PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES

Volume 52, No. 11, pp. 125–142, 12 figs. DEC 11 2000 December 7, 2000

A Review of the Genus *Hemibagrus* in Southern Asia, with Descriptions of Two New Species

by

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The species of the southern Asian bagrid catfish genus *Hemibagrus* are reviewed in this study. Five previously-named species are recognized as valid: *Hemibagrus maydelli* (Rössel, 1964), *H. menoda* (Hamilton, 1822), *H. microphthalmus* (Day, 1877), *H. peguensis* (Boulenger, 1894) and *H. punctatus* (Jerdon, 1849). Two additional species, *H. imbrifer* and *H. variegatus*, from the Salween and Tenasserim River drainages, respectively, are described here as new. The status of controversial names *Pimelodus menoda* Hamilton, 1822, and *Bagrus corsula* Valenciennes, 1840, are stabilized with the designation of a single neotype for both names.

Bleeker (1862) established the genus *Hemibagrus* for a group of bagrid catfishes characterized by having a depressed head, rugose head shield not covered by skin, slender occipital process, and moderately long adipose fin. However, workers since Günther (1864) have placed species of this genus in either *Mystus* Scopoli, 1777, or *Macrones* Dumeril, 1856, and it was not until Mo's (1991) phylogenetic study of the Bagridae that the genus was considered distinct from *Mystus*.

In much of southern Asia (defined in this study as consisting of the Indian subcontinent and Myanmar west of the Tenasserim and Salween River drainages) and particularly in India, *Hemibagrus* species appear to be less common than in Southeast Asia, inasmuch as they are less frequently encountered in markets, certainly less so than other genera of large bagrid catfishes, such as *Sperata* and *Rita*. In this study, the taxonomy of the southern Asian species of *Hemibagrus* is reviewed and seven valid species, two of which are new and described herein, are recognised.

Materials and Methods

Measurements were made point to point with dial calipers and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of specimens whenever possible. Subunits of the head are presented as percent of head length (HL). Head length and measurements of body parts are given as percent of standard length (SL). Measurements and counts were made following Ng and Ng (1995) with the following exceptions: head length is measured from the tip of the snout to the

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posteriormost extremity of fleshy opercular flap. Length of the adipose-fin base is measured from the anteriormost point of origin to the posteriormost point of the adipose-fin base. Post-adipose distance is measured from the posteriormost point of the adipose-fin base to the posterior margin of the hypural complex.

The following additional measurements were made: predorsal, preanal, prepelvic and prepectoral lengths are those measured from the tip of the snout to the anterior bases of the dorsal, anal, pelvic, and pectoral fins, respectively. Pelvic- and pectoral-fin lengths are measured from the origin to the tip of the longest ray. Dorsal and pectoral spine lengths are measured from the base to the tip. Dorsal to adipose distance is measured from the base of the last dorsal-fin ray to the origin of the adipose fin. Caudal-fin length is the length of the longest ray of the lower lobe measured from the posterior margin of the hypural complex. The length of the caudal peduncle is measured from base of the last anal-fin ray to the posterior margin of the hypural complex. Nasal-, maxillary-, and mandibular-barbel lengths are measured from the base to the tip.

Fin-ray counts were obtained under a binocular dissecting microscope using transmitted light. Vertebral counts were taken from radiographs. Following the method of Roberts (1994), the first vertebra bearing fully-developed ribs was counted as vertebra 6, and the first postanal vertebra is taken to be the anteriormost vertebra having its hemal spine posterior to the anteriormost anal-fin pterygiophore. The number in parentheses following a particular count indicates the number of examined specimens with that count. Drawings of the specimens were made with a Nikon SMZ-10 camera lucida. Institutional codes for the repositories of specimens follow Eschmeyer (1998).

Systematic Accounts

Hemibagrus imbrifer **sp. nov.**
Fig. 1

Type Material. — Holotype: ZRC 45406, 186.6 mm SL; Thailand, Tak Province, Salween basin, Mae Nam Moei at Ban Wa Le (16°17′24″N, 98°42′21″E); K. Kubota, Apr 1998. Paratype: CMK 13445 (1, 144.2 mm SL), Thailand, Tak Province, Salween basin, Mae Nam Moei at Na Rei (16°17′23″N, 98°42′20″E); K. Kubota, Mar 1997.

Diagnosis. — *Hemibagrus imbrifer* can be distinguished from its congeners in having relatively large sensory pores arranged in vertical columns along the sides of the body and the following unique combination of characters: length of caudal peduncle 18.8–19.5 %SL, interorbital distance 31.7–32.3 %HL, eye diameter 17.3–18.5 %HL, 48 vertebrae (with 24 postanal vertebrae) and 14 gill rakers on the first gill arch.

Description. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. Adipose fin with long base, spanning most of postdorsal distance. Sensory pores of lateral line system readily visible, arranged in nine vertical columns on sides of body. In %SL: head length 26.6–28.4, head width 18.8–20.0, head depth 13.0–13.1, predorsal distance 38.8–39.2, preanal length 68.4–70.6, prepelvic length 51.0–51.5, prepectoral length 23.7–24.5, body depth at anus 14.4–14.9, length of caudal peduncle 18.8–19.5, depth of caudal peduncle 9.8–11.1, pectoral-spine length 12.2–12.3, pectoral-fin length 16.6, dorsal-spine length 11.7–12.5, length of dorsal fin 22.6–23.5, length of dorsal-fin base 14.4–16.9, pelvic-fin length 14.6–15.5, length of anal-fin base 11.1–13.2, caudal-fin length 19.7–21.6, length of adipose-fin base 38.4–44.2, adipose-fin maximum height 4.2–5.5, post-adipose distance 8.1–10.1; in %HL: snout length 39.3–39.8, interorbital distance 31.7–32.3, eye diameter 17.3–18.5, nasal barbel length 41.3–41.7, maxillary barbel length 175.4–211.7, inner mandibular barbel length 48.8–52.0, outer mandibular barbel length 85.4–88.1.

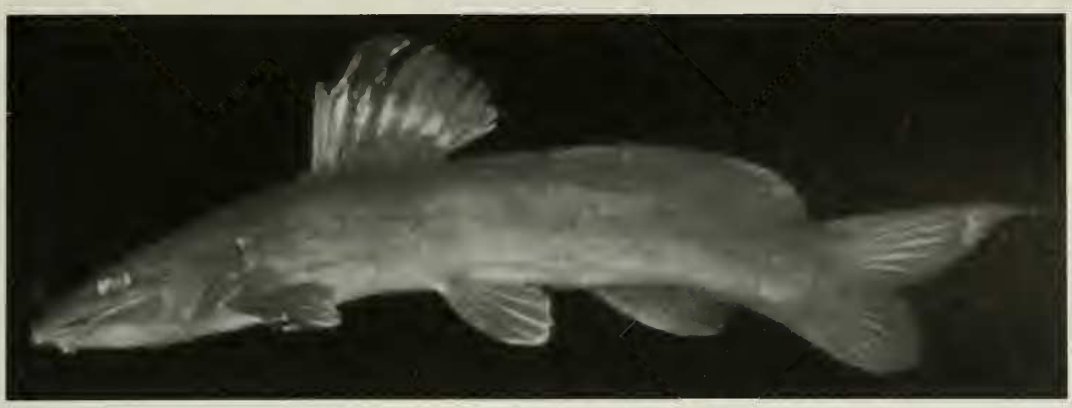

FIGURE 1. *Hemibagrus imbrifer*, ZRC 45406, holotype, 186.6 mm SL; Thailand: Mae Nam Moei.

Branchiostegal rays 10 (1) or 11 (1). Gill rakers 3 + 11 = 14 (1). Vertebrae 26 + 21 = 47 (1) or 26 + 22 = 48 (1).

