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A Review of the Goatfishes of the Genus *Upeneus* (Perciformes: Mullidae) from New Caledonia and the Chesterfield Bank, with a New Species and Four New Records

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John E. Randall and Michel Kulbicki (2006) A review of the goatfishes of the genus *Upeneus* (Perciformes: Mullidae) from New Caledonia and the Chesterfield Bank, with a new species and four new records. *Zoological Studies* 45(3): 298-307. Only 2 species of the goatfish genus *Upeneus* have been recorded from New Caledonia: *U. tragula* Richardson and *U. vittatus* (Forsskål). *Upeneus filifer* (Ogilby) was listed by name only in a report on experimental trawling on the Chesterfield Bank. New records are herein reported of *U. australiae* Kim and Nakaya, *U. guttatus* (Day), *U. moluccensis* (Bleeker), and *U. sulphurus* Cuvier for the New Caledonia region, and *U. mouthami* is described as a new species. A key, diagnoses, and color illustrations are given for all 8 species; summary notes on food habits are provided. <http://zoolstud.sinica.edu.tw/Journals/45.3/298.pdf>

Key words: Mullidae, *Upeneus*, New Caledonia, Chesterfield Bank, New species, New records.

The goatfishes (family Mullidae) are distinctive in having a pair of long barbels at the front of the chin, 2 well-separated dorsal fins, and a forked caudal fin. The family consists of 6 genera that are differentiated mainly by dentition, as shown in the key of Lachner in Schultz and collaborators (1960). Species of *Upeneus* are the only ones with teeth in both jaws, and on the vomer and palatines.

Upeneus was created by Cuvier in *Le Règne Animal* (1829); *Mullus vittatus* Forsskål was designated as the type species by Desmarest (1856). Seventy-one nominal species have been described in *Upeneus*, and another 18 were subsequently reclassified in it (Eschmeyer 1998, updated to 2004 on the website www.calacademy.org/research/ichthyology/catalog/fish). Twenty-four species are currently listed as valid, making the genus 2nd in size only to *Parupeneus*, with 27 species (Randall 2004). However, specimens of *Upeneus* are often difficult to identify to species,

and the genus is clearly in need of revision. The present paper treats just the species from New Caledonia and the Chesterfield Bank.

Fourmanoir and Laboute (1976) and Laboute and Grandperrin (2000) recognized only 2 species of *Upeneus* from New Caledonia: *U. vittatus* (Forsskål) and *U. tragula* Richardson. In a report on experimental trawling on the Chesterfield and Lansdowne Banks in the Coral Sea, mainly over sand substratum, Kulbicki et al. (1990) listed 3 unidentified species of *Upeneus*. Kulbicki et al. (1994) recorded 5 species of the genus from the Chesterfield Bank: *U. filifer* (Ogilby) (the "sp. long filament" of the 1990 report), *U. vittatus*, and 3 as *Upeneus* sp. We have now determined that the unidentified Chesterfield Bank species of *Upeneus* are *U. australiae* Kim and Nakaya, *U. guttatus* (Day), and a small new species that we describe below.

Although *moluccensis* (Bleeker) and *U. sulphureus* Cuvier have been taken by experimental

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trawling over a mud bottom in bays of New Caledonia, they are reported here for the first time in the scientific literature.

In the present paper, we provide a key, brief species accounts, and color illustrations of the 8 species of *Upeneus* now known from New Caledonia and the Chesterfield Bank.

MATERIALS AND METHODS

Type specimens of the new species have been deposited in the Australian Museum, Sydney (AMS); Bishop Museum, Honolulu (BPBM); Museum National d'Histoire Naturelle, Paris (MNHN); the National Science Museum, Tokyo (NSMT); and the US National Museum of Natural History, Washington, DC (USNM).

