

**ALLOCATION TO CALAMIANA
AND REDESCRIPTION OF THE FISH SPECIES
APOCRYPTES VARIEGATUS AND VAIMOSA MINDORA
(GOBIOIDEI: GOBIIDAE: GOBIONELLINAE),
WITH DESCRIPTION OF A NEW SPECIES**

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ABSTRACT. - Two estuarine gobiid fish species currently known as *Apocryptes variegatus* Peters, and *Vaimosa mindora* Herre, and an undescribed species from mangroves in northern Australia, Thailand, Brunei, Singapore and the Philippines, are reclassified in the gobionelline genus *Calamiana*. This genus is closely related to the gobionelline genera *Mugilogobius* and *Eugnathogobius*, and can be distinguished from them by a combination of characters. A lectotype is designated for *Apocryptes variegatus*.

KEY WORDS. - Gobioidae, Gobiidae, Gobionellinae, *Calamiana*, new species, *Apocryptes variegatus*, *Vaimosa mindora*, mangroves.

INTRODUCTION

During revision of the gobiid fish genus *Mugilogobius* Smitt and its nominal relatives (such as *Chlamydogobius* Whitley, *Eugnathogobius* Smith, *Hemigobius* Bleeker and *Pseudogobius* Popta) in the subfamily Gobionellinae (Larson 1995; Larson in press), three species were observed among available material which have been consistently misidentified or previously overlooked. One of these species, *Apocryptes variegatus* Peters, 1869, had been placed previously with the genus *Gobiopterus* Bleeker by Koumans (1953), due to its having a single row of teeth in the upper jaw (Koumans had not examined the type specimens, which otherwise bear very little resemblance to a *Gobiopterus*).

A second species, known as *Vaimosa mindora* Herre, 1945, or *Vaimosa zebrinus* Herre, 1950, originally thought to be *Mugilogobius* by the author (and sometimes identified as such in museum collections), was discovered to share characters with *Apocryptes variegatus*.

Finally, specimens of a new species (initially thought to be a species of *Pseudogobius*) were recognised among freshly collected material from Singapore and Thailand. Further examination of these specimens revealed that they shared a number of characters with the two above species. Cladistic analyses indicate that these three species belonged to the genus *Calamiana* Herre, 1945 (Larson, in press).

MATERIAL AND METHODS

Measurements were taken using electronic callipers and dissecting microscope. Counts and methods generally follow Hubbs and Lagler (1970), except as indicated below. Papillae pattern terminology is based on that of Sanzo (1911), due to its use in previous literature on this group of gobiellines by Aurich (1938) and Miller (1987, 1989). Pterygiophore formula follows Birdsong et al. (1988). Transverse scale counts are taken by counting the number of scale rows from the anal fin origin diagonally dorsally and posteriorly toward the second dorsal fin base. Head length is taken to the upper attachment of the opercular membrane. Interorbital width is least fleshy width (not least bony width). In the descriptions, an asterisk indicates counts of the holotype (or lectotype). Numbers in parentheses after counts indicate the number of specimens with that count, or the range of counts. Vertebral counts and other osteological information was obtained by radiography and clearing and double-staining.

Abbreviations for institutions referred to are: AMS - The Australian Museum, Sydney; CAS - California Academy of Sciences, San Francisco; CMK - Collection Maurice Kottelat, Cornol, Switzerland; KUMF - Kasetsart University Museum of Fisheries, Bangkok; NTM - Museum and Art Gallery of the Northern Territory (previously Northern Territory Museum), Darwin; QM - Queensland Museum, Brisbane; ROM - Royal Ontario Museum, Toronto; URM - University of the Ryukyus, Naha; USNM - National Museum of Natural History, Washington; WAM - Western Australian Museum, Perth; ZMB - Zoologische Museum, Berlin; ZRC - Zoological Reference Collection, Raffles Museum of Biodiversity Research, Department of Biological Sciences, National University of Singapore.

Other abbreviations used: HL - head length; SL; standard length; HD - head depth at rear preopercular margin; HW - head width at rear preopercular margin; BDA - body depth at anus; BWA - body width above anus; CPL - caudal peduncle length; CPD - caudal peduncle depth; CL - caudal length.

SYSTEMATICS

Calamiana Herre, 1945

Calamiana Herre, 1945b (*C. magnoris* Herre, 1945b: 80, Calamianes, Philippines, by original designation and monotypy).

Diagnosis. - Distinguished by combination of characters. Second dorsal rays I,6-9; anal rays I,5-8, rays modally equal in number; pectoral rays 14-18; 16 segmented caudal rays in 9/7 pattern; lateral scales 27-63; TRB 8-22; predorsal scales variable, absent or 2-25; 12-25 circumpeduncular scales; pectoral girdle (anterior edge of cleithrum) smooth or with bony or fleshy smooth flange, no individual fleshy lobes present; gut short, S-bend shape; genital papilla in male usually slender and flattened, and short, rounded and bulbous in female;

Table 1. Frequency distribution of fin ray counts in *Calamiana* species.

Species	Second dorsal rays				Anal rays			Pectoral rays				
	6	7	8	9	6	7	8	14	15	16	17	18
<i>illota</i> , new species	1	22	1	-	-	22	2	1	3	15	5	-
<i>mindora</i>	1	39	3	-	1	42	-	10	20	10	3	-
<i>variegata</i>	-	1	34	1	-	2	34	-	10	23	2	-

Table 2. Frequency distribution of transverse backward scale counts in *Calamiana* species.

Species	9	10	11	12	13	14	15
<i>illota</i> , new species	-	-	1	11	8	3	1
<i>mindora</i>	11	17	6	5	3	1	-
<i>variegata</i>	-	1	4	16	8	7	-

Table 3. Frequency distribution of lateral line counts in *Calamiana* species.

Species	27	28	29	30	31	32	33	34	35	36	37	38	39
<i>illota</i> , new species	-	-	-	-	1	-	1	8	8	1	3	-	2
<i>mindora</i>	3	10	9	5	4	4	-	1	3	1	2	-	1
<i>variegata</i>	-	-	8	10	6	8	1	3	-	-	-	-	-

jaws terminal with lower jaw tip usually anteriormost, jaws usually not enlarged in males (greatly enlarged in one species); inner edges of lips smooth, without fimbriae; profile slightly pointed; snout short, flat; fine villi absent from naked areas of interorbital and snout; sensory papillae in longitudinal pattern (Fig. 3); modally two but up to three *s* papillae rows on snout; papillae rows *p*, *a* and *c* are composed of few large widely spaced papillae, other papillae small and close-set; papilla row *c* broken under eye, rear portion consisting of one papilla; headpores, if present, reduced (no rear part of oculoscapular canal, no preopercular pores, no nasal pores).

Pterygiophore formula 3-12210, modally 26 vertebrae (10+16), two epurals; two anal pterygiophores before first haemal spine, anterior tip of preopercle rounded (blunt in adult males of one species), metapterygoid forming distinct low to moderate dorsally expanded bridge to quadrate, pterygoid shorter than palatine, palatine either reaching or falling short of quadrate, fifth ceratobranchial narrow and triangular, with distinct flange on ventral surface, neural spines on first few vertebrae slender, tips not bifid or broadened except in one species, five to eight rakers on first gill arch ossified, scapula unossified.

Remarks. - The gobionellines related to *Mugilogobius* Smitt are generally similar in appearance, with most genera distinguished by a combination of characters (as are many gobies). *Calamiana* is no exception, and is most similar in appearance to *Mugilogobius* and *Pseudogobius*. The exact relationship of the genus to the 12 others in the group is presently under investigation (Larson, in press). The relationship of *Calamiana* to the related genus *Eugnathogobius* is undergoing further examination, as *Eugnathogobius microps* and *Calamiana kabilia* (not dealt with in this paper) are problematic (Larson, in prep.).

Calamiana differs from *Mugilogobius* in that the mouth is terminal (versus subterminal), not enlarged in most species (versus enlarged, often greatly so, in males); the cheek rows *a* and *b* are composed of few widely spaced, large papillae (versus all cheek papillae small and uniformly sized); the neural spines on the first few vertebrae are usually slender and pointed (versus bifid or broadened); modally two (versus three) *s* rows of papillae present on snout; and two species have headpores (versus headpores always absent). Additionally, fine fleshy villi are absent from the unscaled surface of the head in *Calamiana*, but are present in *Mugilogobius*.

Calamiana differs from *Pseudogobius* in having a short, S-bend shaped gut (versus corkscrew-spiral coiled gut), terminal mouth with short flat snout (versus subterminal mouth and inflated snout), absence of headpores in one species (versus headpores always present), a low metapterygoid, with bridge overlapping quadrate (versus no bridge, metapterygoid short and often expanded dorsally), and fleshy upper and lower lips (versus thin lips, especially the lower, which is often a reduced fold of skin). *Calamiana* is similar to *Pseudogobius* in that at least one species in each genus has compressed, specialised teeth in the upper jaw (a single row present only in *Calamiana variegata*).

Calamiana is similar to *Eugnathogobius microps* Smith, 1931 (Larson, in press). The two share the characters of headpores absent; sensory papillae in cheek rows *c* and *cp* being large and widely spaced, with papillae in rows *b* and *d* small and close-set; papilla row *p* composed of widely spaced papillae, and fine villi absent from the dorsal surface of the head. *Calamiana* differs from *Eugnathogobius* in having 16 segmented caudal rays (versus 17), jaws enlarged in males in one species only (versus jaws greatly enlarged in males and relatively large in females), a low to moderate metapterygoid (versus broad (deep) metapterygoid) with a process or bridge overlapping the quadrate (versus no process reaching the quadrate), and two *s* rows of papillae on the snout (versus three *s* rows).

