

Three New Indo-Australian Species of the Sciaenid Genus *Atrobucca*, with a Reevaluation of Generic Limit

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Abstract Three new species of the sciaenid genus *Atrobucca* are described: *A. kyushini* from off Borneo, differs from all known congeners in having no swimbladder appendages enveloping the bladder, no forward directed branches from the ventral limbs of the appendages, a long tube-like last appendage parallel to the bladder wall and a pale mouth lining; *A. brevis* from off northern Australia and Papua New Guinea, is distinguished by its short pectoral fin (less than 23% SL) and pleural rib on the 11th vertebra; *A. adusta* from Papua New Guinea, is distinctive in having a low dorsal soft ray number (23–24) and long caudal peduncle (27–30% SL). *Atrobucca* Chu, Lo et Wu is redefined to accommodate the new species: the genus is principally characterized by the swimbladder appendages divided into developed dorsal and ventral limbs, and the only slightly curved sulcus tail of the sagitta. A key and diagnoses are provided for all known species of *Atrobucca*.

Atrobucca is a widespread genus of the Sciaenidae, occurring in coastal waters of the tropical and subtropical Indo-West Pacific. Two additional species of *Atrobucca* have been described since Trewavas' (1977) review so that the genus currently contains five species: *Atrobucca nibe* (Jordan et Thompson, 1911) (South Africa (Natal), east coast of India [?], Indonesia, Taiwan, southern Korea and southern Japan), *A. marleyi* (Norman, 1922) (South Africa (Natal)), *A. trewavasae* Talwar et Sathiarajan, 1975 (Bay of Bengal), *A. alcocki* Talwar, 1980 (Arabian Sea) and *A. geniae* Ben-Tuvia et Trewavas, 1987 (Red Sea).

Sciaenid specimens referable to *Atrobucca* from the more easterly Indo-West Pacific have recently been obtained. Kyushin et al. (1982) noticed and drew to the attention of the senior author, specimens of a new sciaenid from the South China Sea. At the same time, exploratory trawling off north-western and northern Australia and southern Papua New Guinea produced a number of specimens of a second undescribed species. Specimens from Papua New Guinea were recognized as a third new species by the junior author.

Although these three species belong to the tribe Otolithini of the subfamily Otolithinae, as defined by Trewavas (1977), generic assignment proved difficult. Although examination of swimbladder and otolith morphologies revealed the close relationship of the new species with *Atrobucca*, they

cannot be accommodated in the generic definition of Trewavas (1977). Hence, the existence of these species makes it necessary to reexamine the properties which set *Atrobucca* apart from other otolithine genera.

Our aim in this paper is to describe the three new species and to provide a key and diagnoses for the species of *Atrobucca*. We also redefine the genus and critically examine the diagnostic characteristics of the closely-related genera *Argyrosomus* Pylaie, *Afroscion* Trewavas and *Pennahia* Fowler.

Materials and methods

Methods of measurements and counts are based on Hubbs and Lagler (1958) except for the following (which includes Trewavas' methods): eye diameter measured horizontally; body depth measured at the dorsal fin origin; body width measured at the pectoral fin origin; lower jaw length measured from the front of the symphysis to the end of the retroarticular; pelvic fin length exclusive of the posterior filament; longest gill raker and gill filament measured only; urostyle counted as one element; gill rakers counted on the first right-hand side arch (denticulate flat plates above and below the rakers not counted), the middle and lower raker numbers expressed separately. Morphological terms for otolith and swimbladder follow Chu et al. (1963) and

Trewavas (1977). Data on the holotype are presented first, with those for the paratypes (when different from those of the holotype) following in parentheses. Standard length and head length are expressed throughout as SL and HL respectively.

Material for this study is deposited in the following institutions (the abbreviations follow Leviton et al., 1985): AMS, BMNH, BPBM, CSIRO, FRSKU, FSFL, HUJ, HUMZ, KFRS, NSMT, QM, SAMA, ZSI.

Genus *Atrobucca* Chu, Lo et Wu, 1963

Atrobucca Chu, Lo and Wu, 1963: 64 (type species by original designation: *Sciaena nibe* Jordan et Thompson, 1911 (= *Sciaena brunneolus* Jordan et Richardson, 1909), see Trewavas, 1979, International Commission on Zoological Nomenclature, 1984).

Diagnosis. 1) Swimbladder carrot-shaped, with several pairs of arborescent appendages arising along its length, first appendage not cephalic, each appendage with well developed dorsal and ventral limbs. 2) Sagitta thick, sulcus tail only slightly curved. 3) Three pairs of mental pores, anterior pair in front of chin, separated by symphysis. 4) No canines. 5) Peritoneum pigmented.

Comparisons and relationships. Within the tribe Otolithini, *Atrobucca* resembles *Argyrosomus* and *Pennahia* in lacking canine teeth on the jaws. However, *Atrobucca* as defined herein, differs from *Argyrosomus* in having a slightly curved sulcus tail of the sagitta and a pigmented peritoneum (instead of strongly curved sulcus tail and usually a pale peritoneum); and differs from *Pennahia* in having well developed dorsal limbs of the bladder appendages (instead of poorly developed dorsal limbs). We treat *Afroscion* as a synonym of *Argyrosomus*, as discussed below.

Inclusion of the three new species in the genus makes it necessary to change Trewavas' (1977) definition of the genus. These alterations are considered below.

Although identical conditions are found in some of the species of *Argyrosomus*, Trewavas (1977) defined *Atrobucca* as having: at least some appendages enveloping the bladder and at least distal branches on the lower limbs of appendages directed forward. In one of the new species (*A. kyushini*), no appendages envelop the bladder and

the distal branches on the lower limbs are directed downward. As these two conditions are therefore not uniform in the genus, we exclude them from its diagnosis.

Trewavas (1977) included pectoral fin length and interorbital width in her definition of *Atrobucca* to further separate the genus from *Argyrosomus*. She cited the pectoral fin length of *Atrobucca* as 25.5–28.5% SL, that of *Argyrosomus* as 15.0–22.5; the interorbital width of the former as 7.7–9.1% SL, that of the latter as 5.0–6.8. However, the shorter pectoral fin length in two of the new species (22.7–26.8 in *A. kyushini*, 20.2–23.0 in *A. brevis*) overlaps that of *Argyrosomus*; and the narrow interorbital in two of the new species (6.8–7.6 in *A. brevis*, 6.9–7.1 in *A. adusta*) also invalidates the efficiency of this fourth character for separation. Accordingly, we exclude these proportions from the generic diagnosis of *Atrobucca*.

Finally, Trewavas (1977) stated that only the males of *Atrobucca* species have a drumming muscle. Our examination confirmed the absence of this muscle in females of the described species, but it is present in females of two new species (*A. kyushini* and *A. brevis*), although less developed than in males. The condition in females of the third new species (*A. adusta*) is unknown.

Afroscion is a monotypic genus established by Trewavas (1977) to accommodate *Argyrosomus thorpei* Smith, 1977. The genus is defined by: bladder appendages with branched dorsal and ventral limbs; "*Pennahia*" pattern of otolith ("The tail is very slightly curved at the end and is truncated by the edge" (p. 265)); weak dentition unmatched in *Atrobucca* and *Argyrosomus*; pectoral fin length and interorbital width within the range of *Argyrosomus*; large size comparable to *Argyrosomus*. In short, an otolith pattern identical with *Atrobucca* ("*Pennahia*" pattern) but different from *Argyrosomus*, prompted Trewavas to establish a new genus. However, the sulcus tail of the sagitta in *Afroscion* appears well curved to us, and we find no significant difference in its curvature from that of *Argyrosomus miuyi*. It is our opinion that the difference in shape of the distal end of the sulcus tail (truncated vs. bluntly rounded = "*Argyrosomus*" pattern) and the dentition, do not deserve generic status. Accordingly, we consider the name *Afroscion* to be a synonym of *Argyrosomus*—a course already followed with little comment, by Mohan (1984) and Heemstra

(1986).

Atrobuca can be distinguished from *Pennahia* only by the possession of well developed dorsal limbs on the bladder appendages (appendages of *Atrobuca* are fan-like; those of *Pennahia* are wing-like without well developed dorsal limbs). We traced the ontogenetic changes of the appendages in *Pennahia argentata* (Houttuyn) in the size range of 42.1–304.3 mm SL. The wing-like shape characteristic of *Pennahia* is already formed by 74 mm SL and remains unchanged up to 304.3 mm SL. No noteworthy ontogenetic changes nor intraspecific variations were observed in *P. argentata*. It may be that fan-like appendages are attained through wing-like appendages in the course of ontogeny, but in adult-based comparisons, the difference between the genera is clear if the case in *P. argentata* is true also for the other species of *Pennahia*. It could be argued that reduction of the dorsal limbs in *Atrobuca* would also invalidate the status of the genus *Atrobuca*. This view is not supported on available evidence however (Yamada, 1973; our observation) which shows that changes in the appendages are always directed from simple to complex.