Lengths of specimens are given as standard length (SL), measured from the front of the upper lip to the base of the caudal fin (posterior end of the hypural plate); head length is from the same anterior point to the posterior end of the opercular flap; body depth is taken vertically from the base of the 1st dorsal spine where it emerges from the body (not the internal base); body width is the maximum width just posterior to the gill opening; orbit diameter is the greatest fleshy diameter, and interorbital width is the least fleshy width; cheek depth is measured from the lower fleshy edge of the orbit vertically to the ventral margin of the preopercle; upper-jaw length is taken from the front of the upper lip to the posterior end of the maxilla; barbel length is the maximum straight length of the longest barbel; caudal-peduncle depth is the least depth, and caudal-peduncle length the horizontal distance between verticals at the rear base of the anal fin and the caudal-fin base; lengths of the fin spines and rays of the dorsal and anal fins are measured from where they emerge from the body; caudal-fin length is the horizontal distance from the base of the fin to a vertical at the tip of the longest ray; caudal concavity is the horizontal distance between verticals at the tips of the longest and shortest rays; pectoral-fin length is the length of the longest ray; and pelvic-fin length is measured from the base of the pelvic spine to the tip of the longest soft ray.

Data in parentheses in the description of the new species refer to paratypes. Proportional measurements in the text are rounded to the nearest 0.05.

Key to the species of *Upeneus* of New Caledonia and the Chesterfield Bank

- 1a. Second dorsal spine very prolonged, extending when depressed beyond base of 2nd dorsal fin; pectoral rays 13 or 14; body pink dorsally, shading to white ventrally, with no stripes or small spots.....*filifer*
- 1b. Second dorsal spine not prolonged, about equal to or slightly longer than 3rd spine; pectoral rays 13-17; color not as in 1a.....2
- 2a. Lateral-line scales (to base of caudal fin) 33-36; pectoral rays 14-17 (modally 15 or 16); gill rakers 26-30.....3
- 2b. Lateral-line scales (to base of caudal fin) 28-29; pectoral rays 12-15 (modally 13 or 14); gill rakers 21-25.....5
- 3a. Barbels reaching to or beyond a vertical at posterior margin of preopercle; lobes of caudal fin without dark cross bands; body with 2 narrow yellow stripes.....*sulphureus*
- 3b. Barbels not reaching a vertical at posterior margin of preopercle; 1 or both lobes of caudal fin with dark cross bands; body with 1 or 4 yellow stripes.....4
- 4a. No scales on side of snout; a single yellow stripe nearly as broad as pupil from behind upper part of eye to upper base of caudal fin; lower lobe of caudal fin without dark cross bands; 1st dorsal fin acutely pointed and not broadly tipped with black.....*moluccensis*
- 4b. Scales present on side of snout; 4 narrow yellow stripes on body; lower lobe of caudal fin with 3 dark brown to black cross bands, the most distal broadest and darkest; 1st dorsal fin not acutely pointed, its tip broadly black.....*vittatus*
- 5a. First dorsal fin with VIII + 8 spines, the 1st spine very small.....6
- 5b. First dorsal fin with VII + 7 spines.....7
- 6a. A red to dark brown stripe as broad as pupil from front of snout through eye to base of caudal fin; body above stripe finely dark-flecked, below stripe with discrete small dark spots; barbels short, 1.45-1.85 in head length; size to 190 mm SL.....*tragula*
- 6b. No red or dark brown stripe on head and body (instead a yellow stripe on body beginning at level of eye); no small dark flecks or spots on body; barbels not short, 1.2-1.35 in head length; size to 95 mm SL.....*mouthami* sp. nov.
- 7a. Both lobes of caudal fin with narrow dark cross bands (red in life, bands may be lost); a yellow stripe from upper end of gill opening to base of caudal fin; pectoral rays 13-15 (usually 14).....*australiae*
- 7b. Only upper lobe of caudal fin with narrow red cross bands (often lost in preserved specimens); no yellow stripe on body; pectoral rays 12-14 (usually 13).....*guttatus*

Upeneus australiae Kim and Nakaya (Fig. 1)

Upeneus australiae Kim and Nakaya 2002: 128 (type locality, west of Island Head, Queensland).

Diagnosis: Dorsal rays VII + 9; anal rays 1,7; pectoral rays 13-15 (usually 14); lateral-line scales 29 or 30 (to caudal-fin base); gill rakers 6 or 7 + 16-18 (total 22-25); body moderately elongate, depth 3.7-4.3 in standard length; scales on side of

snout; barbels not or just reaching to below posterior margin of preopercle, their length 1.45-1.9 in head length; 1st and 2nd dorsal spines longest (no tiny 1st dorsal spine, hence only VII spines); pink dorsally, white ventrally, with a narrow yellow stripe from near upper end of gill opening to base of caudal fin just above lateral line; head with pink to light red blotches; barbels pink to white; dorsal fins with oblique cross bands of light red and translucent white; lobes of caudal fin with narrow red to dark brown cross bands (adults with 6 on upper lobe and 8 on lower, fewer in young).