KEY TO SPECIES

- 1 Upper jaw teeth in single row, teeth compressed and even in height, with tips indented and turned to one side, lower jaw teeth conical, pointed
..... *C. variegata* (Peters, 1868) (Thailand, Singapore, Indonesia, Papua New Guinea)
- Upper jaw teeth in at least two rows, all teeth conical and pointed 2
- 2 First three dorsal spines often elongate in males; four to five oblique dark brown lines cross side of head; headpores absent except in specimens from Fiji; anteriormost nape scale enlarged, occasionally all nape scales small, equal in size
..... *C. mindora* Herre, 1945 (Fiji, Queensland, Philippines, Thailand)
- No dorsal spines elongate in males, second or third spine longest; two or three broad irregular dusky bands cross snout and cheek; headpores present; anteriormost nape scale enlarged ..
..... *C. illota*, new species (Thailand, Singapore, Brunei, Philippines)

Calamiana illota, new species

(Figs 1-4, 10; Tables 1-4)

Pseudogobius sp. 4 - Lim & Larson 1994: 260.

Material examined. - 25 specimens, 19-45 mm SL.

Holotype - ZRC 39268, 37 mm SL female, Sungei Buloh mangroves, Singapore, K. Lim, 30 Jan. 1992.

Paratypes - SINGAPORE: NTM S.14235-002, 7(22.5-34), same data as holotype; NTM S.13959-011, 4(19-32.5), Sungei Buloh mangroves, H. Larson & K. Lim, 4 Jan.1994; AMS I.37147-001, 1(38), Sungei Pandan, D. Hoese, P. Ng & K. Lim, 22 Dec.1993; ZRC 39269, 3(37-45), tidal creek near Woodlands, P. Ng & K. Lim, 30 Jan.1992. THAILAND: CAS 76093, 3(22-31.5), SE bay on Goh Mak Island, SW of Trat Bay, Gulf of Thailand, H.A. Fehlmann, 30 Oct.1957; CAS 206724, 3(28-35), same data as preceding; NTM S.13953-012, 1(40), mangrove creek, Klong Bang Sai, Phuket, H. Larson, D. Hoese & party, 8 Oct.1993. BRUNEI: NTM S.13053-002, 1(24), *Nypa* forest, Pulau Berambang, S. Choy, 26 Sep.1990. PHILIPPINES: USNM 316045, 1(27), fish-market at Sorsogon, Sorsogon Bay, Bikol region, Luzon, T. Roberts, 29-30 Apr.1976; CAS 38650, 1(36.5), Capiz, Panay, A.W. Herre, 3 Aug.1940.

Cleared and stained: NTM ex S.14235-002, 1(30).

X-rayed: holotype, ZRC 39268, 1(37); paratypes, NTM S.14235-002, 7(22.5-34).

Diagnosis. - A relatively large *Calamiana*; second dorsal rays I,6-8; anal rays I,7-8; pectoral rays 14-17; longitudinal scales 31-39; TRB 11-15; predorsal scales 17-25, often single enlarged scale close behind eyes, other nape scales small; scales on body mostly ctenoid; gill opening restricted, reaching anteriorly to just under rear part of opercle; colour pale yellowish with brown speckling dorsally and two irregular rows of brown elongate blotches along mid-side of body, and blotchy dark brown to blackish irregular broad lines over snout and cheeks; known from mangroves, Indo-Malayan Archipelago to Philippines.

Description. - Based on 24 specimens, 19-45 mm SL. Counts of the holotype (Fig. 1) indicated by an asterisk.

First dorsal VI*; second dorsal I,6-8 (mean I,7*); anal I,7-8 (mean I,7*), pectoral rays 14-17 (mean 16, holotype with 14 rays on left, 17 on right), segmented caudal rays 15-16 (mean 16*); caudal ray pattern modally 9/7; branched caudal rays 13-16 (mean 15*); unsegmented (procurent) caudal rays 7/6 to 8/6 (modally 7/7); longitudinal scale count 31-39 (mean 36, 35 in holotype); TRB 11-15 (mean 13, 12 in holotype); predorsal scale count 17-25 (mean 20*); circumpeduncular scales 12-14 (mean 12*). Gill rakers on outer face of first arch 0+7 to 3+8 (modally 3+6). Pterygiophore formula 3-12210 (10). Vertebrae 10+15 (3), 10+16 (15), 10+17 (2). Neural spine of first few vertebrae narrow, pointed (8). Two epurals (13). Two (13) anal pterygiophores before haemal spine of first caudal vertebra. Metapterygoid long, relatively low, not expanded dorsally, with bridge overlapping quadrate; pterygoid shorter than palatine (Fig. 2).

Body compressed, less so anteriorly; rounded anteriorly in large females. Head wider than deep, HL 3.2-3.8 (mean 3.6) in SL; top of head somewhat flattened. Depth at posterior preopercular margin 1.6-2.1 (mean 1.8) in HL. Width at posterior preopercular margin 1.2-

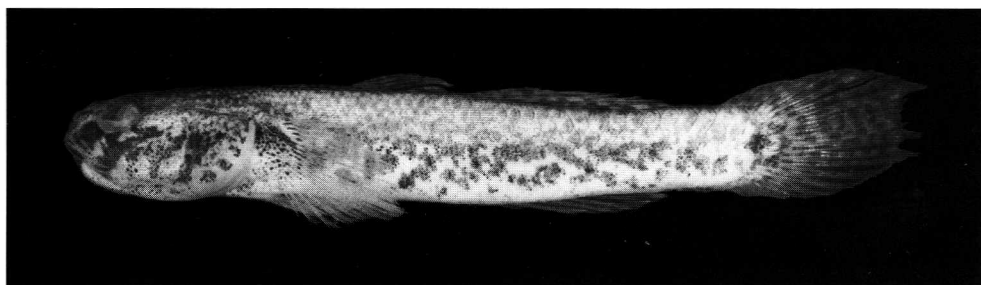


Fig. 1. *Calamiana illota*, new species holotype, 37 mm SL, ZRC 39268, Singapore.

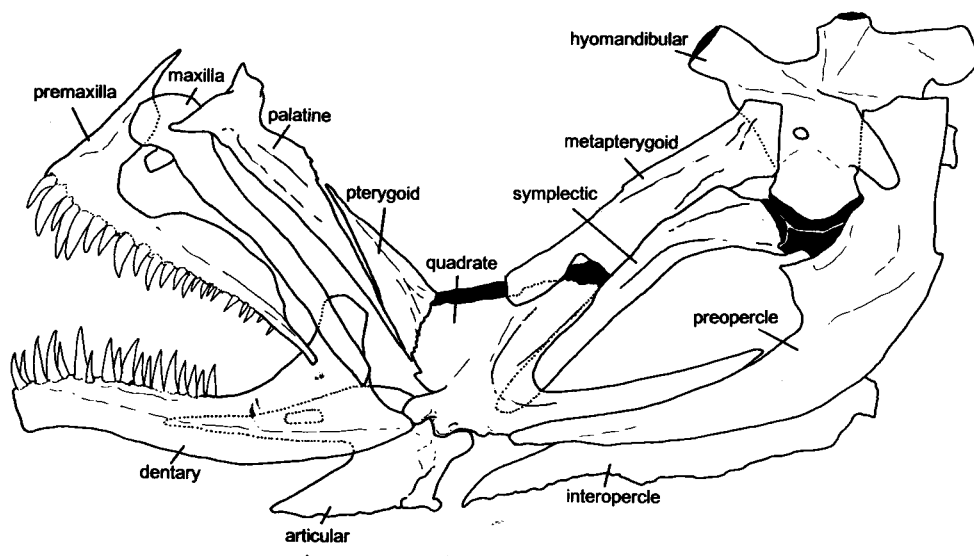


Fig. 2. Jaws and suspensorium of *Calamiana illota*, new species, NTM ex S.14235-002, 30 mm SL, Sungei Buloh, Singapore. Black areas are cartilage. Scale bar = 1 mm.

1.7 (mean 1.4) in HL. Mouth terminal, slightly oblique, forming an angle of 20-25° with body axis; jaws reaching to below anterior half of eye (to mid-eye in large male) in both sexes. Lips fleshy, smooth; few large specimens with fleshy fimbriae anteriorly on inner edges of lips; lower lip free laterally, fused medially. Upper jaw 2.4-3.0 (mean 2.6 in males, 2.7 in females) in HL. Eyes dorsolateral, high on head, forming part of dorsal profile, 3.6-4.5 (mean 4.0) in HL. Snout short, rounded, 3.7-4.6 (mean 4.2) in HL. Interorbital moderate, 3.9-7.5 (mean 5.2) in HL. Naked areas on top of head without fine villi. Body depth at anal origin 5.6-6.6 (mean 6.1) in SL. Caudal peduncle compressed, length 3.2-4.1 (mean 3.8) in SL. Caudal peduncle depth 7.4-8.3 (mean 8.0) in SL.

First dorsal fin triangular to slightly rounded, tips of second to fourth spines partly free, second or third spines longest or subequal, elongate and filamentous in one male specimen from Gulf of Thailand; spines longer in males than females; usually, spines barely reaching second dorsal fin origin when depressed, a few males with spines just reaching first element of second dorsal fin. Second dorsal spine length 3.6-8.8 (mean 6.5 in males, 8.0 in females) in SL. Third dorsal spine length 6.4-8.8 (mean 6.7 in males, 8.0 in females) in SL. Second dorsal and anal fins low to moderately tall, short-based, females and small males with all rays approximately similar in height, posteriormost rays falling well short of caudal fin base when depressed; in large males, posterior rays longest, tips just reaching caudal base. Pectoral fin oval to rounded, central rays longest, 4.4-5.4 (mean 5.0) in SL; rays usually all branched (uppermost ray may be unbranched). Pelvic fins short, rounded to oval, reaching more or less halfway to anus, 5.1-6.6 (mean 5.7) in SL. Caudal fin an elongate oval, rounded posteriorly, 3.0-4.0 (mean 3.6) in SL.