Although Trewavas (1977) did not include the nature of the last appendage in her definition of *Atrobuca*, in all known species of the genus it is either bud-like or short and tube-like. One of the new species (*A. kyushini*) has a long, tube-like last appendage—a condition present in *Pennahia*, the Nibeini, Collichthyini and Johniini. Although a possible relationship is thus indicated, the phyletic implication of the condition is presently unclear.

In summary: *Atrobuca* is distinct from *Argyrosomus* and *Pennahia*, and we regard *Afroscion* as a synonym of *Argyrosomus*.

Key to the species of *Atrobuca*

(see also Table 1)

- 1a. No appendages enveloping swimbladder; forward directed branches absent on ventral limbs of appendages; last appendage long and tube-like, lying parallel to bladder wall; mouth lining pale; membrane between opercular spines dark except for narrow rear margin. *A. kyushini* sp. nov.
- 1b. Some appendages enveloping swimbladder, at least posteriorly; forward directed

branches present on ventral limbs of appendages; last appendage a mere bud, or short and tube-like, lying very obliquely to bladder wall; mouth lining varies from dark to at least grey (palate); membrane between opercular spines either darker anteriorly and paler posteriorly, or entirely dark 2

- 2a. Gill filament length 4.5–6.4% SL, 48.9–90.0% eye diameter; HL 36.6–40.3% SL. 3
- 2b. Gill filament length 2.4–3.5% SL, 29.2–44.9% eye diameter; HL 29.6–36.5% SL. 4
- 3a. Pectoral fin length 27.0–28.0% SL; eye diameter 7.2–8.0% SL, 17.3–20.0% HL (size range: 176–219 mm SL) *A. trewavasae*
- 3b. Pectoral fin length 29.7–31.3% SL; eye diameter 8.9–10.0% SL, 22.9–27.0% HL (size range: 155–216 mm SL) *A. alcocki*
- 4a. Pectoral fin length 20.2–23.0% SL; pleural rib present on 11th vertebra *A. brevis* sp. nov.
- 4b. Pectoral fin length 24.0–31.2% SL; pleural rib absent on 11th vertebra (or if present, minute) 5
- 5a. Dorsal soft rays 23–24; caudal peduncle length 26.7–29.7% SL; membrane between opercular spines entirely dark *A. adusta* sp. nov.
- 5b. Dorsal soft rays 26–33; caudal peduncle length 19.4–27.0% SL; membrane between opercular spines darker anteriorly, paler posteriorly 6
- 6a. HL 35.5–36.5% SL; interorbital width 7.3–7.5% SL, 20.2–20.5% HL *A. geniae*
- 6b. HL 30.4–33.9% SL; interorbital width 7.7–8.5% SL, 23.5–28.0% HL 7
- 7a. Only four or five appendages enveloping swimbladder *A. marleyi*
- 7b. Appendages enveloping swimbladder along its length *A. nibe*

Atrobuca kyushini sp. nov.

(Japanese name: Sumitsuki-ishimochi)

(Figs. 1, 2A, 3)

Pennahia sp., Kyushin et al., 1982: 133, col. pl. (South China Sea).

Holotype. HUMZ 107200, 234.2 mm SL, male, off Kuching, Borneo, Nov. 1971.

Paratypes. BMNH 1987.6.4.1, 238.3 mm SL, male, 02°57'N, 109°55'E, 7 Dec. 1966; BMNH 1987.6.4.2,

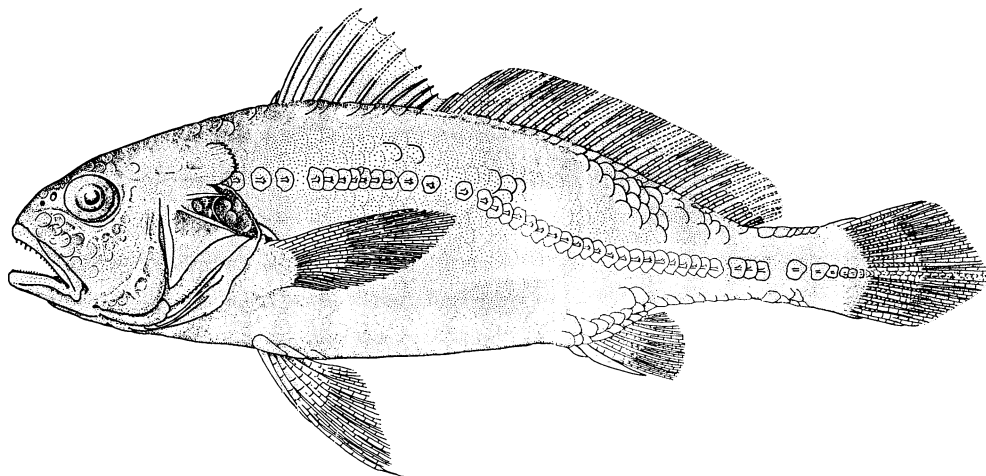


Fig. 1. *Atrobucca kyushini* sp. nov., holotype, HUMZ 107200, 234.2 mm SL.

216.0 mm, male, off Kuching, Borneo, Nov. 1971; HUMZ 107205, 201.0 mm, male, HUMZ 107206, 221.0 mm, female, Singapore fish market, Singapore, 19 Dec. 1957; HUMZ 33633, 241.3 mm, female, 02°10'–03°44'N, 109°49'–110°49'E, 40–78 m, 5–11 Dec. 1966; HUMZ 107201, 252.3 mm, male, 04°17'N, 109°53'E, 104 m, 4 Dec. 1970; HUMZ 107202, 195.5 mm, male, 04°12'N, 111°15'E, 78 m, 15 Dec. 1971; HUMZ 46810, 207.0 mm, male, 03°35'N, 109°03'E, 82 m, 11 Nov. 1975; HUMZ 50132, 208.7 mm, male, 03°14.00'N, 109°28.02'E, 12 Nov. 1975; HUMZ 46945, 203.6 mm, female, 03°00'N, 109°15'E, 56 m, 13 Nov. 1975; NSMT-P 50538, 233.4 mm, female, 04°00'N, 105°49'E, 20 Dec. 1957; NSMT-P 50539, 237.4 mm, male, 02°10'–03°44'N, 109°49'–110°49'E, 40–78 m, 5–11 Dec. 1966. All type specimens except for HUMZ 107205 and HUMZ 107206 were trawled by T/V Oshoro-Maru (Hokkaido University).

Diagnosis. Forward directed branches absent on lower limbs of swimbladder appendages; no appendages enveloping bladder; last one long, tube-like and lying parallel to bladder wall. Drumming muscle present in both sexes. Dorsal soft rays 30–32; vertebrae 10+15, last pleural rib on 10th vertebra. HL 31.4–34.6% SL; caudal peduncle length 23.9–28.1; eye diameter 6.8–9.0; interorbital width 7.9–9.2; pectoral fin length 22.7–26.8; second anal spine length 9.8–10.9; gill filament length 3.7–4.6. Mouth lining pale. Membrane between opercular spines dark except for narrow rear margin.

Description. Dorsal rays X+I, 31 (30–32), first soft ray unbranched; anal rays II, 7; pectoral rays 18 (17–18), upper two unbranched; pelvic rays

I, 5; principal caudal rays 17, upper one and lower one unbranched; lateral line scales 50 (ca. 48–51); gill rakers 5+1+10 (4–5+1+9–12); vertebrae 10+15, last pleural rib on 10th vertebra, first anal proximal radial between 10 and 11th vertebrae; swimbladder appendages 28 (25–27 in five paratypes). Proportions as % SL: HL 32.4 (31.4–34.6); body depth 31.1 (28.8–33.9); body width 17.4 (14.0–17.7); caudal peduncle length 24.5 (23.9–28.1); caudal peduncle depth 8.5 (7.6–10.3); snout length 9.8 (8.9–10.4); eye diameter 7.3 (6.8–9.0); interorbital width 8.3 (7.9–9.2); upper jaw length 14.2 (14.3–15.7); lower jaw length 16.2 (15.4–17.0); pectoral fin length 23.8 (22.7–26.8 in seven paratypes); pelvic fin length 19.9 (18.9–21.5 in 10 paratypes); second dorsal spine length, broken (11.3–13.9 in five paratypes); third dorsal spine length, broken (12.2–17.6 in six paratypes); fourth dorsal spine length, broken (12.1–16.1 in eight paratypes); second anal spine length 9.9 (9.8–10.9 in seven paratypes); gill raker length 2.4 (2.4–3.4); gill filament length 3.8 (3.7–4.6). Proportions as % HL: snout length 30.2 (27.7–31.9); eye diameter 22.4 (20.2–25.9); interorbital width 25.7 (23.9–26.6); upper jaw length 43.8 (42.0–46.7); lower jaw length 50.1 (47.2–51.8); gill raker length 7.4 (7.0–9.8); gill filament length 11.7 (11.3–13.3). Proportions as % eye diameter: gill raker length 32.9 (31.1–39.1); gill filament length 52.4 (48.3–60.4).