Fin ray counts: dorsal II,7 (2); pectoral I,10 (1) or I,10,i (1); pelvic i,5 (2); anal iv,8 (1) or iv,8,i (1); caudal i,7,7,i (1) or i,7,8,i (1). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, without serrations on posterior edge. Pectoral spine stout, with 12–13 large serrations on posterior edge. Caudal fin forked; distal margins of upper and lower lobes rounded.

COLOR. — Dorsal surface of head and body uniform gray; ventral surfaces of head and body dirty white; adipose fin gray, distal edge fading to light gray; caudal and anal fins gray, with melanophores more dense on the fin rays. Distal two-thirds of pectoral and pelvic fins gray, with melanophores more dense on fin rays and proximal third dirty white.

ETYMOLOGY. — From the Latin *imbrifer*, meaning rainy. In allusion to the pattern of the sensory pores being arranged in vertical columns on the sides of the body.

DISTRIBUTION. — Known only from the Salween River drainage (Fig. 2).

REMARKS. — *Hemibagrus imbrifer* can be differentiated from its congeners in having relatively large sensory pores of the lateral line system arranged in vertical columns along the sides of the body. No other species of *Hemibagrus* have the sensory pores of the lateral line system so obviously visible. Furthermore, *H. imbrifer* is one of the only two known species of southern Asian *Hemibagrus* (the other being *H. variegatus*) which has a long-based adipose fin spanning nearly all of the postdorsal distance. *Hemibagrus olyroides* from Borneo and all East Asian species allied with *H. guttatus* have similar long-based adipose fins, but can be differentiated from *H. imbrifer* in having more vertebrae (52–60 vs. 47–48). *Hemibagrus baramensis* and *H. sabanus* (both from Borneo) also have long-based adipose fins with a relatively low vertebral count (44–47), but can be differentiated from *H. imbrifer* in lacking the readily-visible sensory pores arranged in vertical columns. *Hemibagrus imbrifer* can be differentiated from *H. variegatus* in having a shorter caudal peduncle (18.8–19.5 %SL vs. 20.2%SL) with fewer postanal vertebrae (21–22 vs. 24), smaller eyes (17.3–18.5 %HL vs. 23.1%HL), a larger interorbital distance (31.7–32.3 %HL vs. 28.6%HL), fewer gill rakers (14 vs. 21), and a gray body with the sensory pores plainly visible (vs. a variegated brown body with the sensory pores not readily apparent).

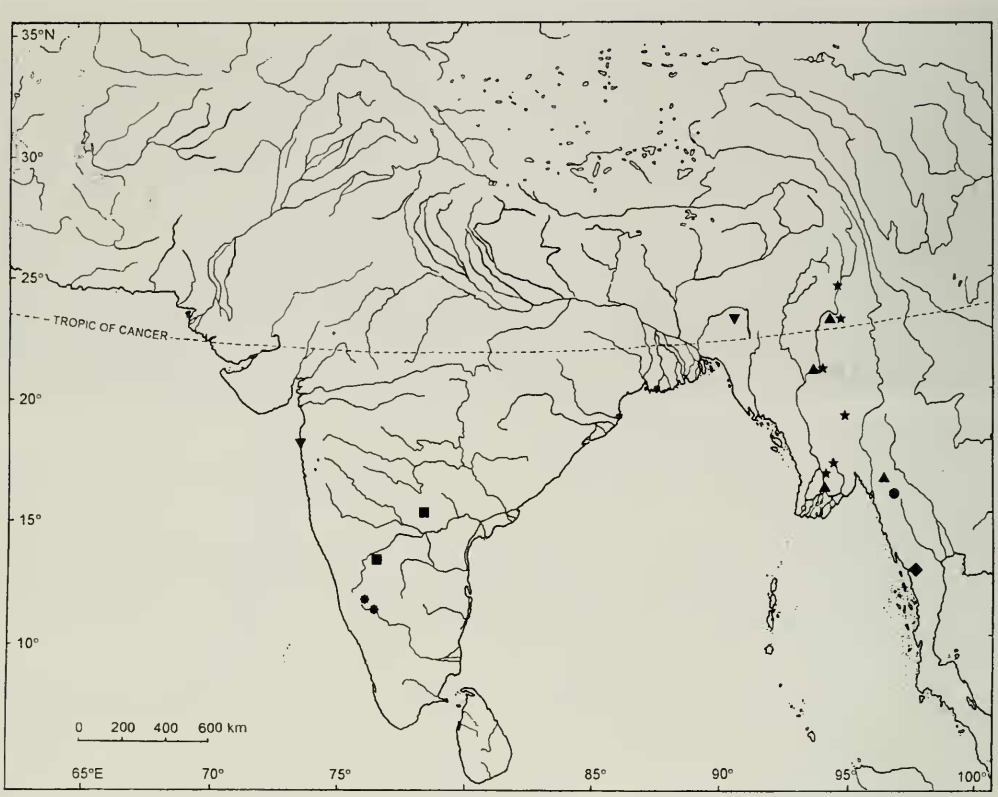

FIGURE 2. Map of southern Asia showing the distribution of *Hemibagrus* species: *H. imbrifer* (●); *H. maydelli* (■), *H. menoda* (▼); *H. microphthalmus* (▲); *H. peguensis* (★); *H. punctatus* (✱) and *H. variegatus* (◆).

Hemibagrus maydelli (Rössel, 1964)
Fig. 3

Mystus maydelli Rössel, 1964:149, fig. 1; Wilkens 1977:159.
Mystus sp. – Govind and Rajagopal, 1975:79.
Mystus malabaricus (in part) – Jayaram, 1977:32; Talwar and Jhingran, 1991:564.
Mystus krishnensis Ramakrishniah, 1988:139, figs. 1–2; Talwar and Jhingran, 1991:563; Jayaram, 1995:97, 105, 108.
Mystus punctatus (non Jerdon) – Barman, 1993:225, fig. 96.
Hemibagrus maydelli – Grant, 1999:172, fig. 2.

DIAGNOSIS. — *Hemibagrus maydelli* can be differentiated from its congeners by a unique combination of the following characters: head length 30.8–32.4 %SL, length of caudal peduncle 15.3–16.1 %SL, depth of caudal peduncle 7.8–8.5 %SL, dorsal to adipose distance 4.0–7.0 %SL, eye diameter 11.5–12.3 %HL, 52 vertebrae, and olive green body with orange fins.

DESCRIPTION. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. Head extremely depressed. In %SL: head length 30.8–32.4, head width 18.9–20.5, head depth 11.7–13.3, predorsal distance 42.0–46.7, preanal length 71.1–73.8, prepelvic length 54.8–58.8, prepectoral length 25.4–28.7, body depth at anus 13.0–15.6, length of caudal

FIGURE 3. *Hemibagrus maydelli*, CAS 62087, 167.2 mm SL; India: Tungabahdra River.

peduncle 15.3–16.1, depth of caudal peduncle 7.8–8.5, pectoral-spine length 13.6–15.3, pectoral-fin length 17.1–19.1, dorsal-spine length 11.4–12.9, length of dorsal fin 24.4–27.3, length of dorsal-fin base 14.4–15.2, pelvic-fin length 13.9–15.5, length of anal-fin base 10.7–13.1, caudal-fin length 19.7–23.2, length of adipose-fin base 14.3–20.3, adipose-fin maximum height 4.0–5.1, post-adipose distance 14.1–14.6, dorsal to adipose distance 4.0–7.0; in %HL: snout length 31.1–35.2, interorbital distance 28.6–29.9, eye diameter 11.5–12.3, nasal barbel length 31.9–35.4, maxillary barbel length 237.6–298.9, inner mandibular barbel length 44.1–48.9, outer mandibular barbel length 78.2–93.9. Branchiostegal rays 9 (6). Gill rakers 3 + 9 = 12 (1). Vertebrae 27 + 25 = 52 (2).