No mental fraenum, chin smooth; area between mental *f* rows slightly inflated in some specimens. Anterior nostril in short tube, placed at edge of upper lip, tube oriented anteroventrally, preorbital curved anteriorly to accommodate nostril. Posterior nostril oval, placed close to anterior centre margin of eye. Gill opening restricted, extending anteriorly to just under rear part of opercle. Inner edge of shoulder girdle smooth (in 10), or with raised

Table 4. Measurements (mm) of *Calamiana illota*, new species.

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head Length	10.8	5.5	10.0	8.0	6.0	12.5	9.4
Head Depth	6.0	3.0	6.0	4.5	3.1	7.7	5.3
Head Width	8.6	3.8	8.2	5.8	4.0	10.1	7.1
Body Depth	6.0	3.1	6.6	4.8	3.4	7.6	5.5
Body Width	-	2.3	5.0	3.2	2.4	5.8	3.7
Caud. Ped. Leng.	9.6	5.3	10.3	7.7	6.3	11.5	8.8
Caud. Ped. Depth	4.7	2.4	4.9	3.7	2.7	5.6	4.1
Snout	2.5	1.3	2.7	1.9	1.5	3.4	2.3
Eye	2.8	1.4	2.8	2.0	1.6	2.9	2.4
Jaw	4.1	2.0	4.2	3.1	2.0	5.1	3.6
Interorbit	2.1	1.1	2.5	1.6	0.8	2.7	1.8
Pectoral	7.6	3.9	7.3	5.9	4.5	8.3	6.6
Pelvic	6.5	3.6	6.8	5.2	3.9	7.7	5.9
Caudal	10.4	5.2	10.9	8.4	6.1	11.6	9.0
Longest D1 spine	5.1	2.2	9.6	5.2	3.5	5.6	4.5

bony or fleshy ridge or flange (14), which may be slightly bent laterally. Gill rakers on outer face of all arches reduced, short and unspined, longest rakers near angle of arch, rakers on upper limb rudimentary to absent; rakers on inner face of first arch rounded and stubby; inner rakers on third and fourth arches slightly larger and longer than first arch inner rakers. Tongue tip blunt to rounded. Outer teeth in upper jaw largest, stout, conical, slightly curved, but not sharply pointed, largest teeth anteriorly; behind outermost row, second row of pointed upright teeth; one row of evenly sized teeth at side of jaw. Lower jaw with three rows of small, stout, slightly curved, dully pointed teeth, all approximately even in size; one or two rows of teeth at side of jaw. Teeth relatively larger in large males.

Predorsal with anteriormost scale enlarged, placed close behind eyes; other scales small, evenly sized; three specimens from Thailand and two from Singapore with all predorsal scales small and about equal in size. Operculum with small cycloid scales on upper quarter to half. Cheek naked. Pectoral base covered with small cycloid scales. Prepelvic area with small cycloid scales. Belly with isolated area under pelvics of ctenoid scales (anterior $\frac{1}{4}$ to $\frac{1}{2}$ of belly scales ctenoid), rest of scales cycloid. Ctenoid scales on side of body in broad wedge extending up to behind pectoral fin.

Head pores present. Two anterior interorbital pores (placed toward centre of interorbital space), single (occasionally paired) posterior interorbital pore, infraorbital and postorbital pores present. No preopercular pores or lateral canal pore.

Sensory papillae pattern longitudinal, as in Fig. 3. Three *s* papillae rows on snout, of single papilla each. Cheek with rows *a*, *c* and *cp* composed of few large, widely spaced papillae,

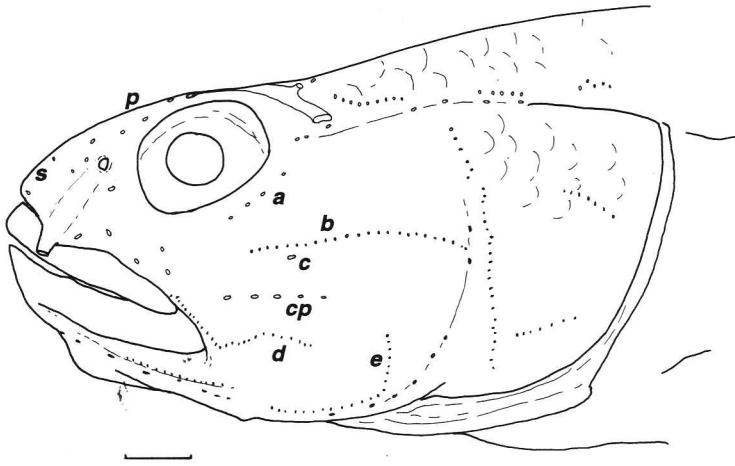


Fig. 3. *Calamiana illota*, new species headpores and papillae, CAS 206724, Gulf of Thailand. Scale bar = 1 mm.

while rows *b* and *d* composed of small closely spaced papillae; row *c* consisting of one papilla only. Preopercular row *e* turning dorsally onto cheek well anterior to rear preopercular margin (as in *Eugnathogobius*).

Coloration of fresh material. - No photographs available. Field notes by the author indicate that a specimen collected at Phuket, Thailand, was pale with dark greyish spotting and blotches, and black face markings.

Coloration of preserved material. - Head and body whitish yellow to very light brown, with fine brown to dark brown spots and elongate small brown blotches on side, and two broad irregular dark brown lines and mottling on head (Figs 1, 4). Dorsum and dorsal third of side of body light brownish, with darker brown speckling and small spots. Side of body with two staggered rows of irregular dark brown elongate blotches, with yellowish white background usually visible between rows; dark blotches obliquely oriented in some specimens; posteriormost brown blotch darkest, small, placed over hypural crease (and partly joined by two or three small brown blotches on mid-base of caudal fin; lower third of body whitish with scattered fine brown speckling. Nape pale brownish to dusky (scale margins often narrowly outlined in brown) with brown spots and small blotches; interorbital area and top of snout with scattered short brown vermiculate lines and small spots.

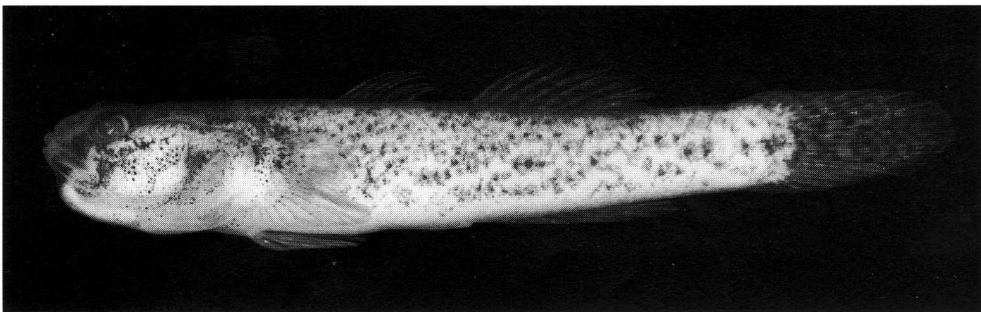


Fig. 4. *Calamiana illota*, new species paratype, 45 mm SL, ZRC 39269, Singapore.

Head with two broad irregular dark brown to blackish lines crossing snout and cheek: first extending anterior to eye and crossing lips, at point just below anterior nostril, to join its counterpart on chin; second line extending from ventral margin of eye and crossing cheek to rictus; pale area between the two broad lines in most specimens. Preopercle and opercle with blotchy brown vermiculate markings (which coalesce, forming two diffuse oblique lines, in small specimens) which may reach to ventral and rear edge of eye. Opercle with brown spots and small irregular blotches; oblique brown line crossing centre of opercle in some specimens. Pectoral base pale whitish yellow ventrally, brown dorsally, usually with brown horizontal bar on upper half, partly extending onto fin rays. Ventral surface of head and anterior half of breast plain dusky or finely spotted with brown; line extending from rictus intensified as blotch on each side of isthmus. Lips brown, barred and spotted by continuation of darker markings on head. Chin with broad V-shaped mark formed by junction of two dark lines extending from eye over lips. Belly plain whitish. Peritoneum blackish dorsally, sides paler, fading ventrally to white belly.

First dorsal fin translucent to whitish with four rows of small brown spots, proximal row just above fin base, distalmost row below dusky or translucent fin margin. Second dorsal fin translucent with three to four rows of small brown spots, fin margin translucent whitish. Anal fin translucent whitish to dusky, margin white or translucent. Caudal fin whitish to translucent with about seven vertically oriented rows of fine brown spots; spots proximal to fin base coalesce to form broad curved brown line or series of blotches which connect with dark brown blotch at mid-base of caudal (over hypural crease); lower edge of fin plain dusky. Pectoral fin translucent to light dusky; bases of rays brown, especially uppermost rays. Pelvic fins whitish to translucent margin, fraenum with dusky patch.

Distribution. - Specimens are so far known only from Thailand, Singapore, Brunei and the Philippines (Fig. 10).

Ecology. - *Calamiana illota* has usually been collected from estuaries or mangrove sites not far from the sea, from mud, muddy sand or rocky and sandy substrates. This species is not as common as *C. mindora*, which it closely resembles, and with which it is syntopic at many localities.

Etymology. - From the Latin *illota*, meaning unwashed or dirty; due to the blotchy dark brown lines and mottling on the snout and cheeks, giving the fish the appearance of having an unwashed, smudged face (this species known colloquially to the author as the "dirty-face goby").

Remarks. - This species is very close in colour pattern to *C. mindora*, differing in the markings on the head and the fins: diffuse mottling and elongate dusky blotches on head in *C. illota* versus four to six distinct oblique dark lines in *C. mindora*, and rows of fine dark spots on dorsal and caudal fins in *C. illota* versus fine dark lines on dorsal and caudal fins (lines partly broken up into rows of spots in some specimens) in *C. mindora*. *Calamiana illota* is a larger species, reaching up to 45 mm SL (male mean 28.6 mm SL, female mean 33.3 mm SL), with the largest *C. mindora* reaching only 26.5 mm SL. *Calamiana illota* always has headpores, which *C. mindora* has only in Fiji specimens; and *C. illota* has slightly higher predorsal scale counts (17-25, mean 20, versus 11-19, mean 15).

