

Akihito futuna, a new species of freshwater goby from the South Pacific (Gobioidei: Sicydiinae)

by

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ABSTRACT. - *Akihito futuna*, new species, is described on the basis of material collected from Futuna Island. It is distinguished from *A. vanuatu* in having less premaxillary teeth in males (4-7 vs 7-17) and tricuspid premaxillary teeth (4-7 vs 30-37) in females; more caniniform premaxillary teeth (2-4 vs 0-1) in females; lower scale counts in lateral scales (19-20 vs 24-32), in transverse forward series (5 vs 8-9), and in transverse back series in females (8-9 vs 9-14).

RÉSUMÉ. - *Akihito futuna*, une espèce nouvelle de gobie d'eau douce du Pacifique sud (Gobioidei : Sicydiinae).

Akihito futuna, espèce nouvelle, est décrite sur la base de matériel collecté sur l'île de Futuna. Elle se distingue d'*A. vanuatu* en ayant moins de dents prémaxillaires chez les mâles (4-7 vs 7-17) et de dents prémaxillaires tricuspides (4-7 vs 30-37) chez la femelle ; plus de dents prémaxillaires caniniformes (2-4 vs 0-1) chez la femelle ; moins d'écaillés en ligne latérale (19-20 vs 24-32), en série transverse antérieure (5 vs 8-9) et en série transverse postérieure (8-9 vs 9-14) chez la femelle.

Key words. - Gobioidei - Sicydiinae - *Akihito futuna* - PSW - Futuna Island - Freshwater - New species.

Based on characteristics of pelvic fin osteology, the subfamily Sicydiinae has been divided into two tribes (Watson *et al.*, 2007). Sicydiini Gill, 1860 is defined as having a broad based pelvic disc, fused to belly between all five rays and Sicyopini Watson, Keith & Marquet, 2007, is defined as having a short based pelvic disc, fused to belly between fifth rays only.

Within the Sicyopini tribe, Watson *et al.* (2007) have described a new genus, *Akihito*, based on material collected in freshwater streams from the island nation of Vanuatu. *Akihito* is differentiated from all other genera in Sicydiinae by a combination of characteristics that include male with only conical and caniniform premaxillary and dentary teeth, female with few caniniform and numerous tricuspid premaxillary teeth and fine horizontal teeth in dentary; tongue free; large broad epural; male with midline scales much greater in height than length; and pelvic disc fused to belly between fifth rays only.

The freshwater ichthyofauna of Futuna, a little island situated between Fiji and Samoa, was completely unknown until October 2004, when a freshwater survey was conducted by the Muséum national d'histoire naturelle of Paris (MNHN), the University of Perpignan, ETHYCO and the CEMAGREF. This small island (84 km²), partly covered by a primary forest, with a maximum altitude of 524 m and short rivers (maximum 3 km long) is particularly rich in endemic Gobioidei. During this study, 18 species of fresh-

water fishes were found and, among them, a new species of *Sicyopus*, a new species of *Stenogobius*, a new species of *Stiphodon* and a new species of *Akihito* (Keith and Marquet, 2005, 2006, 2007, respectively).

The purpose of this paper is to provide a description of *Akihito futuna*, n. sp., a freshwater goby known from Futuna Island.

METHODS

Methods follow Watson (1999) and Watson *et al.* (2007). Counts and measurements were taken from the right side using a dial caliper, expressed to the nearest tenth of a millimetre and then that value rounded to the nearest whole percent of standard length (SL). All values are compared and used in tables and any discussion.

Abbreviations used to represent institutions and collections cited follow Leviton *et al.* (1985) except BLIH (Biological Laboratory, Imperial Household, Akasaka Imperial Palace, Tokyo) formerly LICPP.

Teeth are always counted to the right of symphysis. Upper jaw teeth are referred to here as premaxillary teeth. Teeth projecting horizontally from dentary are termed here as horizontal teeth. Dentary teeth with a more normal or conventional appearance are referred to here as symphyseal teeth.

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Abbreviations and terminology used to identify osteology follow Birdsong (1975).

AKIHITO FUTUNA, N. SP.