Fin ray counts: dorsal II,7 (6); pectoral I,7 (1), I,8 (1) or I,9 (4); pelvic i,5 (6); anal iv,8 (3), v,8 (2) or iv,10 (1); caudal i,7,8,i (6). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, without distinct serrations on posterior edge. Pectoral spine stout, with 13–19 serrations on posterior edge. Caudal fin forked; first principal ray of upper lobe extending into a long filament; distal margin of upper and lower lobes rounded.

COLOR. — Preserved specimens have dorsal surface of head and body brown, gradually fading to dirty white on ventral surface. Pectoral, pelvic, anal and caudal fins brown with melanophores concentrated in interradial membranes. Dorsal fin brown with melanophores evenly distributed. Live specimens are olive green in color with orange-tipped fins (after Ramakrishniah 1988).

DISTRIBUTION. — Known only from the middle reaches of the Krishna River drainage in southern India (Fig. 2).

REMARKS. — *Hemibagrus maydelli* can be differentiated from all other species of *Hemibagrus* on the Indian subcontinent in having more vertebrae (52 vs. 44–46). In its general morphology, *H. maydelli* resembles both *H. microphthalmus* and *H. wyckioides* in having a strongly depressed head. It can be differentiated from both species in having a shorter distance between the dorsal and adipose fins (4.0–7.0 %SL vs. 8.6–14.2%SL), larger eyes (eye diameter 11.5–12.3 %HL vs. 8.4–11.6%HL), and an olive green body with orange fins (vs. gray body with red fins). *Hemibagrus maydelli* can be further differentiated from *H. microphthalmus* in having a shorter and deeper caudal peduncle (length of caudal peduncle 15.3–16.1 %SL vs. 16.4–18.1 %SL, depth of caudal peduncle 7.8–8.5 %SL vs. 6.8–7.7 %SL), a longer head (30.8–32.4 %SL vs. vs. 29.4–31.0 %SL).

Govind and Rajagopal (1975) reported the occurrence of *H. maydelli* from the Tungabahdra River as an unidentified the species of *Mystus*, stating that it resembled *H. punctatus* and further studies were needed to clarify its identity. Barman (1993) then erroneously considered *H. punctatus* to be present in the Krishna River drainage (*H. punctatus* is only known from the Cauvery River drainage further south), basing his record on that of Govind and Rajagopal (1975). *Hemibagrus maydelli* is a relatively large species that grows up to 1650 mm TL and 58.5 kg in weight (Govind and Rajagopal 1975; Jayaram 1995).

MATERIAL EXAMINED. — ZMH 2180 (1), holotype, 82.0 mm SL; India: Maharashtra state, Bhima River at Wadgaon; Maydell, 1955 (photograph and radiograph examined). ZSI FF2532, 271.8 mm SL; India: Andhra Pradesh State, Krishna River below Nagarjunasagar Reservoir; M. Ramakrishniah, 10 Feb 1982 (holotype of *Mystus krishnensis*). ZSI FF 2533 (1, 402.6 mm SL), locality as for ZSI FF2532; M. Ramakrishniah, 9 Mar 1983 (paratype of *Mystus krishnensis*). ZSI FF 2534 (1, 228.0 mm SL), locality as for ZSI FF2532; M. Ramakrishniah, 29 Jan 1985 (paratype of *Mystus krishnensis*). ZSI FF 2535 (1, 278.8 mm SL), locality as for ZSI FF2532; M. Ramakrishniah, 14 Dec 1980 (paratype of *Mystus krishnensis*). CAS 62087 (2, 167.2–214.7 mm SL), India, Karnataka State, Bellary District, Krishna River basin, Tungabahdra River and reservoir at Hospet, Hampi and Kampli; T. R. Roberts, 28 Jan–3 Feb 1985.

***Hemibagrus menoda* (Hamilton, 1822)**
Figs. 4, 5

Pimelodus menoda Hamilton, 1822:203, pl. 1 fig. 72 (figure erroneously labelled *Mugil corsula*; see below for explanation).
Bagrus trachacanthus Valenciennes, in Cuvier and Valenciennes, 1840:419; Bleeker, 1853:56.
Bagrus corsula Valenciennes, in Cuvier and Valenciennes, 1840:408; Bleeker, 1853:56.
Macrones menoda – Günther, 1864:74; Day, 1871b:706 (in part).
Macrones trachacanthus – Günther, 1864:75.
Macrones corsula – Day, 1869:307; 1877:446, pl. 100 fig. 5; 1889:153 (in part).
Mystus menoda – Shaw and Shebbeare, 1937:92, fig. 91; Jayaram and Singh, 1977:263; Menon, 1977:61; Ataur Rahman, 1974:7, 1989:199, fig. 119D; Shrestha. 1994:52, fig. 80.
Mystus (*Mystus*) *menoda* (in part) – Jayaram, 1954:546, fig. 9.
Mystus (*Mystus*) *menoda trachacanthus* – Jayaram, 1954:546.
Mystus (*Mystus*) *punctatus* (in part) – Jayaram, 1954:547.
Mystus (*Mystus*) *menoda* – Motwani et al., 1962:21; Srivastava, 1968:73, fig. 46.
Mystus corsula – Qureshi, 1965:42, fig. 103.
Mystus menoda menoda – Jayaram, 1977:33, fig. 25B (in part); Sen, 1985:137, fig. 75; 1992:183, fig. 60; Dutta et al., 1993:26.
Mystus menoda trachacanthus – Jayaram, 1977:33; Singh and Yazdani, 1993:21.
Mystus trachacanthus – Mo, 1991:130.
Hemibagrus menoda – Mo, 1991:132.

DIAGNOSIS. — *Hemibagrus menoda* can be differentiated from its congeners by the following unique combination of characters: head length 32.7–33.5 %SL, head depth 14.2–15.3 %SL, depth of caudal peduncle 7.5–8.8 %SL, eye diameter 11.9–12.3 %HL, a pattern of dark dots arranged in vertical columns on the sides of the body, a convex snout and a broad, shallowly incised humeral process.

DESCRIPTION. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. In %SL: head length 32.7–33.5, head width 19.3–21.7, head depth 14.2–15.3, predorsal distance 42.2–45.3, preanal length 71.2–77.5, prepelvic length 55.0–60.5, prepectoral length 28.6–30.3, body depth at anus 13.3–17.1, length of caudal peduncle 15.2–17.0, depth of caudal peduncle 7.5–8.8, pectoral-spine length 14.6–19.9, pectoral-fin length 18.6–24.0, dorsal-spine length 13.7–16.6, length of dorsal fin 24.3–27.4, length of dorsal-fin base 14.2–16.5, pelvic-fin length 14.7–16.1, length of anal-fin base 11.9–12.6, caudal-fin length 22.8–24.8, length of adipose-fin base 13.0–15.8, adipose-fin maximum height 3.8–4.5, post-adipose distance 15.0–17.4, dorsal to adipose distance 14.2–14.9; in %HL: snout length 36.2–38.8, interorbital distance 31.4–35.1, eye diameter 11.9–12.3, nasal barbel length 26.4–37.8, maxillary barbel length 191.4–213.3, inner mandibular bar-