***Calamiana mindora* (Herre, 1945)**

(Figs 5-11; Tables 1-3, 5)

Vaimosa mindora Herre, 1945a: 13 (Hacienda Waterous, Mangarin, Mindoro, Philippines).

Vaimosa zebrinus Herre, 1950: 74 (Layia, Batangas Province, Philippines).

Vaimosa zebrina - Herre 1953: 769.

Material examined.- 73 specimens, 8.5-26.5 mm SL.

PHILIPPINES: Holotype of *Vaimosa mindora*, CAS 36826, 21.5 mm SL male, Hacienda Waterous, Mangarin, Mindoro, A.W. Herre, 21 Jul.1940. Holotype of *Vaimosa zebrinus*, USNM 202515, 24.5 mm SL, brackish estuary, Layia, Batangas Province, A.W. Herre, 30 Jun.1948. Paratypes of *Vaimosa zebrinus*, USNM 202572, 3(22.5-23), same data as holotype. USNM 268602, 5(18.5-23.5), tidal lagoon, NE side of Siquijor Island, Negros Oriental, L. Knapp & party, 14 May.1979; USNM 244050, 2(18-18.5), South Bais Bay, Negros Oriental, K. Carpenter & party, 15 May.1978; ROM 53371, 20(14-25), mangrove at Banlas Point, Daco Island, Negros Oriental, R. Winterbottom & party, 21 May.1987; ROM 53370, 1(22), same locality as preceding, 20 May.1987. THAILAND: CMK 5366, 6(19.5-26), estuary at Ao Kammala, Phuket, M. Kottelat, 23 Apr.1985. INDONESIA: USNM 296896, 1(17), near Samei Island, Irian Jaya, B. Collette, 4 Jul.1979; USNM 297054, 14(8.5-18), Marchesa Bay, Bantanta Island, Irian Jaya, B. Collette, 2 Jul.1979. AUSTRALIA - QUEENSLAND: AMS I.21259-008, 14(10.5-26.5), S of Cape Tribulation, D. Hoese, 11 Aug.1979; QM I.21855, 1(26.5), brackish creek, Holloway's Beach, R. Johnson, 23 Nov.1985; AMS I.21273-013, 2(12.5-18.5), mangrove in Esk River, S of Cooktown, D. Hoese, 20 Sep.1979. FIJI: ROM 45998, 1(26), mangrove swamp S of Suva, Viti Levu, A. Emery & party, 5 Mar.1983; ROM 45847, 1(23), mangrove creek W of Lami, Viti Levu, R. Winterbottom & J. McKinnon, 21 Apr.1984.

Other material examined (but not used in description).- Fifty-eight specimens from the following localities. PHILIPPINES: AMS I.21938-015, 4, Mactan Island, Cebu; USNM 244094, 44, Cuyo Island, Palawan. PAPUA NEW GUINEA: NTM S.13674-001, 2, Biges River, N of Madang; NTM S.13662-005, 6, Nagada River, N of Madang. AUSTRALIA - QUEENSLAND: AMS I.22056-015, 2, Bailey Creek, S of Cape Tribulation; AMS I.23262-004, 2, Esplanade, Cairns.

Cleared and stained: ex ROM 53371, 1(24.5).

X-rayed: ROM 53371, 8 of 20(14-25); CMK 5366, 6(19.5-26).

Diagnosis.- A *Calamiana* with second dorsal rays I,6-8; anal rays I,6-7; pectoral rays 14-17; longitudinal scales 27-39; TRB 9-14; predorsal scales 11-19, anteriormost scale close behind eyes, enlarged; headpores modally absent; scales on body mostly ctenoid; pectoral base and breast naked or with few cycloid scales; first dorsal fin pointed, with first three spines longest, elongate and filamentous in some males; body light coloured with fine dark speckling and blotches, small dark spot on upper pectoral base, at least four narrow oblique dark lines crossing sides of head, caudal fin finely barred with brown; known from Indo-Malaysian Archipelago, Papua New Guinea, NE Queensland and Fiji.



Fig. 5. *Calamiana mindora*, holotype of *Vaimosa mindora* Herre, 26.5 mm SL, CAS 36826, Mangarin, Philippines.

Table 5. Measurements (mm) of *Calamiana mindora* (Herre, 1945).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head Length	5.8	4.6	7.5	6.0	4.5	7.1	5.9
Head Depth	3.2	2.5	4.6	3.5	2.5	4.2	3.4
Head Width	3.8	3.0	6.1	4.4	3.0	5.2	4.2
Body Depth	3.7	2.5	4.9	3.6	2.4	4.8	3.6
Body Width	-	1.5	3.1	2.3	1.5	3.2	2.3
Caud. Ped. Leng.	5.6*	4.8	7.0	5.9	4.7	7.6	5.9
Caud. Ped. Depth	2.8	1.8	3.7	2.7	1.8	3.4	2.6
Snout	1.2	1.0	2.0	1.5	0.9	2.0	1.4
Eye	1.9	1.4	2.1	1.7	1.3	2.3	1.7
Jaw	2.4	1.6	3.0	2.3	1.5	2.4	2.0
Interorbit	0.8	0.6	1.7	1.1	0.6	1.4	1.0
Pectoral	4.7	3.5	5.8	4.5	3.2	5.7	4.4
Pelvic	3.9	3.0	5.3	3.9	2.8	5.2	3.9
Caudal	6.0	4.8	8.0	6.1	4.3	7.7	5.9
Longest D1 spine	5.4	2.9	6.8	4.4	2.1	3.6	3.3

Description. - Based on 43 specimens, 16-26.5 mm SL. An asterisk indicates the counts of the holotype (Fig. 5).

First dorsal VI*; second dorsal I,6-8 (mean I,7*); anal I,6-7 (mean I,7*); pectoral rays 14-17 (mean 15*); segmented caudal rays 15-16* (mean 16); caudal ray pattern modally 9/7; branched caudal rays 12-15 (mean 14, 13 in holotype); unsegmented (procurrent) caudal rays 7/6 (1), 7/7 (6); longitudinal scale count 27-39 (mean 31, 29 in holotype); TRB 9-14 (mean 10*); predorsal scale count 11-19 (mean 15, 14 in holotype); circumpeduncular scales 11-14 (mean 12*). Gill rakers on outer face of first arch 2+4 to 4+6 (modally 3+6). Pterygiophore formula 3-12210 (15). Vertebrae 10+16 (14). Neural spine of first few vertebrae slender, pointed (10). Two epurals (15). Two (14) or three (1) anal pterygiophores before haemal spine of first caudal vertebra. Metapterygoid moderately wide but not expanded dorsally; forming distinct bridge overlapping quadrate (Fig. 6).

Body slender, compressed, slightly less so anteriorly. Head wider than deep, but not greatly so, HL 3.4-4.0 (mean 3.7) in SL; cheeks slightly inflated in some specimens. Depth at posterior preopercular margin 1.5-2.0 (mean 1.7) in HL. Width at posterior preopercular margin 1.2-1.6 (mean 1.4) in HL. Mouth terminal, slightly oblique, forming an angle of about 20-25° with body axis; jaws reaching to below mid-eye (or nearly so) in males and to below anterior half of eye in females (to below mid-eye in holotype). Lips narrow and fleshy, smooth, without fleshy fimbriae on inner edges; lower lip free laterally, fused medially. Upper jaw 2.3-7.5 (mean 3.2 in females, 2.6 in males) in HL. Eyes large, dorsolateral, forming part of dorsal profile, 3.0-3.9 (mean 3.4) in HL. Snout short, rounded, 3.0-5.1 (mean 4.1) in HL. Interorbital moderate to rather narrow, 1.3-8.0 (mean 5.9) in HL. Naked areas on top of head

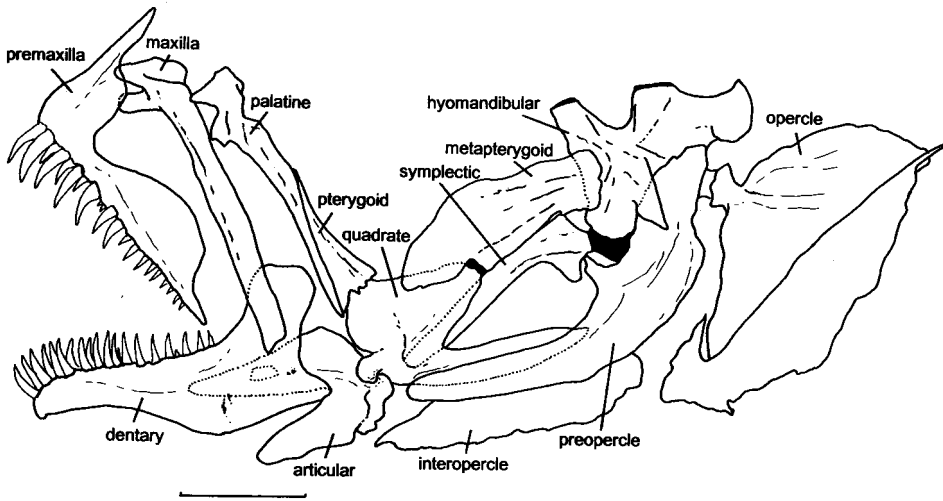


Fig. 6. Jaws and suspensorium of *Calamiana mindora*, ex ROM 53371, 24.5 mm SL, Negros Oriental, Philippines. Black areas are cartilage. Scale bar = 1 mm.

without fine villi. Body depth at anal origin 5.3-7.6 (mean 6.1) in SL. Caudal peduncle compressed, length 3.2-4.1 (mean 3.6) in SL. Caudal peduncle depth 7.0-10.0 (mean 8.3) in SL.

