

***SCHISMATOGOBIOUS VANUATUENSIS*, A NEW SPECIES OF FRESHWATER GOBY FROM VANUATU, SOUTH PACIFIC**

by

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ABSTRACT. - *Schismatogobius vanuatuensis*, new species, is described on the basis of six specimens collected from the Island of Santo, Vanuatu. *S. vanuatuensis* differs from all other congeners in usually having 17 pectoral rays, dorsal fin with VI-I, 9-10 and a red and black spot on the upper anterior part, and a central black spot in the ventral surface of head in females.

RÉSUMÉ. - *Schismatogobius vanuatuensis*, une espèce nouvelle de gobie d'eau douce du Vanuatu, Pacifique Sud.

Schismatogobius vanuatuensis, nouvelle espèce, est décrit à partir de six spécimens collectés dans l'île de Santo au Vanuatu. *S. vanuatuensis* diffère de toutes les autres espèces du même genre en ayant 17 rayons aux nageoires pectorales, une nageoire dorsale avec VI-I, 9-10 avec une tache noire et une rouge sur sa partie supérieure, ainsi qu'une tache noire située au centre de la partie ventrale de la tête chez les femelles.

Key words. - Gobiidae - *Schismatogobius vanuatuensis* - Vanuatu - Freshwater - New species.

Over the past 25 years many freshwater gobies have been collected and identified from freshwater streams over much of the tropical Indo-Pacific.

The freshwater ichthyofauna of Vanuatu is both rich and varied but until 1998 it was poorly sampled and as a result little has been published on these animals over the centuries (Keith *et al.*, 2004). In October and November 1998, the Environment Unit of Vanuatu sponsored a survey of freshwater environments throughout the island nation of Vanuatu (Gerbeaux *et al.*, 1998; Keith *et al.*, 2000). In addition to the survey of 1998, in July 2002 and 2003, the first author conducted inventories of fishes occurring in freshwater streams and rivers on the islands of Santo, Tanna, Ambae and Efate. During these last inventories, a species of *Schismatogobius* was found.

Schismatogobius de Beaufort, 1912 is widely distributed in the tropical Indo-West Pacific and has been collected in freshwater streams from Samoa to Southern Japan and Northern Australia in the Central and Western Pacific westward to Sri Lanka in the Indian Ocean. It can be fairly common in flowing streams, almost always above tidal influence, and has been found in areas of coarse sand (Akihito *et al.*, 1988), pebbles (Kottelat and Pethiyagoda, 1989; Chen *et al.*, 1995a; Chen *et al.*, 1995b; Chen *et al.*, 2001) and gravel (Herre, 1927; Allen, 1989), at times with the presence of some silt and mud. However it is almost always overlooked due to its small size, colouration and cryptic nature.

Seven nominal species can be assigned to *Schismatogobius*: *S. marmoratus* (Peters, 1868), *S. bruyinisi* de Beaufort,

1912, *S. insignis* (Herre, 1927), *S. roxasi* Herre, 1936, *S. deraniyagalai* Kottelat & Pethiyagoda, 1989, *S. ampluvinculus* Chen, Fang & Shao, 1995 and *S. fuligimentus* Chen, Séret, Pöllabauer & Shao, 2001. Another species, *Gobiosoma pallida* Herre, 1934, was included into *Schismatogobius* by Chen *et al.* (1995a) and Chen *et al.* (2001) apparently because it was previously placed into *Gobiosoma* Girard, 1858, genus restricted to the Western Atlantic and Eastern Pacific, but the number of dorsal and anal fin rays [VI-I, 12 and I, 12; *Schismatogobius* almost always VI-I, 9(10) and I, 9], colouration in the original description and presence of 24 scales laterally (Koumans, 1940) indicate it does not belong to *Schismatogobius*.

The most striking features of *Schismatogobius* are the total absence of scales, the remarkable variation in colour patterns when viewed laterally, with no two patterns being the same among individuals regardless of the species being examined, the hugely large jaws in males when contrasted with those in females, the usual presence of only 11 branched caudal fin rays (most Gobioidae with 13), and without pronounced sexual dimorphism in length of fins.

Colouration in *Schismatogobius* is apparently of visual significance to the varying species and other visual characteristics have been noted previously (Pethiyagoda, 1991; Horsthemke, 1992; Watson and Horsthemke, 1995).