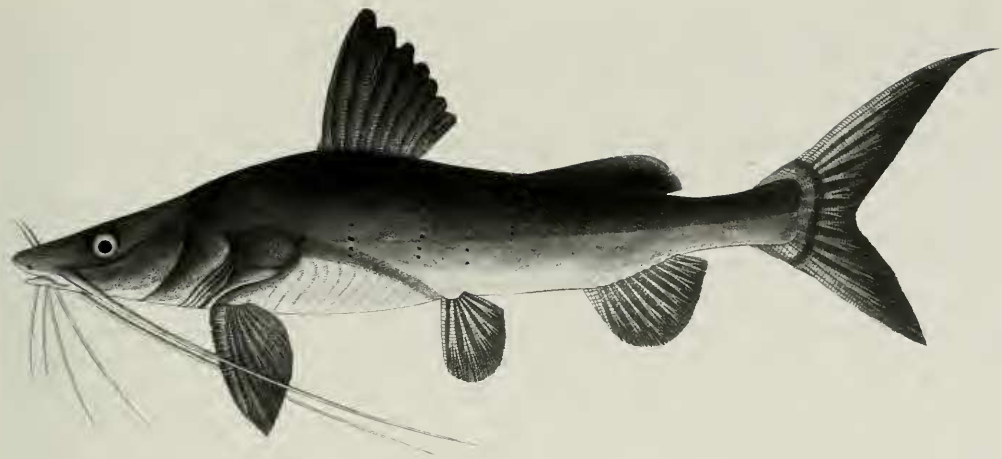

FIGURE 4. *Hemibagrus menoda*, illustration from Hamilton (1822), pl. 1, fig. 72.

bel length 36.8–48.1, outer mandibular barbel length 65.2–73.5. Branchiostegal rays 10 (2) or 11 (1). Gill rakers 3 + 9 = 12 (1) or 4 + 14 = 18 (1). Vertebrae 22 + 22 = 44 (1) or 24 + 21 = 45 (1).

Fin ray counts: dorsal II,7 (4); pectoral I,7 (2) or I,8 (2); pelvic i,5 (4); anal iv,8 (2), iii,9 (1) or iv,9 (1); caudal i,7,8,i (4). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, with 6–9 serrations on posterior edge. Pectoral spine stout, with 11–17 serrations on posterior edge. Caudal fin forked; distal margins of upper and lower lobes rounded.

COLOR. — Preserved specimens have dorsal surface of head and body grayish-brown, gradually fading to dirty white on ventral surface. Lateral surface of body with about nine vertical columns of

FIGURE 5. *Hemibagrus menoda*, neotype, UMMZ 208726, 202.6 mm SL; Bangladesh: Shari River.

black spots, largest spots being those in middle of columns along lateral line. Dorsal, pectoral, pelvic, and anal fins grayish brown, with scattered melanophores on fin rays and interradial membranes. Caudal fin grayish brown, with lighter hue along posterior margin, and on procurrent and outer principal caudal rays.

DISTRIBUTION. — Known from the Ganges, Brahmaputra, Mahanadi and Godavari river drainages in Bangladesh and northern India (Fig. 2).

REMARKS. — As indicated by the extensive synonymy of this species, the identity of *H. menoda* has been problematic. This is due, in large part, to the brief and vague original description in Hamilton (1822) and confusion over the significance of an illustration in that publication. The illustration in question, Plate 1 (Fig. 72), includes a lateral view of a catfish identified as "*Mugil corsula.*" A tipped-in corrigenda in one copy of Hamilton (1822) at the California Academy of Sciences includes the following statement: "For *Mugil Corsula* read *Pimelodus*, the *Mugil Corsula* being delineated Plate IX, Fig. 97." This sentence has been interpreted by several authors (e.g., Valenciennes, in Cuvier and Valenciennes, 1840 and Day, 1877) to mean that the name for the fish should be *Pimelodus corsula*, a name that is otherwise not mentioned in Hamilton's book. By examining the original drawings from which the plates of Hamilton (1822) were made, Day (1871a) found the names *Pimelodus menoda* and *P. telgagra* associated with the figure labeled as drawing no. 18, which was later published as Plate 1 (Fig. 72). On this basis, he later (Day 1877) placed the name *Pimelodus menoda* Hamilton in the synonymy of *Pimelodus corsula*. Somewhat later, Hora (1929) examined a duplicate set of drawings prepared for Hamilton and noted that the drawing that formed the basis of Plate 1 (Fig. 72) was identified as *Pimelodes telagra menoda*. On the basis of that drawing, Hora also concluded that the fish illustrated in Plate 1 (Fig. 72) was *Pimelodus menoda* Hamilton. Following Hora, most Indian ichthyologists have used the name *Macrones menoda*, or *Mystus menoda*, for the species that is represented in Hamilton's Plate 1 (Fig. 72). However, Valenciennes (in Cuvier and Valenciennes 1840) had previously attempted to match that illustration with one of the species described in Hamilton's text. Valenciennes concluded that the description of only one species, *Pimelodus carcio*, resembled the illustration to any degree. Even so, the description was considered sufficiently different such that Valenciennes chose not to associate the name with the figure and, instead, adopted the name *Bagrus corsula* for the illustrated species.

It is generally recognized that Hamilton did not retain specimens. Therefore, the identity of Hamilton's *Pimelodus menoda* and the relationship between that name and Plate 1 (Fig. 72) remains open to question. In order to stabilize the name *Hemibagrus menoda* (Hamilton), we believe it necessary to name a neotype for *Pimelodus menoda* and, in keeping with the current use of the name, we designate UMMZ 208726 as neotype. To further stabilize the nomenclature of this group, we choose the same specimen as the neotype of *Bagrus corsula* Valenciennes, a species name based only on Hamilton's Plate 1 (Fig. 72). By this action, *Bagrus corsula* becomes an objective junior synonym of *Pimelodus menoda*.

Hemibagrus menoda differs from all other species of *Hemibagrus* except *H. peguensis* in having a pattern of dark dots arranged in vertical columns on the sides of the body. *Hemibagrus menoda* differs from *H. peguensis* in having a longer head (32.7–33.5 %SL vs. 29.0–32.5 %SL), a more convex snout (Fig. 6) and a broader, less deeply incised humeral process (Fig. 7). *Hemibagrus menoda* is found only in the river drainages in Bangladesh and northern India. All records of *H. menoda* from Myanmar refer to *H. peguensis* instead.

MATERIAL EXAMINED. — NEOTYPE: UMMZ 208726, 202.6 mm SL; Bangladesh: Surma (Meghna) drainage, Sharighat bazaar, 22 miles NE of Sylhet on Sylhet-Shillong highway (said to be from Shari River); W. J. Rainboth and A. Rahman, 20 Feb 1978. Other material: ANSP 85796 (1, 113.0 mm SL), India, Bombay; Bombay Natural History Society, 1923. MNHN 1191 (1, 285.4 mm SL syntype of *Bagrus trachacanthus*), India, Bengal, A. Duvaucel, date unknown. ZSI 426 (1, 167.2 mm SL), India, Bombay: F. Day collection.

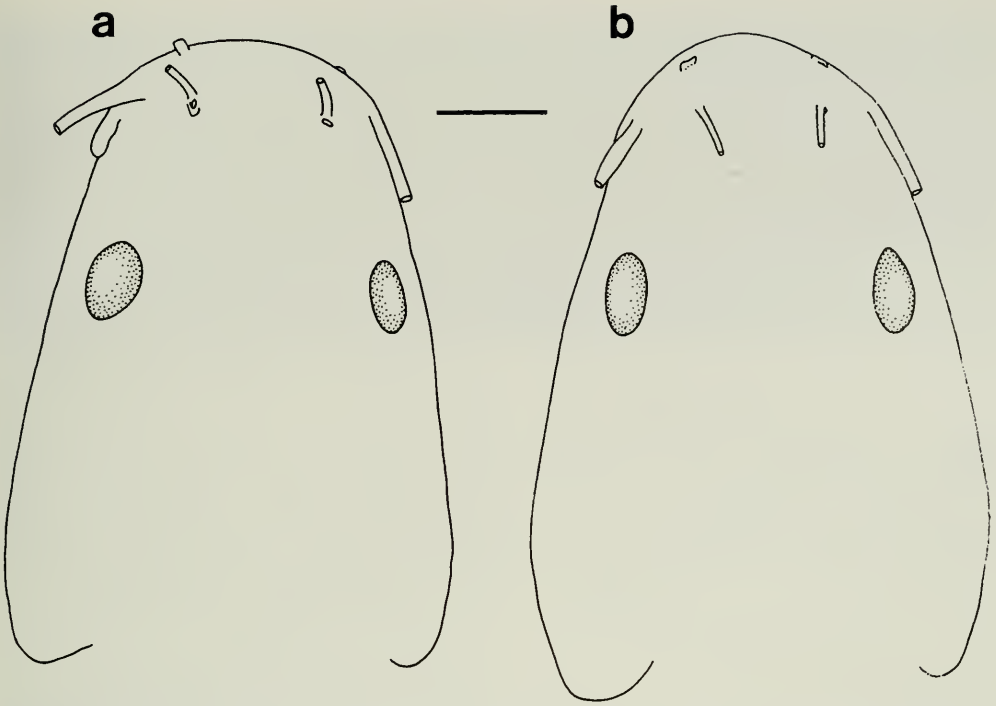

FIGURE 6. Dorsal views of heads of: a. *Hemibagrus peguensis*, CAS 133789, 212.7 mm SL; b. *H. menoda*, UMMZ 208726, 202.6 mm SL.