First dorsal fin triangular, tips of first to fourth spines free, second and third spines longest or subequal, occasionally elongate and filamentous in male; spines longer in males than females; in females, spines falling well short of second dorsal fin origin when depressed; in males, most spines reaching to first few second dorsal fin elements. First dorsal spine length 4.1-8.2 (mean 4.7 in males, 7.4 in females) in SL. Second dorsal spine length 3.6-7.8 (mean 5.2 in males, 7.9 in females) in SL. Third dorsal spine length 4.3-8.8 (mean 6.8 in males, 7.5 in females) in SL. Second dorsal and anal fins moderately tall, short-based, all rays approximately similar in height, posteriormost rays falling well short of caudal fin base when depressed. Pectoral fin slender, oval, central rays longest, 4.0-5.3 (mean 4.9) in SL; rays usually all branched (uppermost ray may be unbranched). Pelvic fins short, oval, reaching halfway or more to anus, 4.3-6.4 (mean 5.6) in SL. Caudal fin rounded, lower rays slightly shorter than upper, 3.2-4.1 (mean 3.6) in SL.

No mental fraenum, chin smooth; area between mental *f* rows slightly inflated in some specimens. Anterior nostril in short tube, placed at edge of upper lip, tube oriented anteroventrally, preorbital slightly curved anteriorly to accommodate nostril. Posterior nostril oval, placed very close to anterior centre margin of eye. Gill opening restricted, extending anteriorly to just ventral to opercle. Inner edge of shoulder girdle smooth (in 9), or with raised bony or fleshy ridge or flange, which may be bent laterally (24). Gill rakers on outer face of all arches short, without spines, longest rakers near angle of arch; rakers on inner face of first arch also stubby; inner rakers on third and fourth arches slightly longer than first arch inner rakers. Tongue tip blunt to rounded. Outer teeth in upper jaw largest, stout, conical and curved, but not very sharply pointed; behind this row, about three rows of small pointed teeth; one or two rows present at side of jaw. Lower jaw with four or five rows of small, stout, curved, dully pointed teeth, all approximately even in size; one or two rows of teeth at side of jaw. Teeth similar in size and shape among males and females.

Predorsal with anteriormost scale usually enlarged, placed close behind eyes (Fig. 7); others small, evenly sized; both specimens from Fiji and three from Thailand with all scales small and about equal in size (Fig. 8). Operculum with small cycloid scales on upper quarter to half; only few scattered scales present in some specimens. Cheek always naked. Pectoral base usually naked, rarely with few cycloid scales; all specimens from Thailand with pectoral base covered with cycloid scales. Prepelvic area naked, or with small cycloid scales just before pelvic fins (Thailand specimens with entire breast fully scaled). Belly with isolated area under pelvics of ctenoid scales (anterior $\frac{1}{4}$ to $\frac{1}{2}$ of belly with ctenoid scales), rest of scales cycloid; entire belly with cycloid scales in some specimens. Ctenoid scales on side of body in wedge extending behind pectoral fin or at least to below second dorsal fin origin.

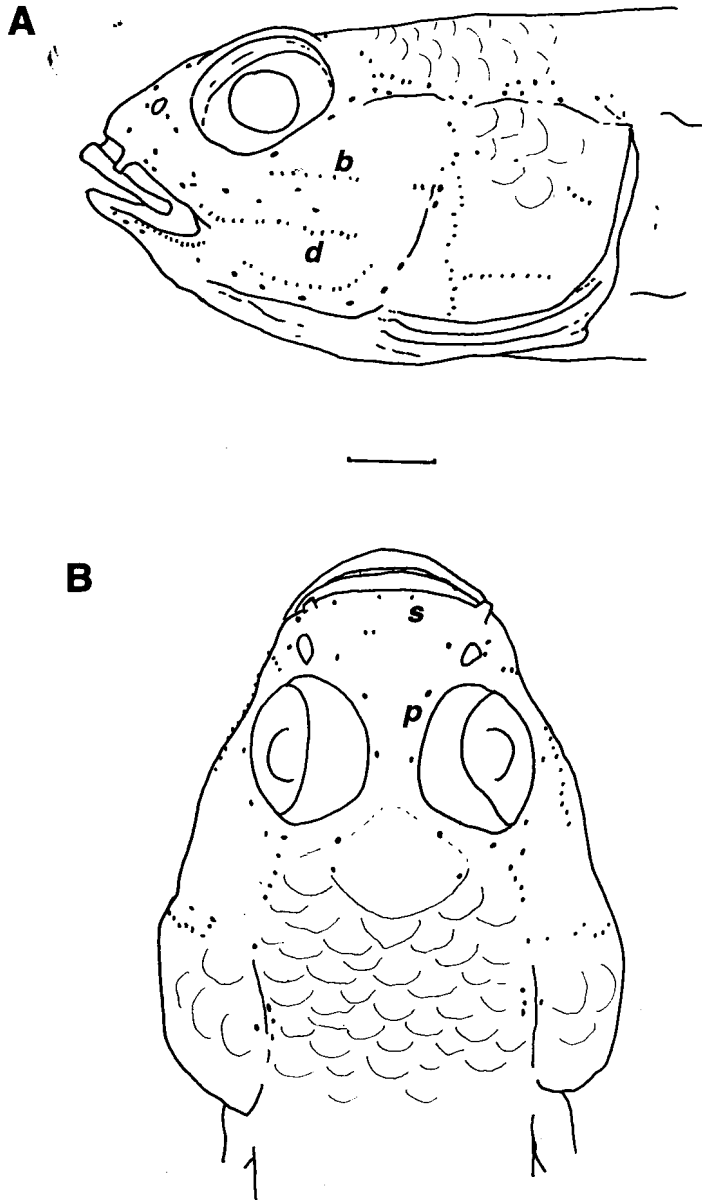


Fig. 7. *Calamiana mindora* papillae. A, lateral view; B, dorsal view. ROM 53370, Negros Oriental, Philippines. Scale bar = 1 mm.

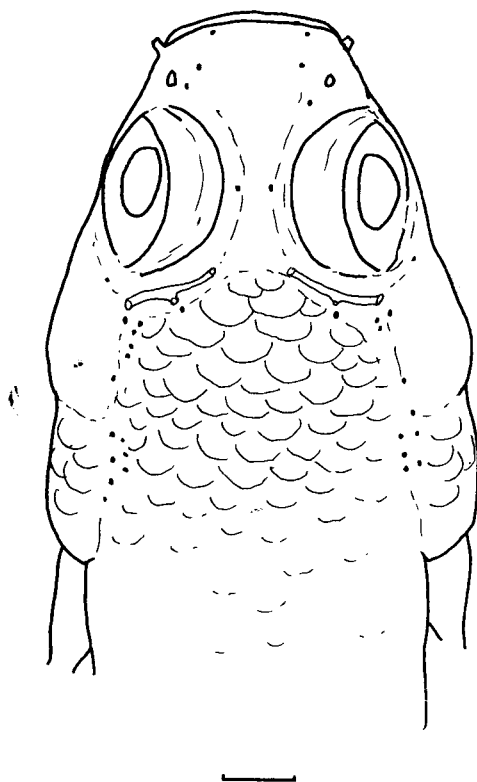


Fig. 8. *Calamiana mindora*, headpores of specimen from Viti Levu, Fiji, ROM 45998. Scale bar = 1 mm.

Head pores absent except for two specimens from Fiji, which have posterior interorbital, infraorbital and postorbital pores, joined by short canal (Fig. 8).

Sensory papillae pattern longitudinal, as in Fig. 7. Two or three *s* rows present, usually of single papilla each (two present in some specimens). Cheek rows with rows *a*, *c* and *cp* composed of few large, widely spaced papillae, while rows *b* and *d* are composed of small, closely spaced papillae; row *c* of one papilla only.

Gut short, with one S-bend loop.

Coloration of fresh material. - Slide of freshly dead Fijian specimen shows upper two-thirds of head and body pale yellowish, with lower third white and brown markings on body. Spotting on both dorsals and caudal fins blackish. Pelvic fins and anal fin dusky grey with white margins. Proximal half of caudal fin yellow, distal half dusky greyish.

Herre (1945a) described both dorsal fins of *Vaimosa mindora* as having conspicuous crossbars of reddish brown dots, and described the dorsal fins of *Vaimosa zebrinus* as having three to four transverse rows of black spots (Herre 1950).

Coloration of preserved material. - Head and body whitish yellow to very light brown, with fine brown to dark brown spots and X-shaped small brown blotches on sides, and three to

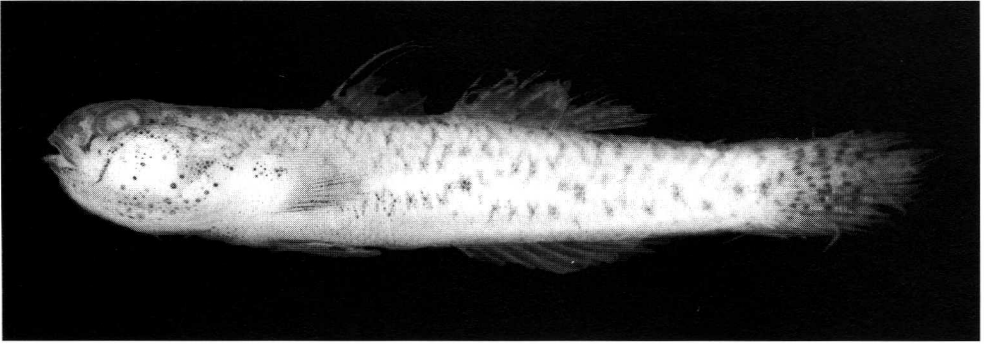


Fig. 9. *Calamiana mindora*, 25 mm SL, ROM 53371, Negros Oriental, Philippines.

five distinct oblique brown lines on head (Fig. 9). Dorsum light brownish or at least with brown scale margins, forming reticulate pattern. Upper two-thirds of body with fine brown spots and X-shaped small blotches, latter forming indistinct row or series of rows along mid-side of body; darkest and most elongate blotch at caudal base (occasionally two diagonally oriented blotches present at caudal base); scale margins on body narrowly outlined in dark brown; lower third of body whitish, often with scattered fine brown speckling. Anterior part of nape, interorbital area and top of snout pale brownish to dusky, with brown spots and small blotches.