Body moderately elongate and compressed. Dorsal profile much more pronounced than ventral, evenly curved between snout tip and

Table 1. Selected diagnostic characters of *Atrobucca* species.

	<i>nibe</i>	<i>marleyi</i>	<i>trewavasae</i>	<i>alcocki</i>	<i>geniae</i>	<i>kyushini</i> sp. nov.	<i>brevis</i> sp. nov.	<i>adusta</i> sp. nov.
Dorsal soft rays	27–33	30	24–26	24–28	26	30–32	31–32	23–24
Last pleural rib	10th vertebra	10th	10th	10th	10th	10th	11th	10th
Proportions (% SL):								
HL	30.4–33.9	33.3	37.4–40.3	36.6–38.9	35.5–36.5	31.4–34.6	29.6–32.5	31.7–33.2
Caudal peduncle length	23.5–27.0	26.5	23.7	22.1–26.1	19.4–23.8	23.9–28.1	23.0–25.8	26.7–29.7
Eye diameter	7.2–9.9	7.6	7.2–8.0	8.9–10.0	7.9–9.2	6.8–9.0	6.4–8.5	6.2–6.6
Interorbital width	7.7–8.5	8.3	7.7–9.1	7.3–8.0	7.3–7.5	7.9–9.2	6.8–7.6	6.9–7.1
Pectoral fin length	25.5–31.2	ca. 28	27.0–28.0	29.7–31.3	26.0–27.4	22.7–26.8	20.2–23.0	24.0–27.2
2nd anal spine length	6.7–8.6	8.3	6.4–7.0	8.3–9.6	10.6	9.8–10.9	6.5–7.5	5.9–8.0
Gill filament length	2.4–3.5	3.1	5.5–6.4	4.5–5.6	3.1–3.3	3.7–4.6	2.5–3.1	2.4–2.9
Swimbladder:								
Enveloping appendages	present	present	present	present	present	absent	present	present
Enveloping degree	strong	weak	strong	strong	weak	none	weak	strong
Forward directed branches on ventral limbs	present	present	present	present	present	absent	present	present
Last appendage	short	short	short	short	short	long	short	short
Drumming muscle (females)	absent	absent	absent	absent	absent	present	present	?
Colour:								
Mouth lining	dark	pigmented	dark	dark	dark	pale	pale (excl. palate & tongue)	dark
Membrane between opercular spines	pale posteriorly	pale posteriorly	pale posteriorly	pale posteriorly	pale posteriorly	uniformly dark	pale posteriorly	uniformly dark

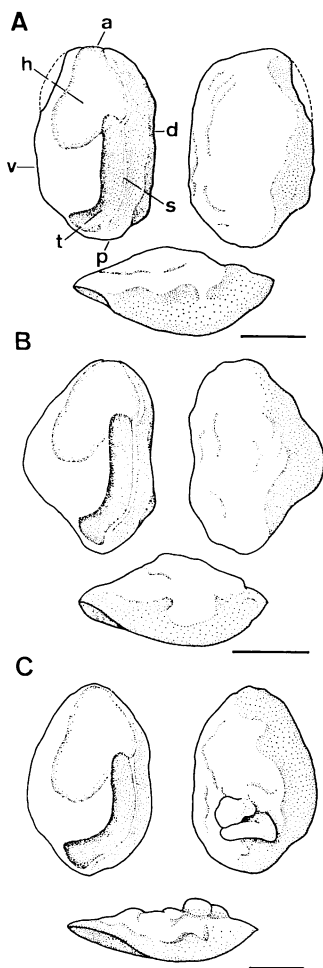


Fig. 2. Sagittae of (A) *Atrobucca kyushini* sp. nov. (paratype, HUMZ 107202), (B) *A. brevis* sp. nov. (paratype, HUMZ 107483) and (C) *A. adusta* sp. nov. (holotype, QM I. 19180). Left, inner surface; right, outer surface; bottom, lateral view. a, anterior margin; p, posterior margin; d, dorsal margin; v, ventral margin; s, sulcus; h, head; t, tail. Bar = 5 mm.

dorsal origin. Snout with three rostral and five marginal pores. Three pairs of mental pores—first small and rounded, at front of chin and separated by symphysis; second oblong, at antero-ventral aspect of dentary; third slit-like and large, well separated and located just beside lower lip fold.

Cleft of mouth at an angle of 25° to the horizontal when mouth somewhat open (variable in paratypes due to condition after fixation: $5\text{--}25^\circ$

when mouth closed or somewhat open; $35\text{--}40^\circ$ when mouth fully open). Upper jaw slightly projecting beyond lower jaw (same length in one paratype); maxillary reaching below middle of eye (middle to posterior margin of eye). Upper jaw with outer row of enlarged teeth and inner band of small conical teeth—consisting of one to three anterior rows and five to six posterior rows; lower jaw with inner row of enlarged teeth and three (near symphysis) to one (near corner of mouth) outer rows of small conical teeth. Enlarged teeth on jaws rather weak and closely spaced, those on upper jaw about twice as large as those on lower, those at front of upper jaw exposed when lower jaw included by upper jaw (concealed in paratype with jaws of same length).

Eye elliptical, longest axis slightly oblique. Nostrils just in front of eye; anterior nostril semi-circular; posterior nostril egg-shaped. Gill rakers rather short and stiff; gill filaments nearly equal to or rather longer than corresponding rakers around angle.

Scales easily lost, cycloid on snout, anterior 2/3 of interorbital space, below eye, cheek, the four opercular bones, pectoral axil, body region below and behind gill cover, and isthmus; ctenoid on remaining interorbital space, occiput, nape, chest and body. A row of small scales sheathing bases of soft dorsal and anal fins, and anterior 2/3 of caudal fin covered with minute scales. Pectoral fin with scaly fleshy flap above its base; a scaly process in axil of pelvic fin. No discs of white opaque tissue under scales on abdomen.

Dorsal fin originates above pelvic fin origin. Anterior spinous portion of dorsal fin broken (second, third, or fourth elements longest). Pectoral fin insertion just below (just below or slightly behind) dorsal fin origin, its distal end extending to vertical line from fourth (third to fifth) dorsal soft ray. First ray of pelvic fin with short filament. Second anal spine strong, its length a little more than 2/3 length of first soft ray. Caudal fin rhomboidal with pointed tip.

Sagitta (in two paratypes) shield-shaped; sulcus head pear-shaped and in contact with anterior margin of sagitta; sulcus tail hockeystick-shaped, slightly curved and truncated at the end (Fig. 2A).

Swimbladder appendages embedded in thin wedge of fat tissue, situated beside bladder in one plane, and none enveloping it. Most appendages richly branched; posterior two or three rather

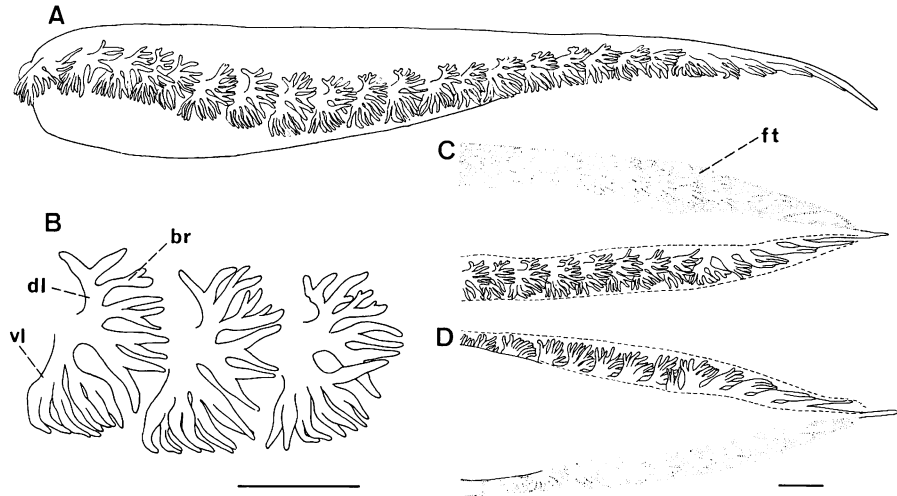


Fig. 3. Swimbladder of *Atrobucca kyushini* sp. nov. (paratype, HUMZ 33633). A, lateral view; B, eighth to 10th appendages; C, dorsal view of posterior portion; D, ventral view of posterior portion. dl, dorsal limb; vl, ventral limb; br, branch; ft, fat tissue. Broken line indicates outline of fat tissue. Bar = 5 mm.

simple, either unbranched or forked above their base, last one long, tube-like and lying parallel to bladder wall. Each appendage fan-like, immediately divided above its insertion into a dorsal and a ventral limb; dorsal limb with branches directed upward and backward, ventral limb with branches downward and backward; branches of both limbs slightly overlapping each subsequent appendage (Fig. 3). Drumming muscle present in both sexes, though much better developed in males.