***Hemibagrus microphthalmus* (Day, 1877)**
Fig. 8

Macrones microphthalmus Day, 1877:446, pl. 100 fig. 4; 1889:154; Vinciguerra, 1890:225.
Mystus (Mystus) menoda microphthalmus – Jayaram, 1954:547.
Mystus microphthalmus – Tint Hlaing, 1971:513; Jayaram, 1977:34; Viswanath and Singh, 1986:197, fig. 1; Mo, 1991:130; Talwar and Jhingran, 1991:566.
Hemibagrus micropthalmus – Ukkatawewat and Vidthayanon, 1998:46.

DIAGNOSIS. — *Hemibagrus microphthalmus* can be differentiated from its congeners by a unique combination of the following characters: length of dorsal-fin base 13.7–16.7 %SL, dorsal to adipose distance 8.6–14.2 %SL, interorbital distance 28.4–31.8 %HL, eye diameter 9.2–11.3 %HL and a rounded snout.

DESCRIPTION. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. Head extremely depressed. In %SL: head length 29.4–31.0, head width 18.0–19.7, head depth 11.2–14.0, predorsal distance 40.6–44.1, preanal length 70.8–74.8, prepelvic length 53.2–55.9, prepectoral length 25.5–28.9, body depth at anus 10.2–14.5, length of caudal peduncle 16.4–18.1, depth of caudal peduncle 6.8–7.7, pectoral-spine length 11.0–14.1, pectoral-fin length 13.9–17.6, dorsal-spine length 9.2–10.8, length of dorsal fin 23.0–25.5, length of dorsal-fin base 13.7–16.7, pelvic-fin length 13.1–15.4, length of anal-fin base 11.2–13.3, caudal-fin length 19.8–23.5, length of adipose-fin base 18.4–25.9, adipose-fin maximum height 4.2–5.8, post-adipose distance 13.4–16.1, dorsal to adipose distance 8.6–14.2; in %HL: snout length 32.9–34.7, interorbital

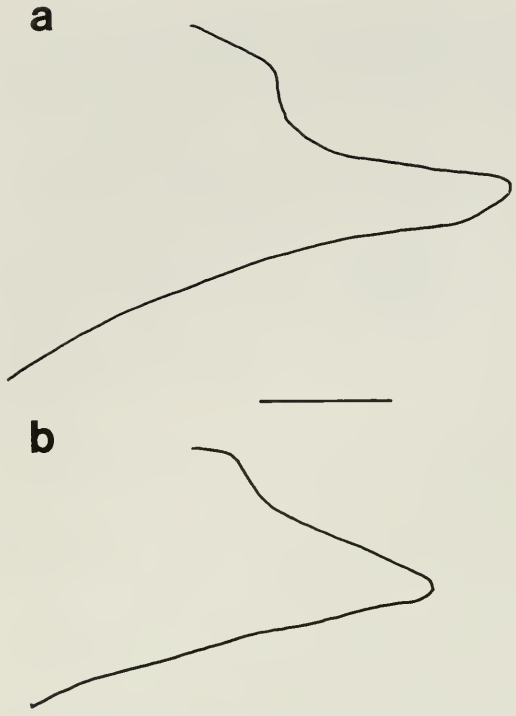

FIGURE 7. Humeral processes of: a. *Hemibagrus menoda*, UMMZ 208726, 202.6 mm SL; b. *H. peguensis*, CAS 89005, 261.9 mm SL.

distance 28.4–31.8, eye diameter 9.2–11.3, nasal barbel length 24.5–35.3, maxillary barbel length 256.4–300.6, inner mandibular barbel length 36.0–57.6, outer mandibular barbel length 65.8–97.2. Branchiostegal rays 9 (3) or 10 (8). Gill rakers 2 + 9 = 11 (1), 2 + 10 = 12 (2), 3 + 7 = 10 (1) or 3 + 9 = 12 (1). Vertebrae 26 + 25 = 51 (1), 28 + 23 = 51 (1), 28 + 24 = 52 (2), 28 + 25 = 53 (2), 29 + 25 = 54 (1) or 30 + 24 = 54 (1).

Fin ray counts: dorsal II,7 (11); pectoral I,7 (1), I,7,i (1), I,8 (1), I,8,i (1), I,9 (4) or I,9,i (3); pelvic i,5 (11); anal iv,8 (6), iii,9 (1) or iv,9 (4); caudal i,7,8,i (11). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, without distinct serrations on posterior edge. Pectoral spine stout, with 9–10 serrations on posterior edge. Caudal fin forked; distal margins of upper and lower lobes rounded.

COLOR. — Preserved specimens with dorsal surface of head and body uniform gray (live or freshly-dead specimens generally darker, fading on preservation); ventral surfaces of head and body dirty white; adipose fin gray, distal edge orange in life but fading to light gray on preservation; caudal fin red in life, fading to gray with very light gray procurrent and outer principal caudal-rays on preservation; all other fins gray with distal portions of fin rays and inter-radial membranes red in life, fading to light gray on preservation. Maxillary barbel white.

DISTRIBUTION. — Known from the Salween River of Thailand, Irrawaddy and Sittang drainages in Myanmar and the Manipur drainage in India (Fig. 2).

REMARKS. — *Hemibagrus microphthalmus* is similar in form and coloration to *H. wyckioides*. In recent years, Roberts (1993) and Roberts and Warren (1994) have considered the latter species a junior synonym of *H. microphthalmus*. However, as discussed in Ng and Rainboth (1999), the two species differ in the shape of their snouts: *H. microphthalmus* has a rounded snout while *H. wyckioides* has a truncate snout (Fig. 11). *Hemibagrus microphthalmus* also has a narrower head (18.0–19.7 %SL vs. 19.5–23.9 %SL), shorter dorsal-fin base (13.7–16.7 %SL vs.16.3–18.3 %SL) and more closely-set eyes (interorbital distance 28.4–31.8 %HL vs. 31.6–36.9 %HL) compared to *H. wyckioides*. Finally, the two species are geographically separate: *H. microphthalmus* is found only in the Salween, Irrawaddy, Sittang and Manipur drainages in Myanmar and India while *H. wyckioides* is only known from the Mekong and Chao Phraya drainages, and possibly the Mae Khlong drainage [reported by Roberts (1993) as *H. microphthalmus*, but we have not examined any specimen from the Mae Khlong to ascertain the exact identity of Roberts' record] in central Indochina.

MATERIAL EXAMINED. — AMS B.7918 (1, 164.0 mm SL syntype), and ZSI 2952 (1, 138.9 mm SL syntype), Burma: Irrawaddy River; F. Day, date unknown. BMNH 1893.2.16.7 (1, 133.5 mm SL). CAS 93192 (3, 132.0–151.5 mm SL), Myanmar: Irrawaddy River drainage, Mandalay markets; T. R. Roberts, Apr 1993. CMK 14706 (1, 204.6 mm SL), Thailand: Tak province, Mae Nam Moei at Mae Sarid (17°26′25″, 98°3′41″E); M. Kottelat and K. Kubota, 8 Apr 1998. NRM 13892 (1, 116.1 mm SL), Myanmar: Mandalay Division, Irrawaddy River drainage, Mandalay area; O. Hetzel, Apr 1935.