Head with four to five oblique brown lines (anteriormost two lines often most distinct; others may be diffuse but always discernible): one from lower anterior edge of eye extending onto upper lip well anterior to rictus and continuing onto lower lip (and often onto inner margin of lip as dark brown edge); one line from rictus extending backward to end on centre of cheek or continuing along lower edge of eye; one line extending from lower rear edge of eye and curving down, then up, ending on middle of rear preopercular margin (this line and line from rictus often fused); one line from lower edge of preopercle extending obliquely up and posteriorly to end at rear uppermost corner of preopercle; and one line from subopercle extending dorsally and posteriorly across opercle, ending on upper third of opercle. Opercle with brown spots and small irregular blotches; rear edge may have dark margin. Pectoral base pale with brown horizontal bar on upper half extending onto fin rays. In males, ventral surface of head and, in some specimens, anterior half of breast plain dusky or finely spotted with brown; females with ventral surface of head and breast whitish. Lines on side of head usually extending onto ventral surface of head as indistinct dusky lines. Lips usually outlined with brown; distinct brown blotch or dusky brownish elongate or V-shaped patch always present on chin. Belly plain whitish to faintly brownish. Peritoneum blackish dorsally, sides paler, fading ventrally to white belly.

First dorsal fin translucent to whitish with three rows of small dense brown spots, distalmost row of spots join posteriorly in some specimens, forming diffuse brown band; rear third of fin often plain dusky. Second dorsal fin translucent with three to five rows of small brown spots, fin margin usually plain dusky. Anal fin translucent whitish to dusky, margin white or translucent. Caudal fin whitish to translucent with five to seven vertically oriented rows of fine brown spots, which may coalesce, forming broken lines; one or two small oval brown spots at mid-base, close to posteriormost mid-lateral blotch on body; lower edge of fin plain dusky. Pectoral fin translucent to dusky; lower fin rays darkest. Pelvic fins dusky with whitish to translucent margin, fraenum dusky; pelvics often quite dark in males, almost whitish in females.

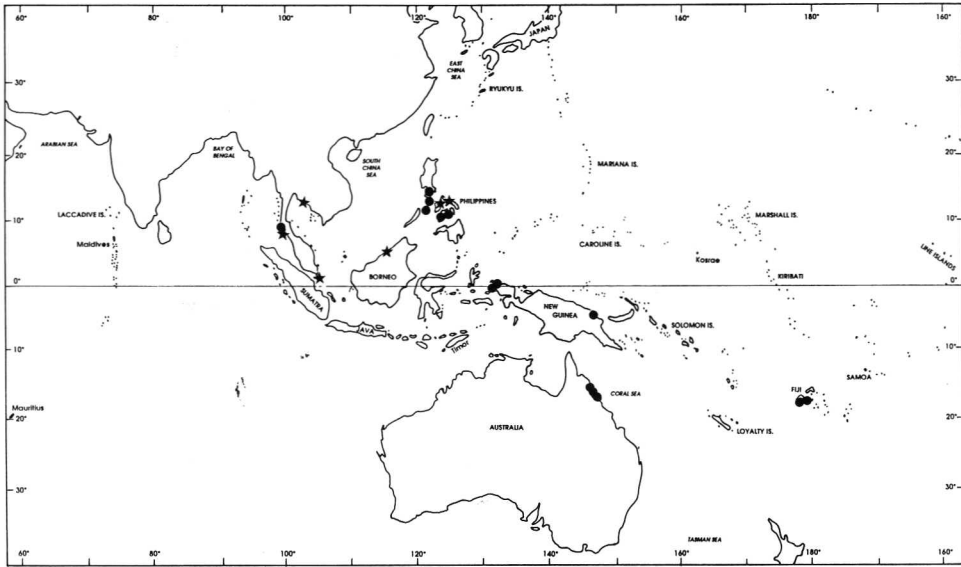


Fig. 10. Distribution of *Calamiana illota*, new species (stars) and *C. mindora* (circles).

Distribution. - Specimens are known from southern Thailand, Philippines, Indonesia (Irian Jaya), northern Queensland and Fiji (Fig. 10). It is not known from Singapore, but *C. illota* and *C. variegatus* occur there.

Ecology. - Found in tidal creeks entering estuaries, and brackish mangrove creeks.

Remarks. - This species looks much like *C. variegata* and *C. illota*. This species is almost identical in colour pattern to *C. illota*, differing in the markings on the head and the fins: diffuse mottling and elongate dusky blotches on head in *C. illota* versus four to six distinct oblique dark lines in *C. mindora*, and rows of fine dark spots on dorsal and caudal fins in *C. illota* versus fine dark lines on dorsal and caudal fins (usually, lines partly broken up into rows of spots in some specimens) in *C. mindora*. *Calamiana mindora* has somewhat lower scale counts (e.g. lateral scales 27-39, modally 28, versus 31-39, modally 34-35) (Tables 2-3). *Calamiana illota* always has headpores, which have been observed in *C. mindora* only in the two specimens known from Fiji. A 19 mm SL specimen of *C. illota* from Sungei Buloh, Singapore, exhibits the same reduced pore pattern as seen in *C. mindora* from Fiji.



Fig. 11. *Calamiana mindora*, holotype of *Vaimosa zebrinus* Herre, 25.5 mm SL, USNM 202515, Layia, Philippines.

Herre (1950) noted the conspicuous stripes on the cheeks of this species; the markings were the reason for his name *Vaimosa zebrinus*. The holotype of *Vaimosa zebrinus*, now at USNM (Fig. 11), was formerly catalogued as UW 19695, and the three paratypes as UW 7539.

The variation in scalation and headpores shown by the six specimens from Thailand and the two Fiji specimens is a problem that may be clarified with additional material from these localities.

***Calamiana variegata* (Peters, 1869)**

(Figs 12-19; Tables 1-3, 9)

Apocryptes variegatus Peters, 1869: 267 (Singapore).

Tamanka ubinensis Herre in Herre & Myers, 1937: 41, pl. 3 (Pulau Ubin, between Singapore and Johore). - Koumans 1940: 153; - Koumans 1953: 157.

Gobiopertus variegatus - Koumans 1953: 244-245.

Pseudogobius variegatus - Lim & Larson 1994: 260.

Material examined. - Forty specimens, 19.5-37 mm SL.

SINGAPORE: Lectotype of *Apocryptes variegatus*, ZMB 6749, 1(33.5), F. Jagor. Paralectotypes of *Apocryptes variegatus*, ZMB 32775, 2(24-32.5), same data as lectotype. Holotype of *Tamanka ubinensis*, CAS 30964, 30 mm SL male, Pulau Ubin, A.W. Herre, Mar.1934. NTM S.13959-010, 6(19.5-28), Sungei Buloh Bird Reserve, H. Larson & K. Lim, 4 Oct.1993; ZRC 39270, 1(33), Sungei Buloh mangroves, K. Lim, 30 Jan.1992; CMK 8311, 29(23-37), Kranji mangrove, M. Kottelat & D. Murphy, 8 Apr.1992. THAILAND: URM P.13341, 2(29-31.5), Kung Kraben Bay, H. Senou, V.

Table 6. Measurements (mm) of *Calamiana variegata* (Peters, 1869).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head Length	9.6	5.4	8.6	7.5	6.5	9.9	8.6
Head Depth	6.0	3.3	6.3	4.9	3.8	6.7	5.5
Head Width	6.6	4.1	7.4	5.9	4.5	8.0	6.6
Body Depth	6.2	3.1	6.8	5.0	4.0	7.0	5.9
Body Width	4.0	2.1	4.2	3.3	2.6	4.5	3.8
Caud. Ped. Leng.	8.8	5.2	8.8	7.2	6.1	9.5	8.1
Caud. Ped. Depth	4.2	2.2	4.9	3.5	2.9	4.7	4.0
Snout	2.8	1.5	2.3	2.0	1.5	2.8	2.3
Eye	3.1	1.5	2.4	2.1	1.9	3.1	2.4
Jaw	3.4	1.8	3.2	2.6	2.0	3.4	2.9
Interorbit	2.4	0.9	2.0	1.4	1.1	2.4	1.7
Pectoral	5.7	4.0	7.4	5.8	4.6	7.8	6.6
Pelvic	6.1	3.3	6.7	4.9	3.9	6.9	5.7
Caudal	8.7	5.7	10.0	8.2	6.8	10.1	9.0
Longest D1 spine	4.3	2.7	4.8	4.5	3.1	4.9	4.7

Chavalit, 13 Dec.1983; URM P.13842, 1(33), Bangpoo, near Paknam, H. Senou, V. Chavalit, 27 Jan.1984; NTM S.13953-011, 4(25-30.5), mangrove at Klong Bang Sai, H. Larson & party, 8 Dec.1993; KUMF University, unregistered, 1(29.5), Narathinat Province, P. Sirimontaporn, 15 Jan.1984. INDONESIA: CMK 7263, 2(20.5-24.5), Takjong Mayong, Padang Island, Riau, M. Kottelat, 12 Feb.1991.

Other material examined (but not used in description). - Five specimens from the following localities: SINGAPORE: NTM S.13968-001, 1, Sungei Pandan; NTM S.13961-005, 1, Sungei Mandai Kecil. PAPUA NEW GUINEA: WAM P.30977-021, 3, Kikori River.

Cleared and stained: ex URM P.13341, 1(32).

X-rayed: holotype of *Tamanka ubinensis*, CAS 30964, 1(30); URM P.13341, 2(29-31.5); ZRC 39270, 1(33); URM P.13842, 1(33).

