 1822, to avoid the tautonymy caused by his proposal to use *Nangra* as a generic name. It appears not to be a strict replacement name, and specimens from the several localities mentioned in the account must be considered syntypes of *N. buchani*. Although we have not been able to examine any of these syntypes, Day's (1877) illustration and description are clearly that of *Nangra nangra*.

***Nangra ornata* new species**  
(Fig. 19)

Holotype: UMMZ 233236 (37 mm), BANGLADESH: Gowain River and Khal at Gowainghat, northern Sylhet province (Surma or Meghna watershed), 21 February 1978, W. J. Rainboth and A. K. Ataur Rahman.

Paratypes: UMMZ 208746 (5, 25–34 mm), collected with the holotype.



FIGURE 19. *Nangra ornata* new species, holotype, 37 mm, UMMZ 233236; Bangladesh, Sylhet Province, Gowain River and Khal at Gowainghat.

DIAGNOSIS. — A small species of *Nangra*, largest specimen only 37 mm. Eye relatively large, its diameter about equal to snout length; nasal barbel extends to just past posterior margin of orbit; maxillary barbel with broad membrane, barbel reaches to anal-fin origin; semicircular spot on middle of caudal-fin base, about equal to eye diameter; dark spot extending across bases of second through fifth branched dorsal-fin rays.

COUNTS. — Dorsal fin with spinelet, spine and 7 branched rays; pectoral fin with spine and 8 branched rays; anal fin with 4 or 5 simple and 8 or 9 branched, total 12–14 rays. Vertebral column with 19 or 20 abdominal and 16 or 17 postabdominal vertebrae, total 35 (rarely 36). First gill arch with 1 or 2 + 6 to 8 rakers, total 7–10.

DESCRIPTION. — Body elongate, slender; round in cross section at abdomen, progressively compressed posteriorly.

Dorsal-fin origin above distal fourth of adpressed pectoral fin, posterior insertion above pelvic-fin origin; fin with short spinelet preceding first fin ray; first ray stiffened for basal half, flexible distally and not prolonged into filament; fin margin straight or slightly convex, each ray slightly shorter than preceding ray; last fin ray without membranous attachment to body.

Interval between dorsal fin and adipose fin greater than length of dorsal-fin base; adipose fin approximately equal in size to anal fin; its origin above, or just anterior to anal-fin origin.

Caudal fin deeply forked, lobes pointed; outer principal rays more than twice length of middle rays; procurrent rays of upper and lower lobes symmetrical, not extending far anteriorly.

Anal-fin base short, approximately equal to that of adipose-fin base; first branched ray longest, fin margin slightly concave, last fin ray without membranous attachment to body.

Pelvic-fin origin at vertical through posterior insertion of dorsal fin; fin margin straight, rays of approximately equal length; adpressed fin not reaching anal fin origin.

Pectoral fin with stout spine; spine smooth anteriorly, but with 7 to 9 stout serrations on posterior margin; serrations progressively longer distally; fin margin straight or slightly convex, first ray longest; adpressed fin extending to vertical from base of second branched dorsal-fin ray.

Head bluntly conical, somewhat depressed dorsally and nearly flat ventrally; dorsal surface

of head with broad median groove, extending from snout to tip of occipital process; eye dorso-lateral, large; eye diameter approximately equals interorbital width, and nearly equals snout length; eye covered with thin skin, no free orbital margin.

Mouth inferior, near snout tip; oral opening entirely anterior to eye, curved slightly; upper lip absent; lower lip continuous with skin of underside of head, except at corners of mouth. Jaws with several rows of tiny teeth, teeth nearly indistinguishable from surrounding tissue; palatal tooth patch elongate, teeth irregularly placed.

Barbels in four pairs. Nasal barbel extends posteriorly to just past posterior margin of orbit. Maxillary barbel with broad sheet of membranous tissue along medial margin that extends to level of corner of mouth; membrane progressively more slender towards barbel tip; maxillary barbel reaches to anal-fin origin. Inner mental barbel originates just posterior to lower jaw and reaches to middle of pectoral-fin spine; outer mental barbel originates lateral and posterior to inner mental barbel and extends to level of tip of adpressed pectoral-fin spine.

Gill openings wide, branchiostegal membranes narrowly attached across isthmus. Vent situated between middle of adpressed pelvic fins. Skin of head and body covered with scattered, elongate, ridged or keeled tubercles; tubercles more abundant on dorsal surface of head and body, absent on ventral surface of abdomen.

COLORATION. — Head and body above lateral line covered with scattered dark flecks, concentrated middorsally on body and above pectoral fin; diffuse dark spot covers posterior extent of occipital process; pigmentation absent below lateral line and on lower half of head; barbels, pelvic fin, and anal fin without pigmentation; dorsal fin with pigment concentrated on lower 1/3 of second through fifth branched fin rays and, to a lesser extent, on intervening interradiial membranes; remainder of fin with little or no pigmentation; basal half of adipose fin with scattered pigmentation; caudal-fin base with dark semicircular spot extending across bases of all principal rays, covering basal third of middle rays, but not extending onto caudal peduncle; sparsely scattered pigmentation reaches distally approximately two-thirds length of caudal-fin rays, but absent from fin-ray tips and interradiial membranes; pectoral fin with scattered pigment on

dorsal surface of spine and basal parts of rays, interradiial membranes, distal parts of rays and ventral surface clear.

**DISTRIBUTION.** — *Nangra ornata* is known only from the type locality in the Surma or Meghna watershed in northeastern Bangladesh (Fig. 15).

**COMMENTS.** — *Nangra ornata* is readily distinguished by two prominent features. It has the largest eye of any *Nangra*, orbit length approximately equal to that of the snout. In all other species, the eye diameter is more typically one-half to one-third the snout length. The dorsal fin of *N. ornata* is unique in having a dark spot at the base of middle rays.

**ETYMOLOGY.** — From *ornatus*, Latin for decorate or embellish, in reference to the bold spots on the caudal peduncle and the dorsal-fin base.

### ***Nangra robusta* Mirza and Awan, 1973**

*Nangra robusta* Mirza and Awan 1973:145, fig. 1 (type locality: Indus River at Jinnah Barrage near Kalabagh, Pakistan).

**MATERIAL EXAMINED.** — None.

**DIAGNOSIS** (after Mirza and Awan). — A relatively large species, attaining 100 mm. Dorsal and pectoral-fin spines with filamentous projections. Snout strongly projecting. Nasal barbel extending to eye; maxillary barbel reaching to anal fin.

**COUNTS.** — Dorsal fin with spinelet, spine and 7 branched rays; pectoral fin with spine and 10 or 11 branched rays; anal fin with 2 simple rays and 8 branched rays (counts from Mirza and Awan, gill rakers and vertebrae not reported).

**DISTRIBUTION.** — This species is reported from the Indus River of Pakistan (Fig. 15), where it is considered to be rare (Mirza, 1980).

**COMMENTS.** — *Nangra robusta* is similar to our new species, *Nangra carcharhinoides*, both in overall appearance and in size. None of the other species of *Nangra* reach the 90 to 100 mm size attained by these two species. All specimens of *N. carcharhinoides* examined by us have only 6 branched dorsal fin rays and 8 branched pectoral fin rays. These are consistently different from the 7 dorsal rays and 10 or 11 pectoral rays reported by Mirza and Awan (1983). These dif-

ferences, in combination with the more slender body of *N. carcharhinoides*, and the disjunct distribution of the two forms, lead us to consider them as separate species.

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