FIGURE 8. *Hemibagrus microphthalmus*, USNM 344670, 201.6 mm SL; Myanmar, Mandalay.

NRM 24979 (2, 144.6–165.1 mm SL), Myanmar: Sagaing Division, Irrawaddy River drainage, Shweli River; Maung Lu Daw, Feb 1935. NRM 31072 (1, 147.1 mm SL), Myanmar: Yangon Division, Yangon River at Yangon; R. Malaise, 30 Nov 1934. USNM 44754 (1, 158.7 mm SL), Myanmar: Irrawaddy River drainage, Mandalay; L. Fea, 1885–1889. USNM 344670 (2, 201.6–239.8 mm SL), Myanmar: Irrawaddy River drainage, Mandalay fish markets; C. J. Ferraris, D. Catania and U Myint Pe, 23 Apr 1996.

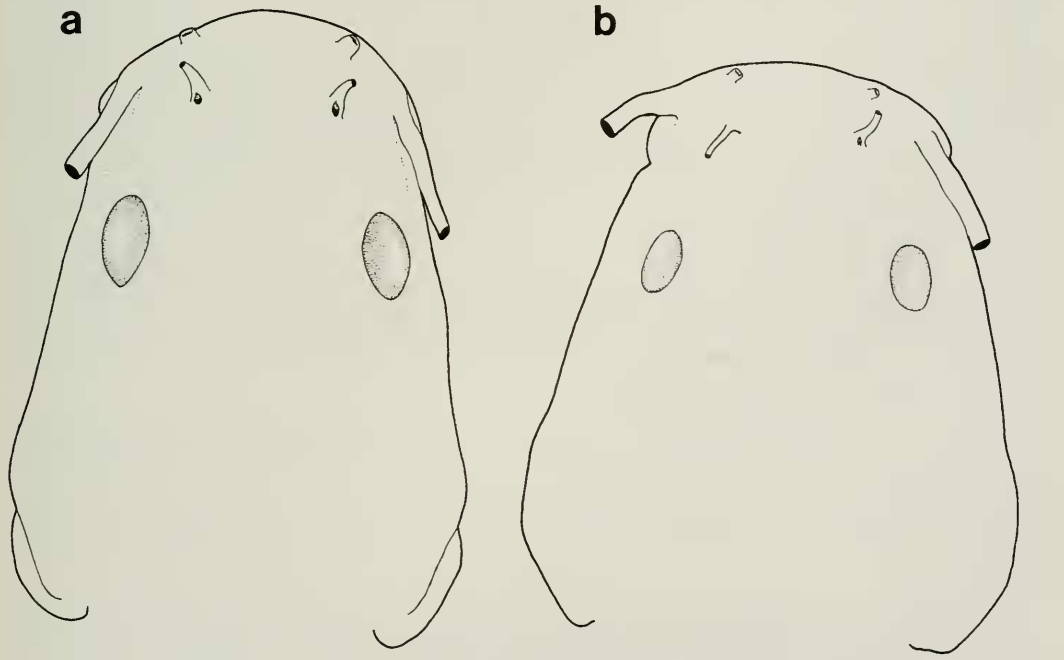

FIGURE 9. Dorsal views of heads of: a. *Hemibagrus microphthalmus*, NRM 13892, 116.1 mm SL; b. *H. wyckioides*, UMMZ 213974, 177.9 mm SL.

***Hemibagrus peguensis* (Boulenger, 1894)**
Fig. 10

Bagrus menoda (non Hamilton, 1822) – Blyth, 1860:285.
Macrones menoda (non Hamilton, 1822) – Day, 1871b:706 (in part); Vinciguerra, 1890:223.
Macrones corsula (non Hamilton, 1822) – Anderson, 1879:863; Kyaw Win, 1971:53, fig. 21.
Macrones peguensis Boulenger, 1894:196.
Mystus (*Mystus*) *menoda* (in part) – Jayaram, 1954:546.
Mystus (*Mystus*) *peguensis* – Jayaram, 1954:552.
Mystus menoda menoda (in part) – Jayaram, 1977:33.
Mystus peguensis – Jayaram, 1977:35; Talwar and Jhingran, 1991:569.
Hemibagrus peguensis – Mo, 1991:132.

DIAGNOSIS. — *Hemibagrus peguensis* can be differentiated from its congeners by a unique combination of the following characters: head length 29.0–32.5 %SL, a gently curving snout and a slender, deeply-incised humeral process, and nine vertical columns of black spots on the sides of the body.

DESCRIPTION. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. In %SL: head length 29.0–32.5, head width 18.8–21.7, head depth 12.9–15.2, predorsal distance 39.8–44.9, preanal length 70.6–74.0, prepelvic length 52.5–57.6, prepectoral length 25.4–30.8, body depth at anus 12.3–16.3, length of caudal peduncle 16.2–18.2, depth of caudal peduncle 7.6–8.8, pectoral-spine length 15.3–19.6, pectoral-fin length 18.2–20.9, dorsal-spine length 13.5–16.2, length of dorsal fin 23.8–27.8, length of dorsal-fin base 13.6–15.9, pelvic-fin length 13.3–15.5, length of anal-fin base 11.2–14.0, caudal-fin length 19.3–23.9, length of adipose-fin base 14.2–19.3, adipose-fin maximum height 3.7–4.9, post-adipose distance 15.4–17.4, dorsal to adipose distance 10.4–15.0; in %HL: snout length 36.3–39.9, interorbital distance 30.5–35.4, eye diameter 11.2–13.5, nasal barbel length 22.7–34.0, maxillary barbel length 160.6–212.6, inner mandibular barbel length 34.5–45.1, outer mandibular barbel length 57.4–70.2. Branchiostegal rays 9 (4) or 10 (13). Gill rakers 3 + 9 = 12 (2) or 4 + 8 = 12 (1). Vertebrae 23 + 21 = 44 (2), 24 + 20 = 44 (1), 23 + 22 = 45 (2) or 24 + 21 = 45 (4).

Fin ray counts: dorsal II,6 (1) or II,7 (16); pectoral I,8 (5), I,8,i (3), I,9 (5), I,9,i (3) or I,10 (1); pelvic i,5 (17); anal iv,6 (1), iv,7 (1), iii,8 (2), iv,8 (7), iii,9 (1), v,8 (2) or iv,9 (3); caudal i,7,8,i (17). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, with 6–11 serrations on posterior edge. Pectoral spine stout, with 15–19 serrations on posterior edge. Caudal fin forked; distal margins of upper and lower lobes rounded.

COLOR. — Preserved specimens with dorsal surface of head and body grayish brown, gradually fading to dirty white on ventral surface. Lateral surfaces of body with about nine vertical columns of black spots, largest spots being those in middle of columns, along the lateral line. Dorsal, pectoral, pelvic and anal fins grayish brown, with scattered melanophores on fin rays and interradial membranes. Caudal fin grayish brown, with lighter hue along posterior margin, and on procurrent and outer principal caudal rays.

DISTRIBUTION. — Known from the Irrawaddy, Sittang and Pegu drainages in Myanmar (Fig. 2).

REMARKS. — *Hemibagrus peguensis* has long been misidentified as *H. menoda* (e.g., Day 1889; Jayaram 1954). Even in cases where it was considered a distinct species (e.g., Jayaram 1977; Talwar and Jhingran 1991), no clear distinguishing characters were used to separate the two species, nor was it recognised that *H. peguensis* superficially resembled *H. menoda*. As a result, these accounts often listed the presence of *H. menoda* in Myanmar when in fact the records actually refer to *H. peguensis*. *Hemibagrus peguensis* can be differentiated from *H. menoda* in having a shorter head (29.0–32.5

FIGURE 10. *Hemibagrus peguensis*, ZRC 43511, 243 mm SL; Myanmar, Yangon Division, Win Paw Hta River.