Remarks: *Upeneus australiae* was described from 13 museum specimens, 40.3-90 mm SL from Queensland, New South Wales, and Monte Bello Is., Western Australia, with no information on life color. The 1st author examined preserved specimens from Moreton Bay, Queensland in 1984 at the Muséum National d'Histoire Naturelle in Paris and obtained some as a gift for the Bishop Museum. Although realizing the specimens represented a new species, he decided to wait until the life color could be determined.

We here extend the range of this species east to New Caledonia, where it averages 97 mm SL and reaches 155 mm SL (based on 417 fish). It is the most abundant species of *Upeneus* on soft bottoms around the main island of New Caledonia; our trawl collections were from 6 to 80 m, mostly from 30 m. Kim and Nakaya's specimens from Australia were collected in 3-11 m.

This species feeds mainly on shrimp (47% of the diet) and worms (35%), based on examination of 46 specimens.

Material examined: Australia: Queensland, Moreton Bay, MNHN 1981-101, 96.5 mm; MNHN 1981-102, 6: 94-119 mm; BPBM 31310, 4: 103-113 mm. New Caledonia: Belep Is., BPBM 39465, 4: 94-106 mm.



Fig. 1. *Upeneus australiae*, specimen not retained, Chesterfield Bank (M. Kulbicki).

Upeneus filifer (Ogilby)

(Fig. 2)

Upenoides filifer Ogilby 1910: 95 (type locality, off Cape Gloucester, Queensland).

Diagnosis: Dorsal rays VIII + 9; anal rays I,8 (spine extremely short); pectoral rays 13 or 14; lateral-line scales about 29 (to caudal-fin base); gill rakers 7 or 8 + 19 (total 26 or 27); body depth 3.8-4.2 in standard length; no scales on side of snout; barbels reaching to or beyond a vertical at posterior margin of preopercle, their length 1.4-1.6 in head length; 1st dorsal spine tiny, 2nd spine extremely long when intact, extending beyond base of 2nd dorsal fin when depressed posteriorly; color (from Ogilby 1910): "Above roseate, shading through the pink of the sides to pearly white of the throat and abdomen; cheeks and opercles washed with gold; barbels lemon yellow; iris purple with a narrow silver rim inferiorly; dorsal and caudal fins pink, basally washed with gold; other fins colorless."

Remarks: Ogilby described this species from 2 specimens, 137-166 mm SL, taken from a trawl haul of a total of 12 specimens from the research vessel *Endeavour*. No depth of capture was given. Our specimens were trawled from the Chesterfield Bank and Landsdowne Bank. Nearly all scales are missing, so the lateral-line scale count of 29 is approximate. Ogilby reported 32 lateral-line scales, but he may have included pored scales continuing onto the base of the caudal fin. Figure 2 represents the 1st illustration of this species, unfortunately it is a juvenile and shows damage from trawling.

This species is rare in New Caledonia and adjacent waters, with only 14 specimens having been collected, and only 1 fish caught around the



Fig. 2. *Upeneus filifer*, BPBM 33866, 51 mm SL, Chesterfield Bank (J. Randall).

main island (from St. Vincent Bay). The depth range was 17-85 m, with most specimens being caught below 70 m.

Material examined: Coral Sea: Chesterfield Bank, 20°40'9"S, 158°45'9"E, BPBM 33844, 106 mm; 20°45'0"S, 158°35'4"E, BPBM 33852, 109 mm; 20°59'36"S, 158°55'42"E, BPBM 33862, 86 mm; 21°5'0"S, 158°50'7"E, BPBM 33866, 51 mm.

***Upeneus guttatus* (Day)**

(Figs. 3, 4)

Upeneoides guttatus Day 1868 (type locality, Madras, India).