Colour in preservative: body light brown without lines (faint dark oblique lines on anterior part of back below spinous dorsal fin present or absent). Lips and mouth lining pale; operculum dark, especially in its upper half due to blackish branchial cavity; membrane between opercular spines dark with dense pigmentations on it, and as dark as upper half of operculum except for narrow rear margin; peritoneum mottled with large and small dark spots. Axil of pectoral fin pigmented but without distinct black blotch; membrane of dorsal fin slightly mottled; pectoral, pelvic and anal fins pale; caudal fin dusky posteriorly. Colour when fresh: body silvery grey above, silvery white below; pectoral and pelvic fins tinged orange.

Remarks. Kyushin et al. (1982) reported this species as *Pennahia* sp. on the basis of four specimens (BMNH 1987.6.4.2, HUMZ 107200,

107201, 107202). The range of dorsal soft ray count given by them (29–31) must be an error, since we do not count 29 dorsal soft rays in any of these specimens.

Comparisons. See diagnosis and key for distinguishing characters.

The mouth lining of *A. kyushini* is very pale compared to the other species of *Atrobucca* which have a dark or grey speckled mouth lining, and/or at least the palate and dorsal side of tongue shaded grey.

A. kyushini is further distinguished by being heavily pigmented on the membrane between the opercular spines, except for the narrow rear margin. It is usual in *Atrobucca*, for the anterior half of this membrane to be dark due to the dark colouration of the branchial cavity, and for the posterior half to be rather abruptly paler with a few melanophores. In one of the new species (*A. adusta*), the membrane between the opercular spines is uniformly dark, the dark colouration of the branchial cavity not being visible through the operculum and its membrane.

The second anal spine of *A. kyushini* is strong and rather long—9.8–10.9% SL in the size range 196–252 mm SL: noticeably longer than the range (6.4–9.6) in six of the remaining species of comparable or even smaller size. The spine length in the eighth species, *A. geniae*, is 10.6% SL in the

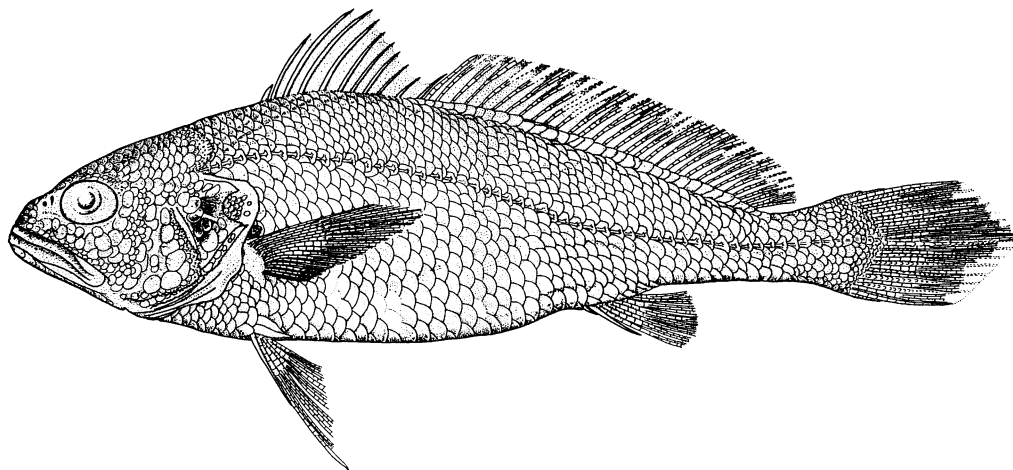


Fig. 4. *Atrobucca brevis* sp. nov., holotype, AMS I. 26447-001, 231.4 mm SL.

146 mm SL holotype (the spine is broken in the two larger paratypes). Because the relative size of the anal spine changes with growth (Trewavas, 1977; our observation), we cannot accurately assess the difference between *A. kyushini* and *A. geniae* from the limited size range of our (type) material.

Distribution. This species is known from off the northwestern coast of Borneo, South China Sea, at depths between 40–104 m. The species appears to be one of the common sciaenids in the area and is landed commercially at Singapore.

Etymology. The new species is named *kyushini* for Dr. Kenichiro Kyushin (Hokkaido University), who first drew the fish to our attention.

Atrobucca brevis sp. nov.
(Figs. 2B, 4, 5)

Argyrosomus sp., Gloerfelt-Tarp and Kailola, 1984: 206, col. pl., 207, 342 (northwestern Australia); Sainsbury et al., 1985: 230, 231, col. pl., 343 (northern Australia).

Holotype. AMS I. 26447-001, 231.4 mm SL, female, 13°25'S, 126°19'E, 60–63 m, 26 June 1980.

Paratypes. AMS I. 26448-001, 242.0 mm SL, male, 14°03'S, 124°05'E, 110–112 m, 18 July 1980; CSIRO H. 748-01, 248.0 mm, male, HUMZ 107483, 200.5 mm, male, HUMZ 107484, 251.9 mm, female, all from 15°32'S, 124°02'E, 60–62 m, 18 July 1980; KFRS F04034, 202.5 mm, male, south of Kerema, Gulf of Papua (08°15'S, 146°00'E), 3 Nov. 1973, trawled, M. V. Spica. All type specimens except for KFRS F04034 were trawled by FRV Soela (CSIRO).

Diagnosis. Forward directed branches present on ventral limbs of swimbladder appendages; appendages enveloping bladder along its posterior half; last appendage short, bud-like, lying very obliquely to bladder wall. Drumming muscle present in both sexes. Dorsal soft rays 31–32; vertebrae 10+15 or 11+14, last pleural rib on 11th vertebra. HL 29.6–32.5% SL; caudal peduncle length 23.0–25.8; eye diameter 6.4–8.5; interorbital width 6.8–7.6; pectoral fin length 20.2–23.0; second anal spine length 6.5–7.5; gill filament length 2.5–3.1. Mouth lining pale except grey palate and dorsal side of tongue. Membrane between opercular spines paler in its posterior half.

Description. Dorsal rays X+I, 31 (31–32), first soft ray unbranched; anal rays II, 7; pectoral rays 18 (18–19), upper two unbranched; pelvic rays I, 5; principal caudal rays 17, the upper one and lower one unbranched; lateral line scales 51 (49–51); gill rakers 5+1+10 (4+6+1+10–11); vertebrae 10+15 (11+14 in two paratypes), last pleural rib on 11th vertebra, first anal proximal radial between 11 and 12th vertebrae (12 and 13th in two paratypes); swimbladder appendages 29 in left, 27 in right (29–30). Proportions as % SL: HL 31.0 (29.6–32.5); body depth 30.1 (25.1–29.9); body width 14.5 (13.4–16.5); caudal peduncle length 23.1 (23.0–25.8); caudal peduncle depth 8.5 (8.6–9.1); snout length 8.0 (8.0–8.7); eye diameter 7.4 (6.4–8.5); interorbital width 6.9 (6.8–7.6); upper jaw length 14.2 (13.2–14.7); lower jaw length 16.7 (15.6–17.3); pectoral fin length 23.0 (20.2–22.1); pelvic fin length 18.3 (17.7–19.6);

second dorsal spine length 9.3 (7.4–10.3 in four paratypes); third dorsal spine length 13.1 (11.2–11.3 in two paratypes); fourth dorsal spine length 13.7 (9.7–12.1); second anal spine length 6.5 (6.5–7.5); gill raker length 2.9 (3.3–3.7); gill filament length 2.9 (2.5–3.1). Proportions as % HL: snout length 25.8 (25.7–28.7); eye diameter 23.8 (21.8–28.1); interorbital width 22.2 (22.8–25.0); upper jaw length 45.9 (44.6–48.3); lower jaw length 54.0 (52.6–56.8); gill raker length 9.5 (10.5–12.3); gill filament length 9.5 (8.1–10.2). Proportions as % eye diameter: gill raker length 39.8 (43.9–51.5); gill filament length 39.8 (35.6–46.2).

Body moderately elongate and compressed. Dorsal and ventral profile evenly curved; dorsal profile slightly convex from snout tip to interorbital, thence nearly straight to dorsal origin. Snout with three rostral pores and five marginal pores. Three pairs of mental pores—first small, rounded, at front of chin, and separated by symphysis; second oblong, at anteroventral aspect of dentary; third slit-like and large, well separated and partially covered by lower lip fold.

Cleft of mouth at an angle of about 30° to the horizontal when mouth closed; lower jaw slightly prominent; maxillary reaching opposite posterior margin of pupil. Upper jaw with enlarged teeth in single outer row, and inner, narrow band of small conical teeth consisting of single row anteriorly, two or three rows posteriorly; single irregular row of teeth in lower jaw consisting of enlarged teeth slightly inwards and separated by one or two (anteriorly) to five (posteriorly) small, conical teeth. Enlarged teeth rather closely (widely) spaced, those on upper jaw except for anterior two pairs as large as those on lower.