%SL vs. 32.7–33.5 %SL), a gently curving snout (Fig. 6) and a thinner, more deeply incised humeral process (Fig. 7).

Hemibagrus peguensis can be differentiated from *H. punctatus* in having a longer adipose-fin base (14.2–19.3 %SL vs. 10.1–13.2 %SL), a shorter distance between the dorsal and adipose fins (10.4–15.0 %SL vs. 16.3–19.4 %SL), a narrower caudal peduncle (7.6–8.8 %SL vs. 8.8–9.9 %SL) and a smaller eye (11.2–13.5 %HL vs. 13.8–15.7 %HL).

The original description of *H. peguensis* gives the total lengths of the syntypes as 20 mm. This is clearly a typographical error for 20 cm, which is the approximate total length of each of the syntypes.

MATERIAL EXAMINED. — BMNH 1894.5.21:25–26 (2, 168.8–185.1 mm SL syntypes), Myanmar, Taungoo; E. W. Oates, 1893. BMNH 1891.11.30:200–209 (16, 168.7–285.6 mm SL), Myanmar, Sittang River; E. W. Oates, 8 May 1891. CAS 89005 (1, 261.9 mm SL), Myanmar: Bago Division, Sittang River at Taungoo; C. J. Ferraris and D. Catania, 7 Apr 1996. CAS 93201 (1, 148.0 mm SL), Myanmar, Irrawaddy River drainage, Mandalay markets; T. R. Roberts, Apr 1993. CAS 133789 (1, 212.7 mm SL), Myanmar, Yangon Division, Pegu River drainage, 9 miles NW of Hlegu; A. W. Herre, 2 Apr 1937. NRM 15064 (2, 116.8–138.9 mm SL), Myanmar, Sagaing Division, Irrawaddy River drainage, Shweli River; Maung Lu Daw, Feb 1935. NRM 15105 (1, 166.8 mm SL), Myanmar, Mandalay Division, Mandalay; collector unknown, 1935. NRM 31068 (1, 186.1 mm SL), Myanmar, Kachin State, Irrawaddy River drainage, Myitkyina; R. Malaise, 10 Mar 1934. NRM 39397 (1, 290.6 mm SL), Myanmar, Bago Division, Bago; R. Malaise, 1934. ZSI 550 (1, 241.2 mm SL) and ZSI 551 (1, 265.6 mm SL), Myanmar: Tagoung; J. Anderson, date unknown.

***Hemibagrus punctatus* (Jerdon, 1849)**
Fig. 11

Bagrus punctatus Jerdon, 1849:339.
Hemibagrus punctatus – Day, 1867:284.
Macrones punctatus – Day, 1877:445, pl. 100 fig. 3; 1889:153.
Mystus (*Mystus*) *punctatus* (in part) – Jayaram, 1954:547.
Mystus punctatus – Jayaram, 1977:36, fig. 25A; 1981:197, 201, fig. 95A; Mo, 1991:131; Talwar and Jhingran, 1991:570, fig. 188.
Mystus menoda menoda (non Day) – (?)Barman, 1993:223, fig. 94.

DIAGNOSIS. — *Hemibagrus punctatus* can be differentiated from its congeners by a unique combination of the following characters: head length 28.1–29.6 %SL, head depth 11.9–14.3 %SL, depth of caudal peduncle 8.8–9.9 %SL, eye diameter 13.8–15.7 %HL.

DESCRIPTION. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. In %SL: head length 28.1–29.6, head width 16.4–20.5, head depth 11.9–14.3, predorsal distance 39.8–42.0, preanal length 71.0–74.2, prepelvic length 53.3–54.2, prepectoral length 26.2–26.6, body depth at anus 11.9–14.3, length of caudal peduncle 16.1–18.6, depth of caudal peduncle 8.8–9.9, pectoral-spine length 15.6–18.1, pectoral-fin length 18.7–21.1, dorsal-spine length 13.9–15.9, length of dorsal fin 24.7–27.6, length of dorsal-fin base 14.7–17.4, pelvic-fin length 14.9–17.2, length of anal-fin base 11.8–14.3, caudal-fin length 21.4–23.9, length of adipose-fin base 10.1–13.2, adipose-fin maximum height 3.9–5.4, post-adipose distance 16.2, dorsal to adipose distance 16.3–19.4; in %HL: snout length 35.7–38.9, interorbital distance 31.3–32.5, eye diameter 13.8–15.7, nasal barbel length 27.5–40.3, maxillary barbel length 163.2–203.4, inner mandibular barbel length 31.7–45.6, outer mandibular barbel length 68.8–80.2. Branchiostegal rays 9 (2) or 10 (1). Gill rakers 4 + 8 = 12 (1) or 5 + 13 = 18 (1). Vertebrae 25 + 21 = 46 (1).

Fin ray counts: dorsal II,7 (3); pectoral I,9 (2) or I,10 (1); pelvic i,5 (3); anal iv,8 (1) or iv,9 (2); caudal i,7,8,i (3). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, with 5–7 serrations on posterior edge. Pectoral spine stout, with 12–19 serrations on posterior edge. Caudal fin forked; distal margins of upper and lower lobes rounded.

COLOR. — Preserved specimens have dorsal surface of head and body grayish brown, fading to dirty white on ventral surface. Lateral surface of body with about 9–10 black spots arranged in horizontal row along lateral line. Dorsal, pectoral, pelvic and anal fins grayish brown, with scattered melanophores on fin rays and interradial membranes. Caudal fin grayish brown, with lighter hue along posterior margin, and on procurrent and outer principal caudal rays.

DISTRIBUTION. — Known only from the Cauvery River drainage in southern India (Fig. 2).

REMARKS. — *Hemibagrus punctatus* has generally been regarded as a species of *Mystus*, as recently as the work of Mo (1991). Our examination of specimens shows that the species has the depressed head characteristic of *Hemibagrus*, and should be placed within this genus instead.

Hemibagrus punctatus differs from *H. menoda* in having a shorter, flatter head (head length 28.1–29.6 %SL vs. 32.7–33.5%SL; head depth 11.9–14.3 %SL vs. 14.2–15.3%SL), deeper caudal peduncle (8.8–9.9 %SL vs. 7.5–8.8%SL) and larger eye (13.8–15.7 %HL vs. 11.9–12.3%HL). The color pattern of *H. punctatus* differs from that of *H. menoda* and *H. peguensis*. In the latter two species, the sides of the body are marked with a series of vertical columns of black spots, the largest of which is in the middle of the columns along the lateral line whereas in *H. punctatus*, there is only a single row of black spots located along the lateral line.