Diagnosis: Dorsal rays VII + 9; anal rays I,7; pectoral rays 12-14 (modally 13); lateral-line scales 28 or 29 (to caudal-fin base); gill rakers 6 or 7 + 16-19 (total 22-26); body depth 4.0-4.4 in standard length; scales present on side of snout; barbels short in juveniles, in adults reaching to or beyond a vertical at posterior margin of preopercle, barbel length 1.45-1.6 in head length; pink, greenish, or light brown dorsally on body, with a red spot of variable size and shape on each scale, silvery-white ventrally; head silvery pink with light red blotches; barbels pale yellow or white; dorsal fins with bands of translucent white and red (oblique in 1st dorsal); upper lobe of caudal fin of adults with 4 or 5 red cross bands narrower than whitish interspaces; lower lobe of caudal fin red, becoming pink or pink with red spots on lower margin. The redder coloration of figure 4 is the result of the fish having been taken in deeper water (and perhaps the added trauma from the trawl) than the fish of figure 3, which was collected at the type locality of Madras.

Remarks: Day described *Upeneus guttatus* from a single 120 mm specimen, adding that it is

abundant year-around on the Coromandel coast of India. He mistakenly regarded it as a synonym of *U. bensasi* (Temminck and Schlegel) in his *Fishes of India* (1875). Randall et al. (1993) showed that *U. bensasi* is a synonym of *U. japonicus* Houttuyn, known from Japan south to Taiwan and Hong Kong. Gloerfelt-Tarp and Kailola (1984) illustrated *U. guttatus* in color (as *U. bensasi*) and reported specimens from southwestern Indonesia and northwestern Australia. Sainsbury et al. (1985) figured it in color from northwestern Australia as *Upeneus* sp. *Upeneus crosnieri* Fourmanoir and Guézé is a probable synonym.

The Chesterfield Bank and New Caledonia specimens of this species were taken by trawling in 10-72 m. The species is found mainly in the northern lagoon of New Caledonia. Crustaceans are the major food item (based on 6 fish). The largest New Caledonia specimen measures 148 mm SL.

Materials examined: Chesterfield Bank, BPBM 33815, 113 mm. South of Chesterfield Is., 20°2'S, 158°20'E, BPBM 39472, 3: 89-104 mm. New Caledonia, Belep Is., BPBM 39466, 2: 129-148 mm; BPBM 39470, 118 mm. Northwest of New Caledonia, 19°37'5"S, 163°40'4"E, BPBM 39471, 2: 116-129 mm. St. Vincent's Bay, BPBM 40166, 91.5 mm. In addition, 58 specimens, 33.5-162 mm, from Somalia, Mozambique, Madagascar, Réunion, Seychelles, India, Bay of Bengal, Andaman Sea, Singapore, Northern Australia, and Philippines, from near shore to a depth of 81.

***Upeneus moluccensis* (Bleeker)**

(Fig. 5)

Upeneoides moluccensis Bleeker 1855: 409 (type locality, Ambon, Molucca Is.).



Fig. 3. *Upeneus guttatus*, BPBM 20658, 113 mm SL, Madras, India (J. Randall).



Fig. 4. *Upeneus guttatus*, BPBM 40166, 91.5 mm SL, New Caledonia (G. Mou Tham).

Diagnosis: Dorsal rays VIII + 9; anal rays I,7; pectoral rays 15-17 (usually 16, rarely 17); lateral-line scales 33-35 (to caudal-fin base); gill rakers 7-9 + 19-22 (total 26-30); body depth 3.5-4.05 in standard length; no scales on side of snout; barbels short, not reaching a vertical at posterior margin of preopercle, their length 1.55-2.1 in head length; 1st dorsal fin pointed; a bright yellow stripe as broad as pupil from behind upper part of eye to upper base of caudal fin; back above stripe pink, below white; barbels white to pink; dorsal fins with broad reddish stripes; upper lobe of caudal fin of adults with 6 or 7 narrow reddish cross bars, the lower lobe light red or longitudinally streaked with red.

Remarks: Wide-ranging from the Red Sea (and Mediterranean Sea via the Suez Canal) south to Mozambique, east to the western Pacific from southern Japan to northern Australia. We report the species here as the first record for New Caledonia, where it has been taken by experimental trawling over mud bottom in bays. Commercial trawling is banned in New Caledonia, so this goatfish is not seen in the markets. It is known from depths of at least 80 m, but most often found in New Caledonia between 9 and 50 m, where it is the 2nd most common species of the genus. It has not been recorded from the Chesterfield area. Reaches nearly 200 mm SL in New Caledonia. The principal prey are fishes (17%), crabs (19%), shrimps (36%), and worms (15%), based on 162 specimens.