Eye egg-shaped. Nostrils just before eye; anterior nostril rounded; posterior nostril vertically slit-like. Gill rakers long and slender; gill filaments equal to or rather shorter than corresponding gill rakers around angle.

Scales cycloid on: snout, anterior half of interorbital space, below eye, the four opercular bones, pectoral axil, body region concealed by gill cover and isthmus; ctenoid scales cover: posterior half of interorbital space, cheek, occiput, nape, chest and remainder of body. One or two rows of small ctenoid scales sheath bases of soft dorsal and anal fins, and anterior half of caudal fin covered with minute scales. Pectoral fin with scaled fleshy flap above its base; a scaly process in axil of

pelvic fin. No discs of white opaque tissue under scales on abdomen.

Dorsal fin originates just above pelvic origin. Fourth dorsal spine longest. Pectoral fin insertion slightly forward of dorsal fin origin, its distal end extending to vertical from second dorsal soft ray (11th spine to third soft ray). First ray of pelvic fin with short filament. Second anal spine slender and weak, its length more than half of first soft ray. Caudal fin rhomboidal with pointed tip.

Sagitta (in one paratype) shield-shaped, ventral margin well produced; sulcus head pear-shaped and in contact with anterior margin of sagitta; sulcus tail hockey-stick-shaped, slightly curved and truncated at the end (Fig. 2B).

Swimbladder with appendages embedded in thin (thin or thick) wedge of fat tissue; posterior six or seven before last three enveloping bladder, and nearly meet (nearly meet or meet) their fellows of the other side; the remainder lie along bladder side and scarcely overlap it. Appendages richly branched except for two or three bud-like posterior ones lying very obliquely to bladder wall. Each appendage immediately divided above its insertion into a dorsal and a ventral limb; dorsal limb curved forward and slightly inclined inward, most of its branches directed backward, upper one or two directed upward and forward; ventral limb directed obliquely downward near the insertion and then turned inward to backward distally in both anterior and posterior appendages, simply directed obliquely downward in middle appendages, most of whose branches directed downward and outward, lower two or three directed forward; branches of both limbs more or less overlap each subsequent appendage (Fig. 5). Drumming muscle present in both sexes, slightly better developed in males.

Colour in preservative: uniform drab brown or tan, darker above; faint dark oblique lines on back and upper side (obscure or absent). Lips edged dark; mouth lining pale except for grey speckled or mottled palate and dorsal side of tongue; peritoneum dark brown; operculum and anterior half of membrane between opercular spines dark due to blackish branchial cavity, posterior half of membrane paler and speckled brown and with a few melanophores. Black blotch at axil of pectoral fin; membrane of dorsal fin lightly mottled dusky and fin edged dark brown

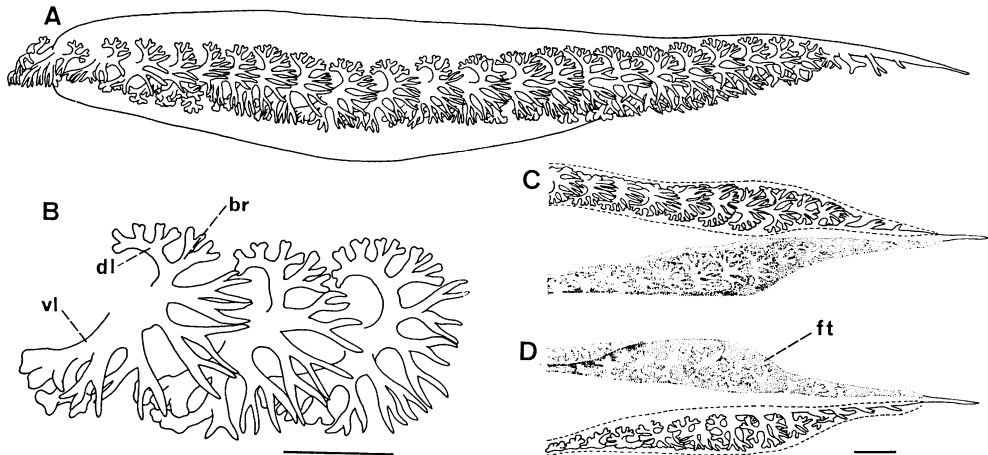


Fig. 5. Swimbladder of *Atrobucca brevis* sp. nov. (holotype, AMS I. 26447-001). A, lateral view (right side, drawing reversed); B, ninth to 11th appendages (right side, drawing reversed); C, dorsal view of posterior portion; D, ventral view of posterior portion. Abbreviations as in Fig. 3. Bar = 5 mm.

or black; pectoral fin lightly pigmented; pelvic fin pale; anal fin edged dusky (pale); caudal fin blackish posteriorly. Colour when fresh: brown or copper-coloured above, pale orange or white below, head, back and sides silvery or iridescent mauve; axil of pectoral fin brown; fins dusky pale orange, spinous dorsal and caudal edged black.

Comparisons. See diagnosis and key for distinguishing characters.

A. brevis has a shorter pectoral fin (20.2–23.0% SL) than that in the remaining seven species (range 22.7–31.3). Moreover, *A. brevis* differs from all congeners in having a pleural rib on the 11th vertebra (absent or minute in the other species). The additional rib is probably associated with the trend towards increase in number of abdominal vertebrae, varying between 10+15 and 11+14 vertebrae in this species. Insertion of the first anal proximal radial between the 11 and 12th or 12 and 13th vertebrae is probably also associated with this trend. For further comparisons, see key and comment under *A. kyushini*.

Distribution. Along northwestern and northern coast of Australia and southern Papua New Guinea, from about 124° to 146°E. Recorded depth of capture is 60–112 m.

Etymology. The new species is named from the Latin *brevis*, “short”, in reference to the short pectoral fin.

Atrobucca adusta sp. nov.
(Figs. 2C, 6, 7)

Holotype. QM I. 19180, 407.7 mm SL, male, mouth of Markham River near Lae, Papua New Guinea, coll. N. J. Quinn.

Paratype. KFRS F03381, 445.0 mm SL, sex unknown, without collection data, but localized to eastern or southern coast of Papua New Guinea.

Diagnosis. Foward directed branches present on ventral limbs of swimbladder appendages; appendages enveloping bladder along its length; last appendage short, bud-like, lying very obliquely to bladder wall. Dorsal soft rays 23–24; vertebrae 10+15, last pleural rib on 10th vertebra. HL 31.7–33.2% SL; caudal peduncle length 26.7–29.7; eye diameter 6.2–6.6; interorbital width 6.9–7.1; pectoral fin length 24.0–27.2; second anal spine length 5.9–8.0; gill filament length 2.4–2.9. Mouth lining dark. Membrane between opercular spines uniformly dark.

Description. Dorsal rays X+I, 24 (23), all soft rays branched; anal rays II, 7; pectoral rays 18, upper two unbranched; pelvic rays I, 5; principal caudal rays 17, upper one and lower one unbranched; lateral line scales 51 (ca. 50); gill rakers 6+1+10 (5+1+9); vertebrae 10+15, last pleural rib on 10th vertebra, minute rib on 11th vertebra, first anal proximal radial between 10 and 11th vertebrae; swimbladder appendages 33. Proportions as % SL: HL 33.2 (31.7); body depth

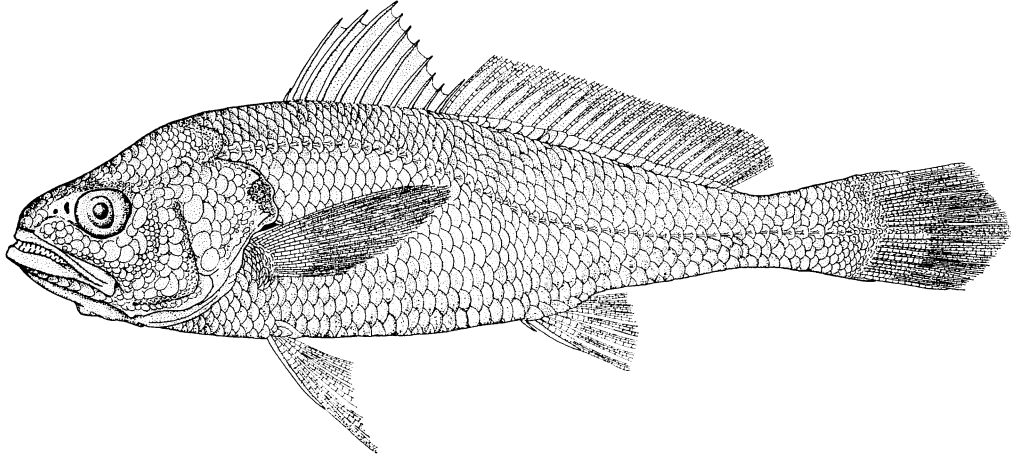


Fig. 6. *Atrobucca adusta* sp. nov., holotype, QM I.19180, 407.7 mm SL.