Babu Rao and Chattopadhyay (1969) record *H. punctatus* from west Bengal based on a specimen of 62.0 mm SL. According to their description, the specimen lacked the black spots on the sides of the body, a feature they attributed to the small size of the specimen. We have not examined enough material to ascertain if this is indeed the case, but the rest of their description does not seem to match that of *H. punctatus*. They stated that the maxillary barbels reached up to the middle of the pelvic fins, but the specimens of *H. punctatus* we examined do not have the maxillary barbels extending beyond the origin of the pelvic fins. Furthermore, they describe the snout of their specimen as being narrow (compared to *Mystus gulio*), but the snout of *H. punctatus* is actually broader than that of *M. gulio*. Therefore in the light of the available evidence, it seems very unlikely that their specimen was really *H. punctatus*. We have also examined specimens recorded as *H. punctatus* from Bombay, and have reidentified them as *H. menoda*. Barman (1993) recorded *H. menoda* (as *Mystus menoda menoda*) from the Krishna River drainage; although he had not examined any specimens, we feel that his record may refer to *H. punctatus* instead, given the proximity of the Cauvery and Krishna river drainages. Therefore, on the basis of the specimens we have examined and the literature, it appears that the distri-

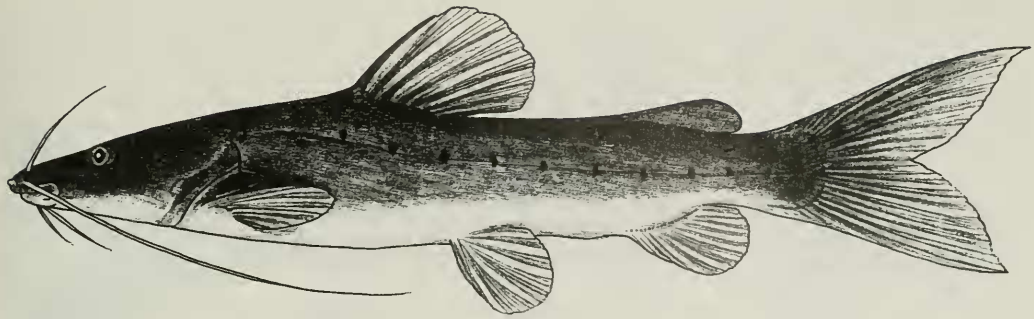

FIGURE 11. *Hemibagrus punctatus*, ZSI FF 1223, 1 ex., 193.1 mm SL; India: Hemavathy River at Huliva Laom.

bution of *H. punctatus* is restricted to the Cauvery River drainage (although it may occur in the Krishna River drainage) in southern India.

MATERIAL EXAMINED. — BMNH 1868.5.14:8 (1, 154.6 mm SL), India; F. Day collection. - ZSI F12403 (1, 120.2 mm SL), India, Karnataka State, Cauvery River at Coorg; C. R. Narayan Rao. ZSI FF 1223 (1, 193.1 mm SL), India, Karnataka State, Hemavathy River at Huliva Laom; K. C. Jayaram, 7 May 1977.

***Hemibagrus variegatus* sp. nov.**
Fig. 12

TYPE MATERIAL. — HOLOTYPE: BMNH 1992.11.16:11, 121.2 mm SL; Myanmar: Tenasserim River; T. R. Roberts, 3–8 Mar 1992.

DIAGNOSIS. — *Hemibagrus variegatus* can be differentiated from its congeners by a unique combination of the following characters: length of caudal peduncle 20.2 %SL, length of adipose-fin base 30.8 %SL, eye diameter 23.1 %HL, interorbital distance 28.6 %HL, 21 gill rakers, 50 vertebrae (24 postanal) and a variegated brown body with the sensory pores not readily visible.

DESCRIPTION. — Head depressed and broad, body moderately compressed. Dorsal profile rising evenly but not steeply from tip of snout to origin of dorsal fin, then sloping gently ventrally from there to end of caudal peduncle. Ventral profile horizontal to origin of anal fin, then sloping dorsally to end of caudal peduncle. Adipose fin with long base, spanning most of postdorsal distance. In %SL: head length 26.8, head width 18.2, head depth 13.6, predorsal distance 38.3, preanal length 69.6, prepelvic length 28.2, prepectoral length 23.8, body depth at anus 15.3, length of caudal peduncle 20.2, depth of caudal peduncle 9.1, pectoral-spine length 11.0, pectoral-fin length 16.5, dorsal-spine length 15.9, length of dorsal fin 24.3, length of dorsal-fin base 15.8, pelvic-fin length 7.9, length of anal-fin base 10.7, caudal-fin length 21.4, length of adipose-fin base 30.8, adipose-fin maximum height 4.9, post-adipose distance 13.8, dorsal to adipose distance 5.0; in %HL: snout length 40.6, interorbital distance 28.6, eye diameter 23.1, nasal barbel length 36.3, maxillary barbel length 243.1, inner mandibular barbel length 49.8, outer mandibular barbel length 78.2. Branchiostegal rays 11 (1). Gill rakers 5 + 16 = 21 (1). Vertebrae 26 + 24 = 50 (1).

Fin ray counts: dorsal II,7 (1); pectoral I,10 (1); pelvic i,5 (1); anal iv,7 (1); caudal i,7,8,i (1). Dorsal-fin origin nearer to tip of snout than to caudal flexure. Dorsal spine stout, without serrations on posterior edge. Pectoral spine stout, with 11 large serrations on posterior edge. Caudal fin forked; distal margins of upper and lower lobes rounded.

COLOR. — Preserved specimen has the dorsal surfaces of the head and body brown with irregular dark brown markings forming a variegated pattern; this color fades to a dirty white on the ventral sur-

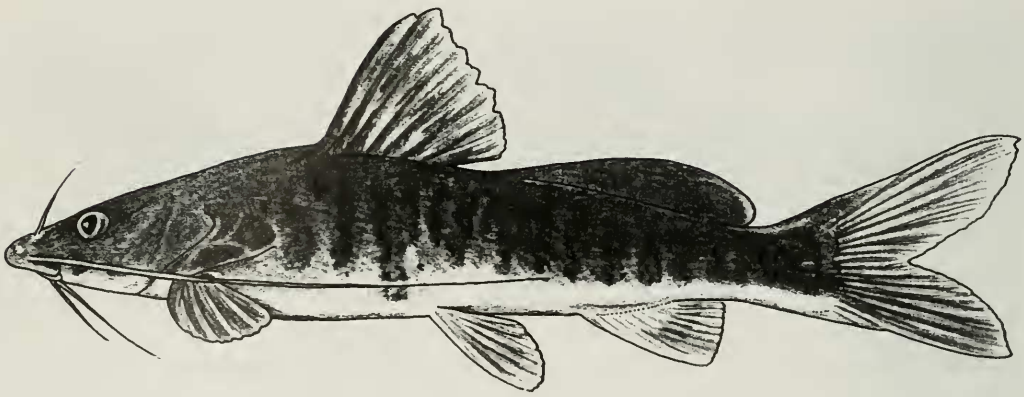

FIGURE 12. *Hemibagrus variegatus*, holotype, BMNH 1992.11.16.11; Myanmar: Tenasserim River.

faces. All fins brown, with melanophores on fin rays and interradial membranes; melanophores are more concentrated in the interradial membranes of the dorsal, pectoral, pelvic and anal fins.

ETYMOLOGY. — From the Latin *variegatus*, meaning of different colors. In reference to the irregular dark brown markings on the sides of the body.

DISTRIBUTION. — Known only from the Tenasserim River drainage in southern Myanmar (Fig. 2).

REMARKS. — As mentioned above, *H. variegatus* is one of the only two known species of southern Asian *Hemibagrus* (the other being *H. imbrifer*) which has a long-based adipose fin spanning nearly all of the postdorsal distance. When compared with other species of *Hemibagrus* with long adipose-fin bases, *H. variegatus* has fewer vertebrae (50 vs. 52–60) than *H. olyroides* and East Asian species allied with *H. guttatus*, and more vertebrae (50 vs. 44–47) than *H. baramensis* and *H. sabanus*.

ACKNOWLEDGMENTS

The authors thank the following for permission to examine specimens under their care: William Saul (ANSP), Darrell Siebert (BMNH), William Eschmeyer (CAS), Sven Kullander (NRM), Douglas Nelson (UMMZ), Lynne Parenti (USNM) and A. K. Karmakar (ZSI). Maurice Kottelat called our attention to the two specimens that constitute the type series of *Hemibagrus imbrifer*. Illustrations of *Hemibagrus punctatus* and *H. variegatus* were provided by Kelvin Lim. Funding for this project was provided by a short-term visitor grant from the Smithsonian Institution to the first author and research grant RP 960314 from the National University of Singapore to Peter K. L. Ng.

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