Material examined: New Caledonia: BPBM 39574, 2: 90-132 mm; St. Vincent Bay, BPBM 40165, 95 mm. In addition, 180 specimens, 56-179 mm, from the Red Sea, Lebanon, Arabian Sea, Madagascar, India, Andaman Sea, Indonesia, Philippines, Taiwan, and southern Japan.



Fig. 5. *Upeneus moluccensis*, BPBM 40165, 95 mm SL, New Caledonia (G. Mou Thom).

***Upeneus mouthami* sp. nov.**

(Table 1; Fig. 6)

Holotype: BPBM 33858, male, 70.3 mm, Coral Sea, Chesterfield Bank, 20°59'48"S, 158°47'18"E, 71 m, beam trawl, R/V *Alis* station 28, M. Kulbicki and J.E. Randall, 24 Aug. 1988.

Paratypes: AMS I.43340-001, 71.1 mm; MNHM 2004-1571, 75.0 mm; NSMT P 68933, 78.3 mm; USNM 378143, 83.2 mm, all from Coral Sea, Chesterfield Bank, north side, 19°12'23"S, 158°42'2"E, 68 m, bottom with algae, R/V *Coriolis* station 6, beam trawl, B. Richer de Forges and M. Kulbicki, 17 July 1984; BPBM 39467, 88.7 mm, Chesterfield Bank, Bellona Reefs, 21°25'S, 159°9'E, 60 m, R/V *Coriolis*, beam trawl, M. Kulbicki, 25 July 1984; BPBM 33855, 95 mm, Coral Sea, Chesterfield Bank, 20°51'S, 158°45'E, 71 m, shrimp trawl, R/V *Alis* station 19, M. Kulbicki and J.E. Randall, 23 Aug. 1988.

Diagnosis: Dorsal rays VIII + 9, 1st spine extremely short; anal rays I,8, spine extremely short; pectoral rays 13; lateral-line scales 29; gill rakers 6 or 7 + 17-19 (total 23-26); body depth 4.15-4.4 in standard length; barbels reaching posterior to rear margin of preopercle, 1.3-1.4 in head length; light red dorsally, white with pink blotches on side and ventrally (diurnal life color probably without pink blotches), with a yellow stripe following lateral line to caudal peduncle where it passes just dorsal to line; barbels pale yellow; lobes of caudal fin with 3 dark cross bands, outer band of lower lobe darkest and twice as broad as other bands; no dark spot on outer part of 1st dorsal fin. Largest specimen, 95 mm SL.

Description: Dorsal rays VIII + 9, 1st spine not visible above dorsal contour of body, 1st dorsal ray unbranched; anal rays I,8, spine extremely short;



Fig. 6. Holotype of *Upeneus mouthami*, BPBM 33858, 70.3 mm SL, Chesterfield Bank, Coral Sea (J. Randall).

1st ray unbranched and spinous but segmented in outer 1/2; pectoral rays 13, upper 2 unbranched; pelvic rays 1,5; principal caudal rays 15, upper and lower ones unbranched; upper and lower procurrent caudal rays 7 (7 or 8), the posterior segmented; lateral-line scales 29 (many scales missing from type specimens; no count possible on holotype); scales above lateral line to base of 1st dorsal fin 2; scales below lateral line to origin of anal fin 4; median predorsal scales partially missing on all specimens; scales present on side of snout; a row of 3 scales on maxilla; scales between dorsal fins 3; gill rakers 7 + 19 (6 or 7 + 17-19); branchiostegal rays 3; supraneural (predorsal) spines 3; vertebrae 24.

Body depth 4.4 (4.15-4.4) in SL; body width 1.7 (1.7-1.9) in body depth; head length 3.3 (3.3-3.4) in SL; snout length 2.45 (2.4-2.5) in head

length; orbit diameter 3.55 (3.55-3.8) in head length; interorbital space flat medially, rounded at edges, the least fleshy width 3.55 (3.25-3.5) in head length; cheek depth 3.55 (3.45-3.55) in head length; barbels reaching slightly posterior to a vertical at rear edge of preopercle, their length 1.35 (1.2-1.4) in head length; caudal-peduncle depth 3.05 (2.8-3.0) in head length; caudal-peduncle length 1.2 (1.2-1.3) in head length.