26.5 (25.2); body width 15.4 (11.7); caudal peduncle length 29.7 (26.7); caudal peduncle depth 7.9 (6.7); snout length 9.2 (8.1); eye diameter 6.6 (6.2); interorbital width 7.1 (6.9); upper jaw length 14.0 (12.7); lower jaw length 16.8 (16.3); pectoral fin length 27.2 (24.0); pelvic fin length 19.3 (19.2); second dorsal spine length ca. 12 (ca. 9.3); third dorsal spine length 14.0 (14.7); fourth dorsal spine length 14.6 (14.8); second anal spine length 8.0 (5.9); gill raker length 3.2 (3.0); gill filament length 2.9 (2.4). Proportions as % HL: snout length 27.6 (25.5); eye diameter 20.0 (19.6); interorbital width 21.5 (21.8); upper jaw length 42.1 (40.1); lower jaw length 50.6 (51.6); gill raker length 9.7 (9.4); gill filament length 8.9 (7.7). Proportions as % eye diameter: gill raker length 48.5 (47.7); gill filament length 44.4 (39.4).

Body slender, moderately elongate and compressed, caudal peduncle noticeably long. Dorsal and ventral profile moderately curved, the dorsal more convex than ventral; dorsal profile convex from snout tip to interorbital, thence slightly concave to nape, rather strongly convex from nape to dorsal origin. Snout with three rostral pores and five marginal pores. Three pairs of mental pores—first small, rounded, at front of chin and separated by symphysis; second also small and rounded, at anteroventral aspect of dentary; third oblong and large, well separated and partially concealed by lower lip fold.

Cleft of mouth at an angle of 25° to 30° to the horizontal when mouth closed; lower jaw prominent, chin rather angular; maxillary reaching

opposite middle of pupil to posterior margin of eye. Upper jaw with enlarged teeth in single outer row, and inner band of small conical teeth consisting of single row anteriorly and three rows posteriorly, band not extending to symphysis; single irregular row of teeth in lower jaw consisting of enlarged teeth separated by two to four (anteriorly) or one to four (posteriorly) small, conical teeth. Enlarged teeth on jaws strong, regularly and well spaced, those placed anteriorly in upper jaw and posteriorly in lower jaw somewhat larger than remainder.

Eye rounded. Nostrils immediately before eye; anterior nostril ovate; large posterior nostril vertical, its opening oblong or triangular. Gill rakers long and slender; gill filaments slightly shorter than corresponding gill rakers around angle.

Scales cycloid on: snout, anterior half of interorbital space, below eye, lower preoperculum and operculum, pectoral axil, body region concealed by gill cover, and isthmus. Ctenoid scales cover: posterior half of interorbital space, cheek, inter- and subopercula, occiput, nape, chest and remainder of body. Bases of soft dorsal and anal fins sheathed by one or two rows of ctenoid scales, and base and anterior $2/3$ of caudal fin and rays covered with small to very small scales. Partly scaly, fleshy flap in upper axil of pectoral fin large, scaly process in pelvic fin axil less conspicuous. No discs of white opaque tissue under scales on abdomen.

Dorsal fin originates above (slightly behind)

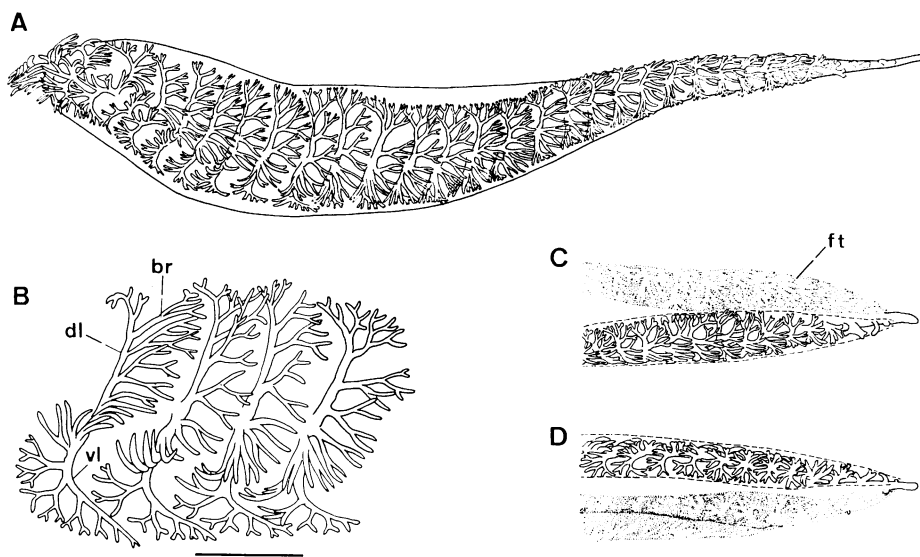


Fig. 7. Swimbladder of *Atrobucca adusta* sp. nov. (holotype, QM I. 19180). A, lateral view; B, ninth to 12th appendages; C, dorsal view of posterior portion; D, ventral view of posterior portion. Abbreviations as in Fig. 3. Bar=10 mm.

pelvic fin origin. Fourth dorsal spine longest. Pectoral fin inserted about $1/2$ ($1/3$) eye diameter before dorsal fin origin, its distal end reaching to vertical from about third (first) dorsal soft ray. Pelvic fin acute, but without a distal filament (broken ?). Second anal spine slender, its length slightly less than half first soft ray. Caudal fin rhomboid.

Sagitta shield-shaped; sulcus head pear-shaped and nearly reaching to anterior margin of sagitta; sulcus tail hockystick-shaped, slightly curved and truncated at the end; outer surface of sagitta with large granules (Fig. 2C).

Swimbladder with appendages in thick wedge of fat tissue; appendages enveloping the bladder along its length, posterior five or six before last three meeting their fellows of the other side dorsally, nearly meet ventrally; other appendages also well applied on surface of bladder, leaving a narrow space dorsally, rather wide space ventrally. Appendages richly branched except for two or three bud-like posterior ones lying very obliquely to bladder wall. Each appendage immediately divided above insertion into extensive dorsal and ventral limbs; dorsal limb directed upward, slightly curved forward and inward, most branches directed backward, upper one or two turned upward and forward; ventral limb directed downward and slightly forward near insertion, thence turned

inward to backward distally, branches directed outward from origin and redirected from forward to backward according to curvature of ventral limb. Each appendage (both limbs) overlapped by branches of preceding appendage (Fig. 7). Drumming muscle present in males (condition in females unknown).

Colour in preservative: dark to dull brown or tan above, slightly paler below. Scales of belly dark margined, particularly on flanks above anal fin and lower caudal peduncle, with proximal part hyaline and revealing silvery or cream-coloured skin below. Mouth lining black posteriorly, mostly black but somewhat mottled grey anteriorly, underside of tongue pale. Operculum brown, membrane between opercular spines dark brown except for pale narrow rear margin; branchial cavity black, its dark colouration not visible through operculum nor its membrane; peritoneum black or mottled dark grey. Process in pectoral axil black with pale margin. Dorsal fin membrane brown, lighter below and darker over outer half, fin edged black; upper $2/3$ of pectoral fin black or charcoal-coloured, remainder paler (particularly noticeable on inner aspect of fin); outer pelvic rays dark brown, inner rays pale; anal fin brown, posterior rays pale; caudal fin dark brown, becoming black posteriorly. Colour when fresh: unknown.

Remarks. It is possible that *A. adusta* and *A. brevis* are endemic to the New Guinea-Australian continental shelf. As such, they replace the widely distributed *A. nibe* which is unknown east of Lydekker's Line (see Woodland, 1986).

Comparisons. See diagnosis and key for distinguishing characters.

Although *A. adusta* has a low dorsal soft ray count similar to those of *A. trewavasae* and *A. alcocki*, it differs from them by having a shorter head and gill filaments (see key). Moreover this species is distinguished from its congeners by the long caudal peduncle (26.7–29.7% SL, cf. range of the remainder: 19.4–28.1).

Distribution. Only known from the type locality.

Etymology. The new species is named from the Latin *adustus*, "scorched" or "sunburned", in reference to its dark brown colouration.

Atrobucca nibe (Jordan et Thompson, 1911)
(Japanese name: Kuroguchi)

Pseudotolithus brunneolus Jordan and Richardson, 1909: 191, pl. 71 (Type locality: Formosa=Taiwan).

Sciaena nibe Jordan and Thompson, 1911: 258, fig. 4 (Type locality: Wakanoura, Japan).

Nibea pingi Wang, 1935: 448, fig. 32 (Type locality: Chefoo, China).