(Figs 1-3; Tabs I-III)

Material examined

Nine specimens from Futuna Island, totalling 6 males and 3 females, size range 28-33.3 mm SL, largest male 33.3 mm SL, largest female 29.2 mm SL, smallest gravid female 28 mm SL.

Holotype. - 2006-0775, male (33.3 mm SL); Futuna, Vanifao River, elevation 147 m; 15 Oct. 2004; Keith, Marquet, Sasal & Labrousse coll.

Paratypes. - 2006-0776, 5 males, 3 females (28-32.7 mm SL); same data as holotype.

Diagnosis

Females with 4-7 closely set, slightly flexible tricuspid premaxillary teeth and 2-4 canine-like teeth at the tip of the premaxilla. Adult males with only 4-7 premaxillary fixed recurved conical to canine-like teeth. Scales along lateral midline 19-20 in female. Tongue small, rounded and mostly free from floor of mouth anteriorly. Pelvic disc fused to belly between fifth rays only.

Description

Dorsal fins VI-I,10 (7), VI-I,9 (2), first dorsal fin membrane may connect basally to second dorsal fin in male and not in female; in male first dorsal spines 4, 5 and 6 filamentous with spine 5 longest, spines not filamentous in female. Anal fin I,10 (5), I,9 (4) and directly opposite to second dorsal fin. Pectoral fin 15 (4)-16 (5), ventral most ray simple (1-3), uppermost rays extend slightly beyond membrane not appearing feathery or silky. Caudal fin usually with 13 (12-13) branched rays, posterior margin rounded. Pelvic disc with 1 stout spine and 5 heavily branched rays, fifth rays joined together in their entire length forming a strong circular disc, a strong frenum between both spines; disc strongly adherent to belly between fifth rays only.

Scales in lateral series cycloid; distribution of scales sexually dimorphic in number, male (15-17) with midline scales much greater in height than length appearing broadly elliptical. Female (19-20) with well developed scales extending anteriorly to posterior region of nape. Scales in transverse back series: male without, female 8-9. Scales in transverse forward series: male without, female 5. Scales in predorsal series: male and female without. Scales in zigzag series usually with 9 in both sexes. Head, breast and pectoral base without scales. Belly may be with few cycloid scales close to anus in female and naked in male.

Exposed premaxillary teeth (7-10) in a single row in

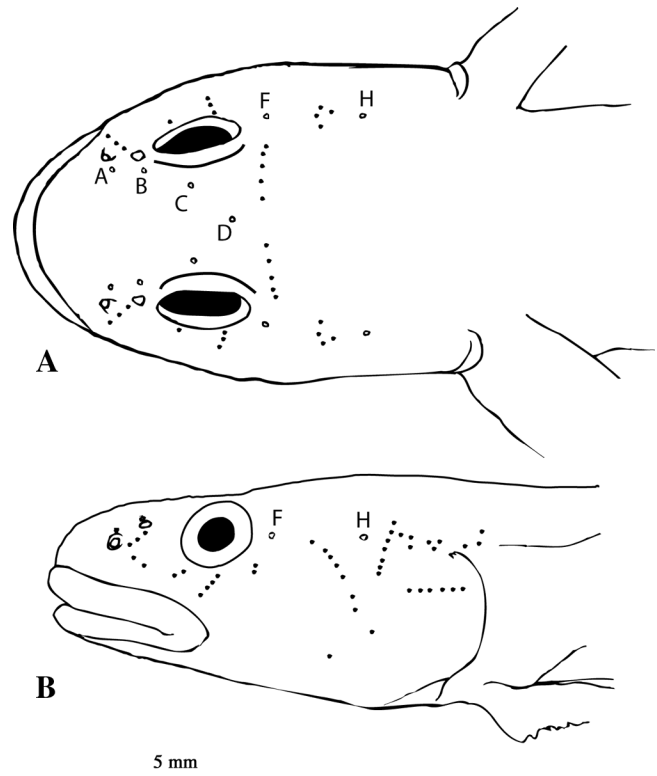


Figure 1. - Diagrammatic illustration of head in *Akihito futuna* with pores and sensory papillae. **A**: Dorsal view; **B**: Lateral view. [Illustration de la tête avec les pores et les papilles sensorielles. **A**: Vue dorsale; **B**: Vue latérale.]