Mouth ventral and oblique, forming an angle of about 25° to horizontal axis of head and body; mouth small, maxilla not reaching a vertical at front edge of orbit, upper-jaw length 2.65 (2.5-2.65) in head length; posterior edge of maxilla membranous and convex; a villiform band of small nodular teeth in jaws, in at most 5 or 6 rows; vomer with a V-shaped band of villiform teeth in 2 or 3 rows; palatines with a band of villiform teeth in up to 3

Table 1. Proportional measurements of the type specimens of *Upeneus mouthami* expressed as percentages of the standard length

	Holotype	Paratypes			
	BPBM 33858	AMS I.43340	MNHN 2004-1571	NSMT P 68933	BPBM 39467
Standard Length (mm)	70.3	71.1	75.0	78.3	88.7
Body depth	22.8	24.0	23.2	22.8	23.8
Body width	12.3	14.1	12.7	13.4	12.6
Head length	30.5	29.3	29.8	30.4	29.9
Snout length	12.4	12.1	12.0	12.1	12.1
Orbit diameter	8.1	8.3	8.3	8.4	7.9
Interorbital width	8.0	9.3	8.9	8.9	8.5
Upper-jaw length	11.5	11.8	11.7	12.1	11.3
Cheek depth	8.6	8.5	8.4	8.7	8.7
Barbel length	22.8	21.3	21.6	23.4	22.5
Caudal-peduncle depth	10.0	10.5	10.4	10.2	10.6
Caudal-peduncle length	25.1	24.6	25.3	24.0	24.0
Predorsal length	36.9	36.5	36.4	37.1	36.3
Preanal length	65.3	62.5	64.3	63.7	65.4
Prepelvic length	32.5	31.6	32.0	31.1	32.1
Second dorsal spine	19.9	21.2	broken	18.9	20.1
Third dorsal spine	20.2	21.3	broken	17.7	broken
Fourth dorsal spine	18.5	19.0	broken	17.5	broken
First dorsal ray	9.9	broken	broken	9.0	10.0
Second dorsal ray	18.7	broken	broken	17.8	broken
Ninth dorsal ray	8.0	8.5	broken	7.0	7.0
First anal ray	11.4	11.0	11.6	10.5	9.8
Second anal ray	15.9	15.2	16.3	16.3	15.4
Seventh anal ray	9.7	8.6	8.4	8.5	8.6
Caudal-fin length	29.7	29.4	broken	29.3	28.1
Caudal concavity	16.9	16.2	-	16.6	15.8
Pectoral-fin length	21.8	20.9	21.4	21.7	20.8
Pelvic-spine length	18.7	18.3	19.1	18.2	17.0
Pelvic-fin length	24.2	24.7	25.1	22.9	21.8

rows. Tongue triangular and fused to floor of mouth.

Posterior nostril a curved vertical slit just anterior to orbit in front of upper edge of pupil; anterior nostril a short vertically oval opening before middle of eye, internarial distance slightly more than 1/2 orbit diameter. Longest gill raker on 1st gill arch nearly as long as longest gill filaments.

Opercular spine at level of lower edge of orbit, its tip nearly or just reaching end of opercular membrane. Free posterior membranous edge of preopercle extending slightly above level of lower edge of orbit; free ventral membranous edge of preopercle nearly reaching a vertical at anterior edge of orbit.

Scales finely ctenoid, too many missing from specimens for adequate description. Fins naked except for base of caudal fin. Sensory canals on lateral-line scales in 2 or 3 branches.

Origin of dorsal fin above 3rd lateral-line scale, predorsal length 2.7 (2.7-2.75) in SL; 1st dorsal spine extremely short, barely extending above profile of body when elevated with a probe; 2nd or 3rd dorsal spines longest, 1.5 (1.4-1.6) in head length; 1st dorsal soft ray 3.1 (3.4) in head length; 2nd anal soft ray longest, 1.9 (1.85-1.95) in head length; caudal fin 3.4 (3.4-3.55) in SL and strongly forked, caudal concavity 1.8 (1.8-1.9) in head length; pectoral fins 1.4 (1.4-1.45) in head length; pelvic fins 1.25 (1.2-1.35) in SL.

Color of holotype in alcohol: head and body light brown, barbels and fins pale yellowish except for a faint submarginal dusky band on 2nd dorsal fin and dark bands or spots on lobes of caudal fin; upper lobe of caudal fin with 2 markings, distal one crossing the fin, but proximal one a spot in middle of lobe; lower lobe of fin with 3 markings, most basal a faint spot, middle one a short oblique band but not crossing lobe of fin, outer one a complete band near tip of fin, about twice as broad as middle band and heavily pigmented.