While examining these gobies ventrally it was discovered distinctive markings exist especially on the ventral surface of head and breast that are sexually dichromatic and generally unique to each species. The significance and use of

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ventral markings to these animals remain unknown but from a systematic standpoint these are of great importance. Also considered important in separating species belonging to *Schismatogobius* is the number of pectoral rays.

The cephalic sensory pore pattern is also useful in separating *S. deraniyagalai* from all other species (Kottelat and Pethiyagoda, 1989). The vast majority of *Schismatogobius* has a cephalic sensory pore system of B, D, F, K, L, N and O, with pore D singular and all other paired, and with oculoscapular canal absent between pores F and K. *S. deraniyagalai* is the only member of the genus lacking the preopercular canal and associated pores N and O, and some individuals lack posterior section of the oculoscapular canal and associated pores K and L.

The purpose of this paper is to provide a description of *Schismatogobius vanuatuensis* n. sp., a new freshwater goby known only from Vanuatu, the second species known from the region of South Pacific Islands with *S. fuligimentus* endemic to New Caledonia.

MATERIALS AND METHODS

Methods largely follow Chen *et al.* (2001) and Watson (1995) with exception of body depth, which is measured at anal fin origin. Measurements were accomplished using a dial calliper and expressed to the nearest tenth of a millimetre. Teeth always counted to right of symphysis from tooth closest to symphysis to posterior most dentary or premaxillary tooth; outer row of teeth counted in upper jaw and inner row counted in lower jaw.

Abbreviations used to represent cephalic sensory pores follow Akihito (1986).

In all previous research pertaining to pores of the preopercular canal those with only two pores have been consistently identified as M for the upper most and O for the lower most. Examination of numerous specimens and illustrations shows pore M in specimens corresponds in position with pore N in specimens having three preopercular pores. Pore M is actually situated much closer to the eye and usually between pores F and H, when present, and slightly below level of oculoscapular canal. As a result of this observation pore N is stated as present in *Schismatogobius* and not pore M.

Abbreviations used to represent institutions and collections follow Leviton *et al.* (1985).

Some aspects of morphology and morphometrics are summarized in table I.

Comparative material

Schismatogobius fuligimentus. - MNHN 2002-149 to MNHN 2002-151, 3 specimens (17.5-33.9 mm SL), Lembi River, New Caledonia. - MNHN 2002-152, 1 spm (28.1 mm SL), July 2000,

Pourina River, Chloé 3, New Caledonia. - Holotype: MNHN 1992-22 (30.6 mm SL), Dumbéa River, New Caledonia.

Schismatogobius bruynisi. - CAS 63588, 1 spm (23.6 mm SL), tributary of Rempi River, Madang, Papua New Guinea.

Schismatogobius roxasi. - Holotype: CAS 128609, 1 spm (45.9 mm SL), San Jose, Panay I., Antique Prov., Philippines.

Schismatogobius insignis. - USNM 339676, 5 spms (14.8-21.0 mm SL), Ocoy River near Sibulan, off Dumaguete along highway from Sumaguete to Tanay, Negros Oriental Prov., Philippines.

Schismatogobius deraniyagalai. - Holotype: ZSM 27362 (30.8 mm SL), We Oya River, Parusella estate, Kegala district, Sri Lanka. - USNM 268297, 3 spms (28.1-30.7 mm SL), tributary to Gin Ganga, Kanneliya Forest, Hiniduma district, Sri Lanka.

Schismatogobius ampluvinculus. - Holotype: ASIZP 056923 (22.2 mm SL), Jinglun River, Taitung Co., Taiwan. - Paratypes: ASIZP 056988 (22.3 mm SL), Jinglun River, Taitung Co., Taiwan.

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(Figs 1, 2; Tables I, II)

Material examined

Six specimens from the island of Santo in Vanuatu with a size range of 18.4-39.9 mm SL.

Holotype. - MNHN 2003-1557, female (39.9 mm); Matentas River; Santo Island, 23 Jul. 2003, Coll. P. Keith, G. Marquet and J. Keith.

Paratypes. - MNHN 2003-1558, 5 spms, size range 18.4-22.1 mm; Matentas River; Santo Island, 23 Jul. 2003, Coll. P. Keith, G. Marquet and J. Keith.