females, slightly flexible, with 4-7 tricuspid teeth and 2-4 canine-like teeth at the tip of the premaxilla. Adult males possess only 4-7 fixed conical to canine-like premaxillary teeth. 4-7 symphyseal teeth in males and 5-6 in females, appearing conical to canine-like, most recurved in a broad curving band not meeting at symphysis. Horizontal teeth recurved conical to canine-like and restricted to anterior region on both dentaries in male and as fine numerous teeth in female. Upper lip smooth without any clefts. Lower lip incomplete. Tongue small, rounded and mostly free from floor of mouth anteriorly.

Gill rakers on inner edge of outer gill arch 1-2+1+2, each raker appear as small papillous projections without ossification. Cephalic sensory pore system usually A, B, C, D, F, and H, pore D singular with all other pores paired. Cutaneous sensory papillae well developed with each being circular in appearance set in a shallow depression (Fig. 1).

Sexual dimorphism well developed. Besides teeth, male with length of jaw and unpaired fins greater than in female and first dorsal spines filamentous in male and not in female. Anterior to urogenital papilla in male with an expanded fleshy sack extending slightly under urogenital papilla, not well developed in female. Male with slender urogenital papilla pointed at distal tip and in female blunt with two fim-

Table I. - Tooth counts in *Akihito futuna*. M: Male, F: Female.

		Premaxillary teeth (caniniform + tricuspid teeth for females)																									
		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	-	-	30	31	32	33	34	35	36	37
<i>A. futuna</i> M		1	-	3	2																						
<i>A. vanuatu</i> M					5	3	2	2	1	-	-	-	-	1													
<i>A. futuna</i> F					1	1	-	1																			
<i>A. vanuatu</i> F																				1	1	1	1	2	1	1	1
		Symphyseal teeth																									
		3	4	5	6	7																					
<i>A. futuna</i> M			1	1	3	1																					
<i>A. vanuatu</i> M		2	1	7	4																						
<i>A. futuna</i> F				1	2																						
<i>A. vanuatu</i> F		1	2	4	1	1																					

Table II. - Scale counts in *Akihito futuna* and *A. vanuatu*.

		Lateral scales																		
		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
<i>A. futuna</i> M			1	1	4															
<i>A. vanuatu</i> M		1	5	4	2	2														
<i>A. futuna</i> F							1	2												
<i>A. vanuatu</i> F											1	-	-	-	1	4	-	2	1	
		Predorsal scales																		
		0	1	2																
<i>A. futuna</i> M		6																		
<i>A. vanuatu</i> M		13																		
<i>A. futuna</i> F		3																		
<i>A. vanuatu</i> F		4	3	2																
		Transverse back series																		
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14				
<i>A. futuna</i> M		6																		
<i>A. vanuatu</i> M		9	2	3																
<i>A. futuna</i> F									2	1										
<i>A. vanuatu</i> F									1	2	3	1	1	1						
		Transverse forward series									Zigzag scales									
		0	1	2	3	4	5	6	7	8	9	6	7	8	9	10				
<i>A. futuna</i> M		6										6	1	2	3					
<i>A. vanuatu</i> M		9	5									1	4	5	4					
<i>A. futuna</i> F							3								3					
<i>A. vanuatu</i> F									7	2				1	7	1				

briate projections (Fig. 2). Adult male with midlateral scales much larger than those found on female.

Colour in preservation

Both sexes similarly coloured.

Males. - Background of body and head greyish, belly cream coloured. Scales anteriorly with a dusky margin. Dorsal fins with spines, rays and membrane uniformly dusky. Caudal fin with dusky rays darkest medially and membrane generally clear. Anal fin slightly dusky. Pelvic disc slightly dusky in centre. Pectoral fin with rays their entire length

dusky and membrane generally clear.

Females (Fig. 3B). - Colouration almost identical to male but more whitish. A grey to white band is present from head to pectoral fin and from below the second dorsal to caudal fin. Head ventrally slightly whitish. First dorsal and second dorsal fins hyaline. Caudal fin with rays dusky and membrane clear. Anal fin rays hyaline. Pectoral fin rays slightly dusky with membrane generally clear.