Color of holotype shown in figure 6. The blotchy pink color pattern may be related to the damage from trawling, in particular the extensive loss of scales. The yellow stripe on the body probably more conspicuous in life.

Etymology: This species is named in honor of Gerard Mou Tham, a colleague of the 2nd author, who assisted in the collection of many of the goatfishes in this report and provided two of the color photographs for our illustrations.

Remarks: *Upeneus mouthami* is presently known from the 7 type specimens trawled from the Chesterfield Bank, Coral Sea at depths of 60-71

m. We have no specific record of the bottom type except a mention in field notes of some green algae being taken in the trawl haul of R/V *Coriolis* station 6. However, the area of trawling on the bank, in general, is shallow sand on eroded flat rock with scattered patches of green algae.

The species is small; our largest specimen measures 95 mm SL (too damaged to include in Table 1). The smallest specimen, the 70.3 mm holotype, is a male. The gonad was not found in the 71.1 mm paratype. The remaining paratypes, 75-95 mm, are mature females except for the 88.7 mm specimen, which is a male.

This species may have been overlooked as the young of *vittatus* because of the very broad outer black band in the lower lobe of the caudal fin. However, these 2 species are not closely related. *Upeneus vittatus* has 16 or 17 pectoral rays, 34-36 lateral-line scales, 4 yellow stripes instead of 1, and the 1st dorsal fin is broadly tipped with black. It is typically found on mud bottoms.

There is also some similarity to *U. australiae*, both of which have a single yellow stripe, but *australiae* has VII (vs. VIII) dorsal spines, a mode of 14 pectoral rays, and attains a larger size.

Upeneus mouthami is closest meristically to *U. tragula*, but the two are very different in color, as may be seen by comparing figures 6 and 8. Also, *tragula* reaches a much larger size and is typically found in shallower water.

***Upeneus sulphureus* Cuvier** (Fig. 7)

Upeneus sulphureus Cuvier in Cuvier and Valenciennes 1829: 450 (type locality, Anjer, western Java).

Diagnosis: Dorsal rays VIII + 9; anal rays I,7; pectoral rays 15-17 (usually 16, rarely 17); lateral-



Fig. 7. *Upeneus sulphureus*, BPBM 29734, 119 mm SL, Lombok, Indonesia (J. Randall).

line scales 33-36 (to caudal-fin base; rarely 33 or 36); gill rakers 7-9 + 18-22 (total 26-30); body depth 3.25-3.85 in standard length; no scales on side of snout; barbels usually reaching to or beyond a vertical at posterior margin of preopercle, their length 1.25-1.7 in head length; 2nd to 4th dorsal spines about equal in length; pink or greenish dorsally, white ventrally, with 2 narrow bright yellow stripes on side of body; 1st dorsal fin broadly black-tipped with a narrow white band below; caudal fin gray without dark cross bands.

Remarks: Ranges from the Red Sea south to Mozambique, east to the western Pacific from southern Japan throughout the Indo-Malayan region to northern Australia, and east to Fiji. Reported on mud bottoms from depths of 20-66 m. As with *U. moluccensis*, this species became known in New Caledonia only by experimental trawling in bays. It is found in the southern part of the island. It is not common and not known from the Chesterfield area. The largest recorded size in New Caledonia is 140 mm SL. *Upeneus bilineatus* Valenciennes and *U. bivittatus* Valenciennes are synonyms.

Material examined: New Caledonia, St. Vincent Pass, BPBM 39571, 2: 129-130 mm. In addition, 204 specimens, 48-137 m, from Madagascar, Seychelles, Pakistan, India, Andaman Sea, Indonesia, Philippines, New Guinea, and Fiji.

***Upeneus tragula* Richardson**
(Fig. 8)

Upeneus tragula Richardson 1846: 220 (type locality, Guangzhou, China).

Diagnosis: Dorsal rays VIII + 9, 1st spine extremely short; anal rays I,7-8; pectoral rays 13 or

14 (usually 13); lateral-line scales 28 or 29; gill rakers 5 or 6 + 15-18 (total 20-24); body depth 3.9-4.4 in standard length; barbels short, usually not reaching to below rear margin of preopercle, 1.45-1.85 in head length; greenish gray dorsally, densely flecked with red or brown, white ventrally with numerous small red to brown spots; a red to brown stripe from front of upper lip through eye to mid-base of caudal fin, often containing 6 sections that are more-darkly pigmented; barbels yellow; lobes of caudal fin with transverse dark brown to black bands, increasing in number with growth to 5 in upper lobe and 6 in lower; upper part of 1st dorsal fin red to dark reddish brown with a few small yellow spots. Attains 192 mm SL.