Diagnosis

Usually 17 pectoral rays; dorsal fins with VI-I, 9-10; ventral surface of head in females with a central black spot. Jaw lengths in males much greater than in females. In live colors, lateral body markings with patterns of orange, brown, grey, white and black can appear as transverse bars or big spots. Transverse black bars with a marginal blue line. First dorsal fin with a black spot and an upper red one.

Description

Dorsal fins VI-I, 9-10, membrane in first dorsal fin posterior to spine 6 usually nearly connects at base of spine in second dorsal fin. Anal fins I, 9 directly opposite to second dorsal fin. Caudal fin with 11 branched rays, posterior margin rounded. Pectoral fin oblong with posterior margin straight, usually 17 (16-17) rays, ventral most ray simple. Pelvic fins always I, 5 with both fins joined together their entire length between rays 5 to form a strong cup-like disc and between spines a well developed frenum. Teeth in upper jaw in two rows, teeth conical and only slightly recurved, usually 8 (8-12). Teeth in lower jaw in usually two (2-3) rows of teeth anteriorly and a single row laterally, all teeth conical with outer row only slightly enlarged and somewhat

Table I. - Morphometrics of *Schismatogobius vanuatuensis*, n. sp.

Morphometrics	MNHN 2003-1557	MNHN 2003-1558
Number of specimens	1 (Holotype)	5 (Paratypes)
Total length (mm)	47.54	19.40-27.50
Standard length (SL) (mm)	39.90	18.40-22.10
Lower jaw length (% SL)	13.06	12.24-14.90
Snout length (% SL)	5.30	5.30-7.40
Eye diameter (% SL)	3.50	3.50-5.10
Caudal peduncle depth (% SL)	7.27	5.82-6.94
Caudal peduncle length (% SL)	17.79	15.84-16.30
Body depth at first dorsal fin (% SL)	16.70	12.10-13.50
Head length (% SL)	29.17	30.77-32.14
Head depth (% SL)	6.40	3.60-6.40
Predorsal length (% SL)	40.78	40.76-43.88
Preanal length (% SL)	63.26	59.78-61.99
Prepelvic length (% SL)	28.00	25.40-28.00
Second dorsal fin length (% SL)	28.50	28.70-29.50
Anal fin length (% SL)	24.69	24.52-27.17
Caudal fin length (% SL)	18.92	17.35-20.65
Pectoral fin length (% SL)	28.30	27.30-29.40
Pelvic fin length (% SL)	28.30	27.80-29.40
Pectoral rays	17	16-17
Dorsal rays	VI, 19	VI, 19-10
Anal rays	19	19

recurved, usually 18-22. Jaw lengths in males much greater than in females. Cephalic sensory pore system always with pores B, D, F, K, L, N and O, pore D singular with all other pores paired; oculoscapular canal absent between pores F and K (Fig. 1). Cutaneous sensory papillae not well developed and few lines present on head: infraorbital papillae in longitudinal row; opercule with 3 rows.

Sexual dimorphism fairly well developed with males always having jaws longer and head slightly larger than females and these last have a central black spot in the ventral surface of head not present in males. Urogenital papilla in both sexes similar and appearing broadly rounded in ventral view and somewhat flattened in lateral view, posterior margin straight or rounded in females and slightly pointed in males.

Colour in preservation. - Ventral half of head mostly black and white coloured and tan to black dorsally; belly whitish; breast dusky; lateral body markings variable with numerous individual patterns of brown to grey to black and can appear as oblique bars. Head dusky, darker dorsally than