Diagnosis. - Slender-bodied; second dorsal rays I,7-9, modally I,8; anal rays I, 7-8, modally I,8; pectoral rays 14-17; longitudinal scales 29-34; TRB 10-14; predorsal scales 15-22, quite small, reaching to above preopercular margin; 29-34 lateral scales, scales on body mostly ctenoid; single row of flattened teeth in upper jaw, tips pointed and sharply bent to one side; gill opening restricted to pectoral base; colour pale yellowish with black speckling and marbling along side of body, and oblique dark streaks from eye across cheek and preorbital; known from Indo-Malayan Archipelago.

Description. - Based on 36 specimens, 19.5-37 mm SL. Counts of the lectotype of *Apocryptes variegatus* (Fig. 12) indicated by an asterisk.

First dorsal VI*; second dorsal I,7-9 (mean I,8*); anal I,7-8 (mean I,8*); pectoral rays 14-17 (mean 16*), segmented caudal rays always 16*; caudal ray pattern modally 9/7; branched caudal rays 13-16 (mean 15*); unsegmented (procurrent) caudal rays 8/8 (in one); longitudinal scale count 29-34* (mean 31); TRB 10-14 (mean 13*); predorsal scale count 15-22 (mean 19, 20 in holotype); circumpeduncular scales 14*-18 (mean 15). Gill rakers on outer face of first arch 0+6 to 4+7 (modally 3+7). Pterygiophore formula 3-12210 (in four). Vertebrae 10+16 (in six). Neural spine of first few vertebrae narrow, pointed (in four). Two epurals (in six). Two (in six) anal pterygiophores before haemal spine of first caudal vertebra. Metapterygoid long, low, with bridge overlapping quadrate; palatine stout; pterygoid short (Fig. 13).

Body compressed, especially posteriorly, more rounded anteriorly. Head slightly depressed, usually wider than deep, width occasionally nearly equal to depth, HL 3.4-3.9 (mean 3.7) in SL. Depth at posterior preopercular margin 1.3-1.7 (mean 1.6) in HL. Width at posterior preopercular margin 1.1-1.5 (mean 1.3) in HL. Profile pointed. Mouth upturned, terminal to supraterminal, steeply oblique, forming angle of about 60-70° with body axis; jaws reaching to below anterior part of eye or just falling short of point below anterior margin of eye (latter more usual). Lips smooth, without fleshy fimbriae on inner edges of lips; lower lip free laterally, narrowly fused medially. Upper jaw 2.6-3.4 (mean 3.0 in both sexes) in HL. Eyes small, dorsolateral, top forming part of dorsal profile, 3.1-4.0 (mean 3.6) in HL. Snout short, flat, blunt in dorsal view, 3.4-4.5 (mean 3.7) in HL. Interorbital narrow, flat to concave, 2.9-7.8 (mean 5.4) in HL. Naked areas on top of head without fine villi. Body depth at anal origin 4.9-6.4 (mean 5.5) in SL. Caudal peduncle compressed, length 3.5-4.1 (mean 3.9) in SL. Caudal peduncle depth 6.7-8.9 (mean 7.8) in SL.



Fig. 12. *Calamiana variegata*, lectotype of *Apocryptes variegatus* Peters, 33.5 mm SL, ZMB 6749, Singapore.

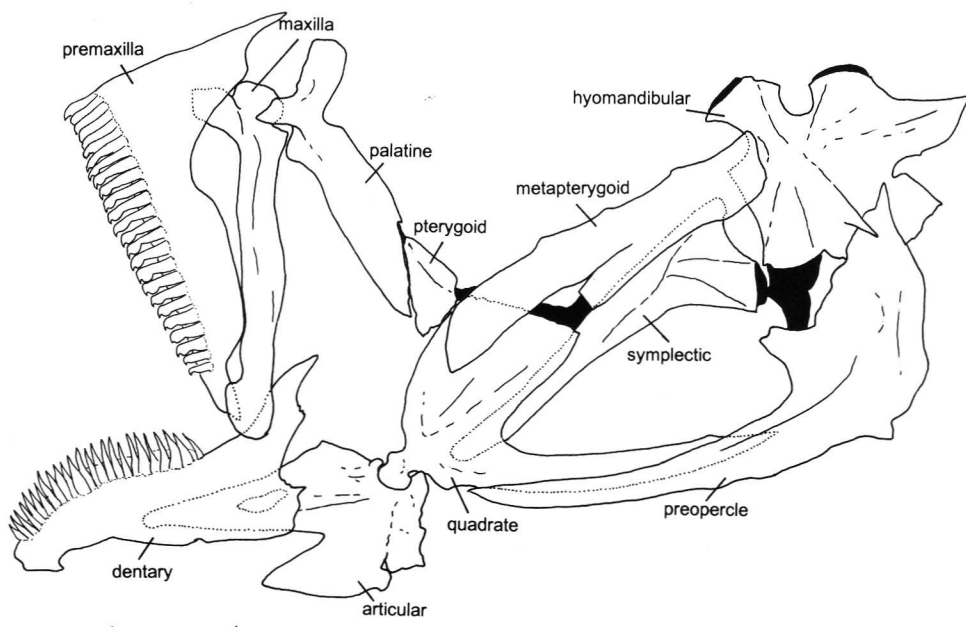


Fig. 13. Jaws and suspensorium of *Calamiana variegata*, ex URM P.13341, 32 mm SL, Kung Kraben Bay, Thailand. Black areas are cartilage. Scale bar = 1 mm.

First dorsal fin low, rounded, no spines elongate or particularly longer than others; third or fourth spine usually longest; spines not reaching second dorsal fin origin when depressed. First dorsal spine length 3.5-8.3 (mean 5.9 in males, 8.1 in females) in SL. Second dorsal spine length 7.2-7.7 (mean 7.4) in SL. Third dorsal spine length 6.6-8.4 (mean 7.6) in SL. Fourth dorsal spine rarely longer than others, occasionally equal to third spine in females, length 7.2-4.4 (mean 7.8) in SL. Second dorsal and anal fins low, posteriormost rays usually longest, rays fall well short of caudal fin when depressed. Pectoral fin oval, slender, central rays longest, 4.1-5.6 (mean 4.8) in SL; rays all branched but for uppermost (which may be unbranched). Pelvic fins short, oval, reaching halfway to two-thirds of distance to anus, 4.6-6.4 (mean 5.6) in SL. Caudal fin rounded posteriorly, 3.0-5.8 (mean 3.5) in SL.

No mental fraenum, chin smooth. Anterior nostril tubular, placed on edge of upper lip, tube oriented anteroventrally, preorbital curved anteriorly to accommodate nostril; preorbital

curved anteriorly just above rictus. Posterior nostril oval, placed closer to anterior centre margin of eye than halfway between eye and upper lip. Gill opening restricted to pectoral base. Inner edge of shoulder girdle smooth with no bony flange (in nine) or with low smooth bony flange which may be bent laterally (in 20). Gill rakers on outer face of first arch very short and without spines, longest rakers near angle of arch, shortest on upper limb (rudimentary to absent); rakers on inner face of first arch rudimentary; outer rakers on second to third arches low, rounded and reduced; rakers on fourth arch similar to those on first arch; inner rakers on second to fourth arches similar to those on first (or longer). Tongue tip blunt to rounded. Teeth in upper jaw in single row, compressed, with pointed tips sharply bent laterally (Fig. 13). Lower jaw with one or two rows of evenly sized, upright, slightly flattened to conical teeth with sharp tips. Males and females with similar teeth.

Predorsal scales small, evenly sized, reaching anteriorly to close behind eyes. Operculum with small cycloid scales on upper third to half; only a few scales present in some specimens. Upper part of preopercle behind eyes with small patch of cycloid scales in some specimens. Pectoral base covered with cycloid scales. Prepelvic area naked anteriorly, posterior two-thirds with small cycloid scales. Belly with isolated area under pelvics with ctenoid scales (anterior $\frac{1}{4}$ to $\frac{1}{2}$ ctenoid), rest of scales cycloid. Ctenoid scales on side of body extending anteriorly to behind pectoral fin.

Headpores present on top of head only; no preopercular pores (Fig. 14). Two interorbital pores, one posterior interorbital pore, an infraorbital pore behind each eye, and lateral pore above preopercle.

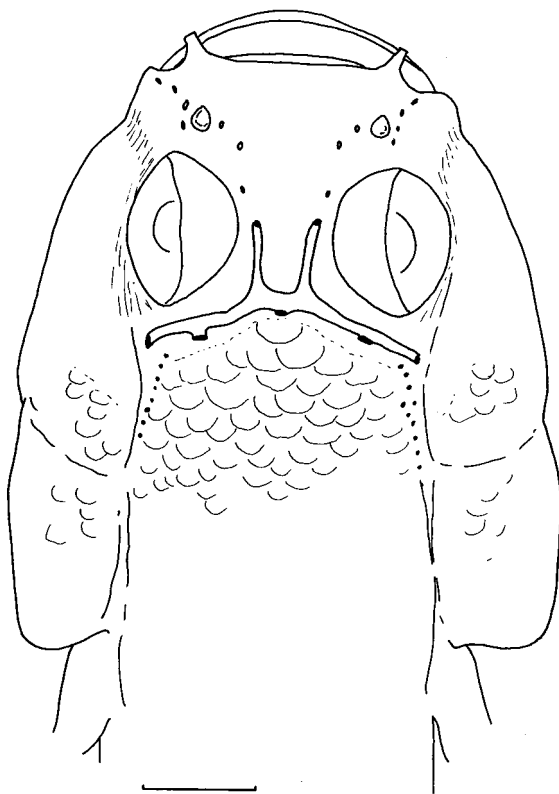


Fig. 14. *Calamiana variegata* headpores and papillae, dorsal view. CMK 8311, Kranji, Singapore. Scale bar = 1 mm.