Material examined. No type material seen by us. HUMZ 72922, 196.0 mm SL, probably from Sagami Bay, Japan, 6 Nov. 1977; HUMZ 106571, 153.0 mm, 123°50'–124°00'E, 28°00'–28°50'N, 10 Oct. 1983; HUMZ 105988–105991, 227.8–262.5 mm, Bungo Strait, Oita Pref., Kyushu, Japan, 6 Dec. 1985; HUMZ 107749, 218.7 mm, Taiwan Strait, 10 April 1986; HUMZ 109505, 142.0 mm, HUMZ 109507, 167.4 mm, Taiwan Strait, 16 April 1986.

Diagnosis. Forward directed branches present on ventral limbs of swimbladder appendages; appendages strongly enveloping bladder along its length (rather weakly so in young); last appendage short, tube-like or bud-like, lying very obliquely to bladder wall. Drumming muscle present in males, absent in females. Dorsal soft rays 27–33; vertebrae 10+15, last pleural rib on 10th vertebra. HL 30.4–33.9% SL; caudal peduncle length 23.5–27.0; pectoral fin length 25.5–31.2; second anal spine length 6.7–8.6; eye diameter 7.2–9.9; interorbital width 7.7–8.5; gill filament length 2.4–3.5. Mouth lining dark. Membrane between opercular spines paler posteriorly.

Remarks. The specific name *nibe* has been conserved by the International Commission on Zoological Nomenclature (1984) acting on the recommendation of Trewavas (1979). The range of body proportions and counts presented above was compiled from the original description, Matsubara (1937), Chu et al. (1963), Sato (1974), Trewavas (1977) and our material. Proportions were calculated on specimens with size range between 142–263 mm SL. Data on Indian material given by Trewavas were not included (see below).

Although in Japanese and Chinese *A. nibe* the mouth lining is entirely dark, the anterior part of the mouth is pale in specimens from the Bay of Bengal (Trewavas, 1977). We hesitate to identify such Indian material as *A. nibe*, because Trewavas also noted a higher gill raker count (6–7+1+13; 5–6+1+9–11 in Japanese and Chinese material) and lower range of dorsal soft ray number (26–29) for these specimens. Sato (1974) examined 800 specimens from the Yellow Sea and the East China Sea, but did not find a specimen with 26 dorsal soft rays, the vast majority (95%) being in the range 29–33. We conclude that the status of more southwesterly records remains questionable until more specimens from the area become available for study.

Comparisons. See key and this section under *A. marleyi*.

Distribution. Definitely known from South Africa (Natal), Indonesia, China, Taiwan, southern Korea and southern Japan. In the East China Sea, fishing grounds of this species are restricted to water shallower than 120 m (Sato, 1974).

Atrobucca marleyi (Norman, 1922)

Sciaena marleyi Norman, 1922: 319 (Type locality: off Durban (=Natal), South Africa, depth between 73–91 m).

Material examined. BMNH 1922.1.13.37, holotype, 162 mm SL. Radiograph of holotype examined by us; E. Trewavas provided additional information.

Diagnosis. Forward directed branches present on ventral limbs of swimbladder appendages. Only four or five posterior appendages enveloping bladder. Drumming muscle absent in females. Dorsal soft rays 30; vertebrae 10+15, last pleural rib on 10th vertebra. HL 33.3% SL; caudal peduncle length (from radiograph) 26.5; eye diameter 7.6; interorbital width 8.3; pectoral fin length

ca. 28; second anal spine length 8.3; gill filament length 3.1. Mouth lining pigmented. Membrane between opercular spines paler posteriorly.

Remarks. This species is known only from the holotype. Trewavas (1977) redescribed *A. marleyi* and figured its swimbladder. Our diagnosis was compiled from that description and the radiograph. The true colour of the mouth lining cannot be accurately determined on the long-preserved and faded holotype (E. Trewavas, pers. comm.).

Comparisons. Only the difference of swimbladder structures separates *A. marleyi* from *A. nibe*—as presented in our key and diagnoses (see also Trewavas, 1977: fig. 14). Although Heemstra (1986) placed *A. marleyi* in the synonymy of *A. nibe*, we prefer to regard the former as a separate species, since it is not yet certain if the range of intraspecific variation of the latter incorporates the difference in the structure now apparent.

Distribution. Known only from the type locality.

Atrobucca trewavasae Talwar et Sathiarajan, 1975

Atrobucca trewavasae Talwar and Sathiarajan, 1975; 575, figs. 1–3 (Type locality: off Madras, Bay of Bengal, in depth of 250 m).

Material examined. ZSI 7140/2, paratype, 219.0 mm SL, 1 Jan. 1974. Information on BMNH paratypes was provided by E. Trewavas.

Diagnosis. Swimbladder as in *A. nibe*. Drumming muscle present in males, absent in females. Dorsal soft rays 24–26; vertebrae 10+15, last pleural rib on 10th vertebra (minute rib may be present on 11th vertebra). HL 37.4–40.3% SL; caudal peduncle length 23.7 (in one paratype); eye diameter 7.2–8.0; interorbital width 7.7–9.1; pectoral fin length 27.0–28.0; second anal spine length 6.4–7.0; gill filament length 5.5–6.4. Mouth lining dark. Membrane between opercular spines paler posteriorly.

Remarks. *A. trewavasae* is known from only the 10 type specimens (176–219 mm SL). Our diagnosis was compiled from Talwar and Sathiarajan (1975), Trewavas (1977), and a paratype we examined. E. Trewavas (pers. comm.) found luminous (?) white opaque tissue under the scales on the abdomen in one of the two BMNH paratypes. Such tissue has not been reported in the Sciaenidae except for fishes of the tribe Collichthyini. However it is uncertain if this tissue is always present in the species, and if so, it may be

deciduous. For example, we failed to detect the tissue in the ZSI paratype which has lost its scales.

Comparisons. See key and this section under *A. alcocki*.

Distribution. Known only from the type locality.

Atrobucca alcocki Talwar, 1980

Atrobucca alcocki Talwar, 1980: 23, fig. 1 (Type locality: off Bombay, Arabian Sea, at depth of ca. 60 m).

Material examined. ZSI F7591/2, holotype, 154.6 mm SL, June–Aug. 1977; FRSKU A1069, 213.3 mm, FRSKU A1070, 195.0 mm, FRSKU A1071, 211.8 mm, FRSKU A1072, 195.6 mm, FRSKU A1073, 163.4 mm, FRSKU A1074, 215.9 mm, all from off Sind, Pakistan (23°04'N, 67°14'E), 105 m, 8 Dec. 1976.

Diagnosis. Swimbladder as in *A. nibe*. Drumming muscle present in males, absent in females. Dorsal soft rays 24–28; vertebrae 10+15, last pleural rib on 10th vertebra (minute rib either present or absent on 11th vertebra). HL 36.6–38.9% SL; caudal peduncle length 22.1–26.1; eye diameter 8.9–10.0; interorbital width 7.3–8.0; pectoral fin length 29.7–31.3; second anal spine length 8.3–9.6; gill filament length 4.5–5.6. Mouth lining dark. Membrane between opercular spines paler posteriorly.

Remarks. *A. alcocki* was hitherto known only from the holotype. Our diagnosis was compiled from the holotype and six additional specimens. Our counts and measurements on the holotype essentially coincide with Talwar's (1980) except for dorsal soft rays (we count 28, instead of 29) and gill rakers (6+1+10, instead of 4+1+10). Talwar found no upper pores, and nor did we (in the holotype) because of partially removed skin from the snout region. However, three upper pores are definitely present in the new material from Pakistan.

These specimens contrast with the holotype in the degree the appendages envelop the bladder: in the small holotype only two or three pairs of appendages meet each other across the bladder, but in the larger, new material there is strong overlap, with eight or more appendages meeting each other. However, when we compared the swimbladder of small (142 mm SL) and large (246.8) *A. nibe* specimens we found a similar trend, so supporting our identification of the Pakistan

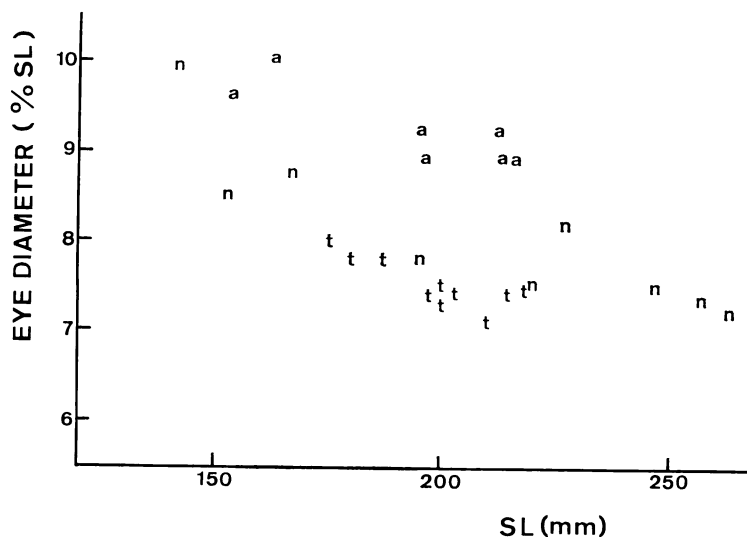


Fig. 8. Relationship between eye diameter as % SL and SL in three *Atrobucca* species. a, *alcocki*; n, *nibe*; t, *trewavasae*. Data of *A. trewavasae* from Talwar and Sathiarajan (1975) except for one paratype.

material as *A. alcocki*; i.e. appendages rather weakly enveloping the bladder in small individuals, strongly so in larger individuals. Possibly the appendages are not fully developed in the young.