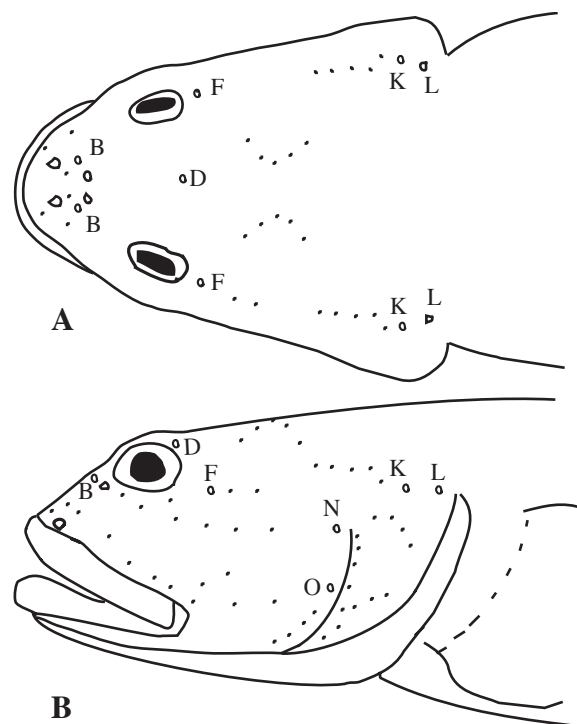


Figure 1. - Diagrammatic illustration of the head in *Sicyopterus vanuatuensis* n. sp., showing the cephalic sensory pore system. A: Dorsal view; B: Lateral view.

ventrally in lateral view. In region of isthmus this area seems darker in females than in males. First dorsal fin with a black spot. Second dorsal fin mostly cream with black markings appearing as spots restricted to rays. Caudal fin black and white, with a black spot at hypural point and two vertical black bands. Anal fins mostly cream. Pelvic disc mostly whitish over rays with numerous tiny black spots. Frenum mostly without markings, distal margin of disc mostly clear. Pectoral fins tan with about 3 to 4 irregular blackish bars, bars formed by black markings on pectoral rays.

Colour in life (Fig. 2). - Head dusky, darker dorsally than ventrally in lateral view. Ventral half of head mostly black and white coloured and tan to black dorsally; belly goldish; breast dusky; lateral body markings variable with patterns of orange, brown, grey, white and black can appear as transverse bars or big spots. Transverse black bars with a marginal blue line. First dorsal fin with a black spot and an upper red one. Second dorsal fin mostly cream with black markings appearing as spots restricted to rays. Caudal fin black and white, with a black spot at hypural point and two vertical black bands. Anal fins mostly cream. Pelvic disc mostly whitish over rays with numerous tiny black spots. Pectoral fins tan with about 3 to 4 irregular blackish bars, bars formed by black markings on pectoral rays.



Figure 2. - *Schismatogobius vanuatuensis*, MNHN 2003-1557, holotype, female (39.9 mm SL).

Table II. - Comparison of fin-ray counts and body depth (BD) at anal fin origin (% of SL) from the different species of *Schismatogobius*. *: data from original description; UN: unknown data.

Species	Dorsal fin	Anal fin	Pectoral fin	BD (%LS)
<i>S. vanuatuensis</i> n. sp.	VI-I, 9-10	1,9	17(16)	12.1-16.7
<i>S. marmoratus</i> *	VI-I, 10	1,9	UN	UN
<i>S. roxasi</i>	VI-I, 9	1,9	17	20
<i>S. insignis</i>	VI-I, 9	1,9	16(17)	23.5-25.0
<i>S. ampluvinculus</i>	VI-I, 9	1,9	16	14.2-15.0
<i>S. bruynisi</i>	VI-I, 9	1,8-9	16	16.6
<i>S. deraniyagalai</i>	VI-I, 9	1,9	15	10.4-12.7
<i>S. fuligimentus</i>	VI-I, 9	1,9	13(14)	12.2-17.5

Habitat

Schismatogobius vanuatuensis has been collected in the Matentas river, a freshwater stream in a protected area. It has been caught in a moderate flow in shallow areas of rocks and gravel (depth 0.3-1 m) just above tidal influence.

Etymology

The name for the new species is derived by combining Vanuatu and the Latin suffix *-ensis* that in combination means 'from or of Vanuatu'. This name is used because the new species is known only from Vanuatu.

Affinities

S. vanuatuensis differs from all other species in having: dorsal fins with VI-I, 9-10 (mostly 1,9 for the others), 17 pectoral rays (13 to 16 for the others, except *S. roxasi* (17)); ventral surface of head in females with a central black spot; first dorsal fin with an anterior red and black spot and a slender body (body depth at first dorsal fin: 12-16.7 (% of SL)) than the *S. insignis* (23.5-25) and *S. roxasi* (20), and larger than *S. deraniyagalai* (10.4-12.7) (Table II).

Distribution

Schismatogobius vanuatuensis is known from the island of Santo, Vanuatu.

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