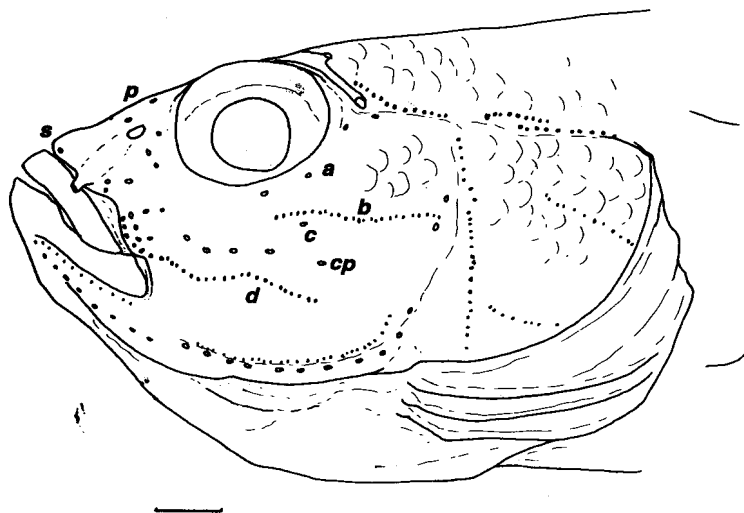


Fig. 15. *Calamiana variegata* headpores and papillae, lateral view. CMK 8311, Kranji, Singapore. Scale bar = 1 mm.

Sensory papillae pattern longitudinal, as in Fig. 15. Two *s* rows present on snout, of one or two papillae each. Cheek rows *b* and *d* composed of small closely spaced papillae; rows *a*, *c* and *cp* composed of few large widely spaced papillae.

Gut simple, with one loop.

Coloration of fresh material. - Live specimens from Thailand were noted (in my field notes) as being yellowish white with brownish grey markings. A Kikori River specimen was yellowish white with brown spots and markings on the body, and brown to purplish brown markings on the fins. The iris is orange tinged silver.

Coloration of preserved material. - Head and body whitish yellow, with variable brown to dark brown spots and blotches, and three distinct oblique brown lines on head (Figs. 16-17). Dorsum crossed by eight (usually indistinct) brown saddles or blotches; three or four anteriormost saddles forming oblique bars across nape and upper side of body in some specimens. Upper two-thirds of body with fine brown spots and blotches, often forming indistinct rows, short oblique bars or wavy lines; usually large brown blotch on side behind pectoral fin; scale margins narrowly outlined in dark brown; lower third of body whitish with scattered dusky speckles. Anterior part of nape, interorbital area and top of snout with brown spots and small blotches.

Head with three distinct oblique brown lines: one from lower anterior edge of eye extending onto upper lip anterior to rictus and continuing onto lower lip (and onto inner margin of lip as dark brown edge); one line from rictus extending backward to centre of cheek (this line often curved or broken-up into segments); and one line extending from lower rear edge of eye and curving down, then up, ending on middle of rear preopercular margin. Upper half (or more) of opercle covered with brown spots and small irregular blotches; anteriorly, at middle, an oblique oval to rounded brown blotch (which may extend onto preopercle). Pectoral base pale with brown horizontal bar on upper half extending onto fin rays; usually a short oblique brown bar just above upper edge of fin base extending dorsally and posteriorly toward dorsal fin. Ventral surface of head and, in some specimens, anterior half of breast plain



Fig. 16. *Calamiana variegata*, 37 mm SL, CMK 8311, Kranji, Singapore.

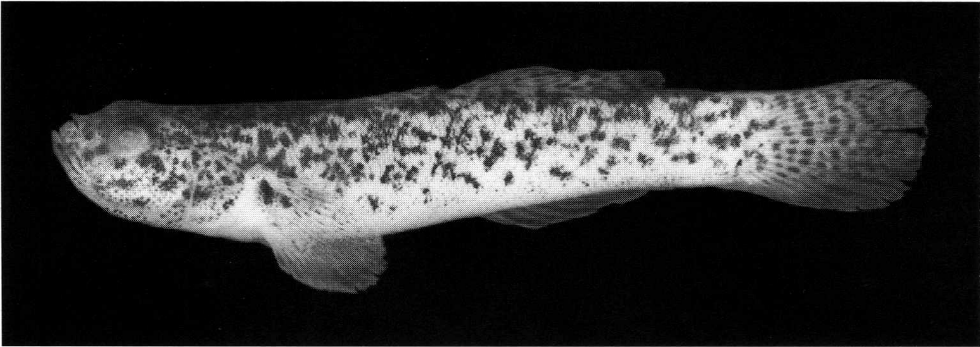


Fig. 17. *Calamiana variegata*, WAM P.30977-021, 38 mm SL, Kikori River, Papua New Guinea.

dusky or finely spotted with brown. Belly plain whitish. Peritoneum black dorsally and on upper sides, abruptly pale whitish on lower sides and belly.

First dorsal fin translucent whitish with three rows of small brown spots, most distinct anteriorly, usually joined, forming diffuse bands; blackish oval blotch present between fifth and sixth fin spines; fin margin whitish. Second dorsal fin similar; translucent whitish with three rows of oval brown spots, rarely forming bands. Anal fin translucent whitish to dusky, or translucent with distal half dusky; margin white or translucent. Caudal fin whitish to translucent with seven or more vertically oriented rows of fine brown spots and diffuse brown blotch on upper half of fin base; often lower fifth of fin plain dusky with whitish margin. Pectoral fin translucent to slightly dusky; bases of upper fin rays brown or with brown curved line crossing them. Pelvic fins translucent whitish with proximal two-thirds of fin rays dusky; fraenum plain whitish.

Distribution. - Specimens are known from a number of localities in Thailand and Singapore; also from Sumatra and the Kikori River, Papua New Guinea (Fig. 18).

Ecology. - *Calamiana variegata* has been collected from a number of mangrove sites, not far from the sea, from thick mud to sandy mud substrates. They are not easily observed, due to the cryptic brown spotted colouring, and look like a species of *Pseudogobius* from a distance.

Remarks. - Peters' syntypes (ZMB 6749), all females, are in fairly good condition; the largest (33.5 mm SL) is hereby designated as lectotype. Koumans did not examine the type of

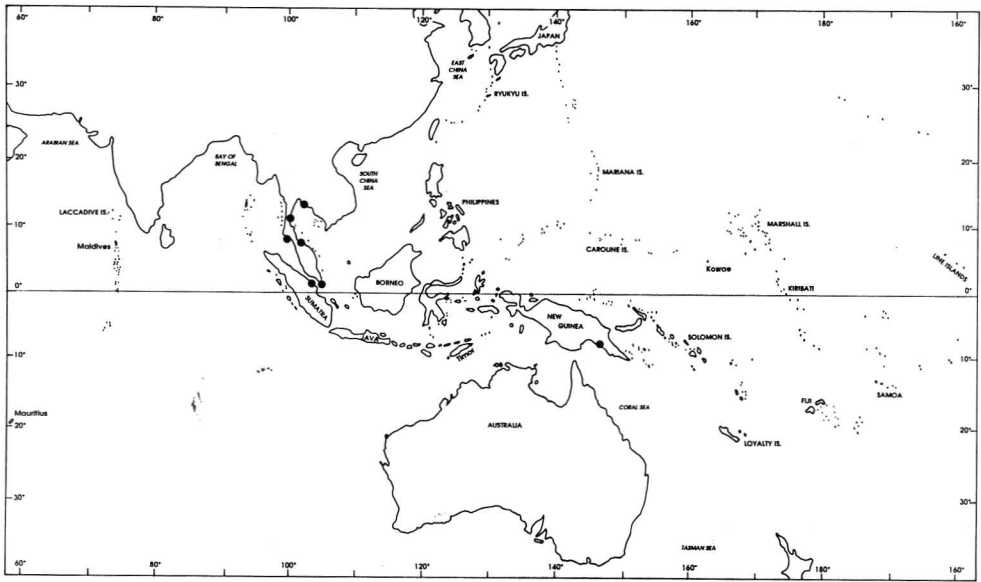


Fig. 18. Distribution of *Calamiana variegata*.

Apocryptes variegatus; it was probably Peters' description of the single row of teeth in each jaw which caused him to include the species in *Gobiophterus* (despite anomalies in fin ray and scale counts).

Tamanka ubinensis Herre was based on a single specimen 29 mm long (Fig. 19). Koumans (1940) could not decide if Herre's species was a *Tamanka* or *Mugilogobius*, or if the two genera were really distinct ("... perhaps it is different in the number of scales on opercle").

This species differs from the two preceding (and from many other species of gobiionellines) in the form of the suspensorium (Figs 2, 6, 13). The pterygoid is short and stout, and the triangular dorsal arm of the quadrate is longer, with the dorsalmost point of its crest more posterior to that in *C. illota* and *C. mindora*. Thus the pterygoid is bound to the quadrate more posteriorly in *C. variegatus* and attaches to the quadrate closer to the jaw ends in *C. illota* and *C. mindora* (and in most other gobiionellines). This shift in attachment may be linked to the development of specialised compressed teeth.

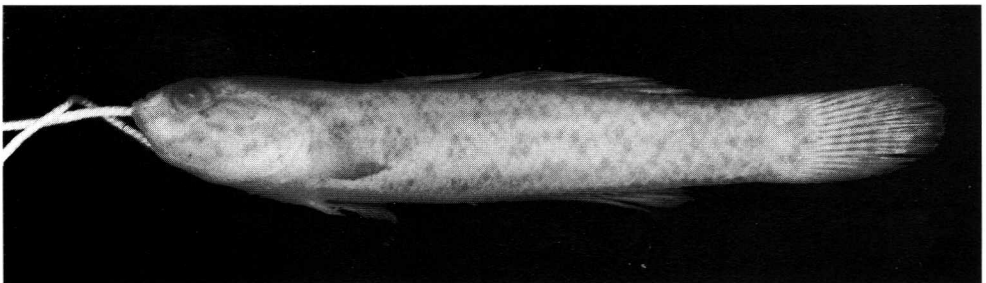


Fig. 19. *Calamiana variegata*, holotype of *Tamanka ubinensis* Herre, 30 mm SL, CAS 30964, Pulau Ubin, Singapore.

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