Comparisons. *A. alcocki* is very similar to *A. trewavasae*, but differs in having a longer pectoral and larger eye (see key). The unique feature of this species is that in both young and adults, the eye is almost equally large (Fig. 8). Although Talwar (1980) pointed to the large eye as a major difference between *A. alcocki* and *A. trewavasae* (even though his holotype is smaller than any known specimens of *A. trewavasae*), we expect the eye diameter proportions would overlap once small *A. trewavasae* specimens were obtained and examined. As shown in Fig. 8, although adults of *A. nibe* have an eye equally as large as the eye of *A. trewavasae*, their young have a larger eye (8.6–9.9% SL in 142–167 mm SL)—comparable to that of *A. alcocki*. Additional juvenile material of all three species should further validate this trend.

The higher dorsal ray number of *A. alcocki* was considered by Talwar as another useful character to distinguish *A. alcocki* from *A. trewavasae*. However our new material bridges this gap, with a range of 24 to 28 (\bar{x} = 26.4). We do not find discs of white opaque tissue in this species as were found in *A. trewavasae* by E. Trewavas.

Distribution. Type locality and off Sind,

Pakistan.

Atrobucca geniae Ben-Tuvia et Trewavas, 1987

Atrobucca geniae Ben-Tuvia and Trewavas, 1987: 17, figs. 1–4 (Type locality: Gulf of Elat, Red Sea, at depths of 300 and 750 m).

Material examined. HJ 11398, holotype, 146.0 mm SL, 15 May 1984; BMNH 1985.3.19: 1, paratype, 248.0 mm, 19 March 1985. Radiographs were examined by us. Information was provided by A. Ben-Tuvia and E. Trewavas.

Diagnosis. Swimbladder essentially like that of *A. nibe*, differing only in having wide spaces between the appendages on dorsal and ventral surfaces of the bladder in adults. Drumming muscle absent in females. Dorsal soft rays 26; vertebrae 10+15, last pleural rib on 10th vertebra. HL 35.5–36.5% SL; caudal peduncle length 19.4–23.8; eye diameter 7.9–9.2; interorbital width 7.3–7.5; pectoral fin length 26.0–27.4; second anal spine length 10.6 (in one, 146 mm SL); gill filament length 3.1–3.3. Mouth lining dark. Membrane between opercular spines paler posteriorly.

Remarks. This species is known only from the three type specimens (146–260 mm SL). The diagnosis was compiled from Ben-Tuvia and Trewavas (1987) and radiographs. Anal spine is broken in the two larger paratypes.

Comparisons. This species has a longer head

and narrower interorbital than do *A. nibe* and *A. marleyi* (see key). It differs further from *A. nibe* by the weak degree the appendages envelop the bladder. Although Ben-Tuvia and Trewavas (1987) stated that the symmetrical, rounded distal expansion of the sulcus tail of sagitta is diagnostic for the species, E. Trewavas informed us (pers. comm.) that her reexamination of the sagitta revealed no significant difference from other *Atrobucca* species in this regard.

Distribution. Known only from the type locality.

Comparative material

Argyrosomus regius: FSFL uncatalogued, 408.4 mm SL, Atlantic coast of Africa; HUMZ 111136, 215.9 mm, Nile Delta, 1906.

Argyrosomus hololepidotus: SAMA F. 2242, three specimens, 180.0–200.0 mm SL, off the Coorong, South Australia (35°42'S, 139°10'E), 22 Oct. 1940; SAMA F. 4947, three specimens, 179.3–261.0 mm, Coorong Lagoon, South Australia, 1983; SAMA F. 5133, 182.4 mm, the Coorong, South Australia, 11–12 Feb. 1985.

Argyrosomus japonicus: HUMZ 106578, 347.0 mm SL, off Tei, Kochi Pref., Japan, 18 Nov. 1977; HUMZ 106576, 389.0 mm, HUMZ 106577, 430.7 mm, off Tei, Kochi Pref., Japan, 1978; HUMZ 106580, 161.7 mm, HUMZ 106581, 158.8 mm, off Mimase, Kochi Pref., Japan, 30 July 1979; HUMZ 106579, 310.3 mm, off Mimase, Kochi Pref., Japan, 9 Nov. 1979; HUMZ 106212–106217, 301.6–340.0 mm, the Sea of Hiuga, Miyazaki Pref., Japan, 11 Dec. 1985.

Argyrosomus miuy: HUMZ 33138, 393.6 mm SL, HUMZ 33176, 516.2 mm, East China Sea, April 1968; HUMZ 90615, 424.9 mm, 31°42'N, 120°59'E, 7 April 1981; HUMZ 108363, 278.2 mm, 34°32.07'N, 122°23.05'E, 29 Nov. 1985; HUMZ 108627, 246.7 mm, 34°46.12'N, 122°26.97'E, 29 Nov. 1985; HUMZ 108575, 263.7 mm, HUMZ 108576, 245.8 mm, 34°43.27'N, 122°28.75'E, 30 Nov. 1985.

Argyrosomus heinii: BPBM 21001, 352.9 mm SL, Gulf of Oman, 5 May 1977.

Pennahia macrocephalus: HUMZ 33340, 163.6 mm SL, off Kuching, Borneo, Dec. 1966.

Pennahia macrophthalmus: HUMZ 43447, 93.0 mm SL, Singapore fish market, 9 Dec. 1957; HUMZ 101703, 136.9 mm, HUMZ 101704, 149.4 mm, Songkhla fish market, Thailand, March 1983.

Pennahia argentata: HUMZ 33168, 276.5 mm SL, East China Sea, April 1968; HUMZ 39553, 153.0 mm, Mimase fish market, Kochi Pref., Japan, 12 July 1973; HUMZ 39722, 203.9 mm, Mimase fish market, Kochi Pref., Japan, 13 July 1973; HUMZ 48322,

174.8 mm, off Shimizu, Shizuoka Pref., Japan, 1 June 1974; HUMZ 89831, 51.2 mm, HUMZ 89832, 42.1 mm, off Tomakomai, Hokkaido, Japan, 2 Oct. 1974; HUMZ 52276, 130.4 mm, Miya fish market, Aichi Pref., Japan, 27 March 1976; HUMZ 59976, 114.5 mm, HUMZ 59978, 107.6 mm, off Murakami, Niigata Pref., Japan, 23 Oct. 1976; HUMZ 71497, 89.8 mm, off Iwaki, Fukushima Pref., Japan, 11 Nov. 1977; HUMZ 79346, 80.7 mm, off Hinase-cho, Okayama Pref., Japan, 23 Nov. 1978; HUMZ 94851, 212.8 mm, HUMZ 94852, 172.3 mm, 30°20.05'N, 127°02.01'E, 6 April 1982; HUMZ 106211, 304.3 mm, the Sea of Hiuga, Miyazaki Pref., Japan, 11 Dec. 1985; HUMZ 36178, 74.0 mm, data unknown.

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- インド・オーストラリア海域から得られたクログチ属 (ニベ科) の3新種と属の再定義
- 佐々木邦夫・Patricia J. Kailola
- インド・オーストラリア海域から得られたクログチ属 *Atrubucca* (ニベ科) の3新種を記載した。 *A. kyushini* (スミツキイシモチ) はボルネオ島沖の南シナ海で採集され、鰾の側枝が鰾をつつみこまないこと、側枝の腹分枝から出る小枝が前方に向かわないこと、最後方の側枝が長くチューブ状であること、口腔が白色であることで識別される。 *A. brevis* は北部オーストラリアとパプア・ニューギニア沿岸で採集され、短い胸鰭 (体長の23%以下) と第11脊椎骨が肋骨をもつことで特徴づけられる。 *A. adusta* はパプア・ニューギニア沿岸で採集され、23~24本の背鰭軟条と長い尾柄 (体長の27~30%) をもつことで他種と区別される。従来用いられてきた本属の定義はこれらの新種を含めるのに不十分であるため属を再定義した。本属は主に鰾の側枝がよく発達した背分枝と腹分枝をもつこと、耳石の内面にある溝の尾部がわずかに湾曲することによって特徴づけられる。本属魚類の検索表を作製し、本属のすべての種に標徴を与えた。
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