Remarks: Distributed from the southern Red Sea and Persian Gulf to Mozambique, east to the western Pacific from southern Japan throughout the Indo-Malayan region to Australia (on east coast to central New South Wales); east in the South Pacific to New Caledonia and Vanuatu. An inshore species of lagoons and protected bays, on sand or silty sand, often in sparse seagrass, and sometimes near coral reefs; may be found in estuaries. Range in New Caledonia 1-50 m. Not recorded from the Chesterfield Bank. *Upeneoides variegatus* Bleeker and *Upeneus oligospilus* Lachner are synonyms. Fourmanoir and Laboute (1976) and Laboute and Grandperrin (2000) illustrated the species from New Caledonia from 2 underwater photographs, one with red and the other with dark brown markings. Largest New Caledonia specimen, 192 mm SL. Feeds mainly on shrimps (71% of the diet, based on 112 specimens).

Material examined: New Caledonia (no other locality), BPBM 39572, 141 mm; New Caledonia, St. Vincent Pass, BPBM 39573, 172 mm; Belap, BPBM 39576, 165 mm. In addition, 152 speci-



Fig. 8. *Upeneus tragula*, BPBM 9493, 216 mm SL, Palau (J. Randall).



Fig. 9. *Upeneus vittatus*, BPBM 19909, 199 mm SL, Hawaiian Is. (J. Randall).

mens, 36-190 mm, from the Red Sea, Somalia, Tanzania, Madagascar, Oman, Persian Gulf, India, Sri Lanka, Indonesia, Cambodia, Thailand, Singapore, Sabah, Vietnam, Philippines, Papua New Guinea, Palau, and southern Japan.

***Upeneus vittatus* (Forsskål)**
(Fig. 9)

Mullus vittatus Forsskål 1775: 31 (type locality, Jeddah, Red Sea).

Diagnosis: Dorsal rays VIII + 9; anal rays I, 7-8; pectoral rays 15-17 (usually 16); lateral-line scales 33-36; gill rakers 8 or 9 + 19-21 (total 27-30); body depth 3.5-4.1 in standard length; snout length 2.5-2.8 in head length; barbels short, usually not reaching posterior margin of preopercle, their length 1.5-1.7 in head length; green dorsally, white on sides and ventrally, with 4 yellow stripes (the upper 2 may be yellowish brown); upper lobe of caudal fin of adults with 5 dark brown to black transverse bands, the lower lobe with 3, the outer band twice as broad and darkest; 1st dorsal fin with 2 horizontal brown bands, tip broadly black.

Remarks: Known throughout the tropical and subtropical Indo-Pacific region (its occurrence in the Hawaiian Is. was by unintentional introduction from French Polynesia). Randall (1974) showed that Forsskål's type of *Mullus vittatus* was lost, and a specimen of *Mulloidichthys vanicolensis* was mistakenly put in its place. Forsskål's description was sufficiently detailed to provide positive identification. *Mullus bandi* Shaw is a synonym.

Upeneus vittatus is found on mud or silty sand substrata from shallow estuarine areas to depths of at least 320 m (1 New Caledonian specimen from that depth). Largest New Caledonia specimen, 194 mm SL. Not recorded from the Chesterfield Bank area. Fourmanoir and Laboute (1976) and Laboute and Grandperrin (2000) illustrated the species from New Caledonia by a specimen photograph. Feeds on a wide range of benthic invertebrates, mainly on shrimps (26%), bivalves (22%), and crabs (21%), based on 88 specimens.

Material examined: New Caledonia, BPBM 39575, 171 mm, 21°43'S, 166°36'E, 130 m. In addition, 180 specimens, 60-206 mm, from the Red Sea, Gulf of Aden, Pakistan, India, Tanzania, Natal, Madagascar, Réunion, Mauritius, Indonesia, Thailand, New Guinea, southern Japan, Palau, Mariana Is., Fiji, Samoa Is., Society Is., Marquesas Is., and the Hawaiian Is. (introduced).

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