Colour in life

Males (Fig. 3A). - Two types of coloration have been

Table III. - Morphometrics in *Akihito futuna* expressed as a percentage of the standard length and to the nearest integer. [Morphométrie exprimée en pourcentage de la longueur standard et arrondie au nombre entier le plus proche.]

	Predorsal length									Preanal length													
	33	34	35	36	37	38	39	40	41	56	57	58	59	60	61	62	63						
<i>A. futuna</i> M			2	1	2	1						2	-	2	2								
<i>A. vanuatu</i> M	1	2	4	3	3	1				3	2	2	5	1	1								
<i>A. futuna</i> F						2	-	1				1	1	1									
<i>A. vanuatu</i> F		2	1	2	3	1							1	2	3	3	1						
	Head length						Jaw length																
	21	22	23	24	25	26	27	8	9	10	11	12											
<i>A. futuna</i> M				1	1	3	1	1	1	2	2												
<i>A. vanuatu</i> M	2	1	3	3	4	1				2	5	5											
<i>A. futuna</i> F			1	1	1			1	1	1													
<i>A. vanuatu</i> F	2	1	3	3				3	5	3													
	Caudal peduncle length																						
	12	13	14	15	16	17	18	19	20														
<i>A. futuna</i> M	1	-	2	1	1	1																	
<i>A. vanuatu</i> M					5	3	2	2	2														
<i>A. futuna</i> F					2	1																	
<i>A. vanuatu</i> F					2	1	2	3	1														
	Caudal peduncle depth					Body depth in males at origin of second dorsal fin																	
	9	10	11	12	13	10	11	12	13	14													
<i>A. futuna</i>	4	5	1			1	1	3	1														
<i>A. vanuatu</i>		3	8	6	4	1	2	3	4	3													
	Second dorsal fin length																						
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
<i>A. futuna</i> M										1	-	1	1	-	1	1							
<i>A. vanuatu</i> M									1	-	-	-	-	-	-	-	1	3	3	3	1	-	2
<i>A. futuna</i> F			2	-	1																		
<i>A. vanuatu</i> F	1	-	1	1	2	1	-	-	1	1													
	Anal fin length										Caudal fin length												
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	17	18	19	20	21	22	23	24	25
<i>A. futuna</i> M						1	-	1	-	1	-	2						3	-	2	1		
<i>A. vanuatu</i> M									2	-	2	6	2	1	1	-	-	-	-	1	3	4	4
<i>A. futuna</i> F			2	-	-	-	1									1	1	-	-	1			
<i>A. vanuatu</i> F	1	-	-	1	1	1	1	2	1	1				1	-	-	3	2	2				

observed. First one: dorsally body and head blackish; area between second dorsal and anal fins and caudal peduncle greyish to blackish; each scale with a posterior black margin. Pectoral fin base brownish. First dorsal fin with blackish spines and greyish membrane. Second dorsal fin greyish to brownish. Caudal fin with dusky rays and clear membrane. Anal fin rays and membrane dusky. Pectoral fin rays and membrane dusky. Second one: area between first dorsal, anal and caudal peduncle greyish to yellowish. Belly greyish to yellowish. Each scale with a posterior black margin. Area between head and first dorsal fin mottled with yellow, brown and grey. Two longitudinal black bars are visible on the head. The first one is from the tip of snout to pectoral base, the second one is above the first one. Predorsal and head area

yellowish and greyish. First dorsal fin with blackish spines and greyish membrane. Second dorsal fin greyish to brownish. Caudal fin with dusky rays and clear membrane. Anal fin rays and membrane dusky. Pectoral fin rays and membrane dusky.

Females. - Area between first dorsal, anal and caudal peduncle greyish to yellowish. Belly greyish to yellowish, sometimes reddish. Each scale with a posterior black margin. Predorsal and head area greyish and whitish. Dorsally, body and head may be either with yellow or greyish. A mid-lateral blackish band is present from head to pectoral fin and from below second dorsal fin to caudal fin. First dorsal fin with blackish spines and greyish membrane. Second dorsal fin greyish to brownish. Caudal fin with dusky rays and clear

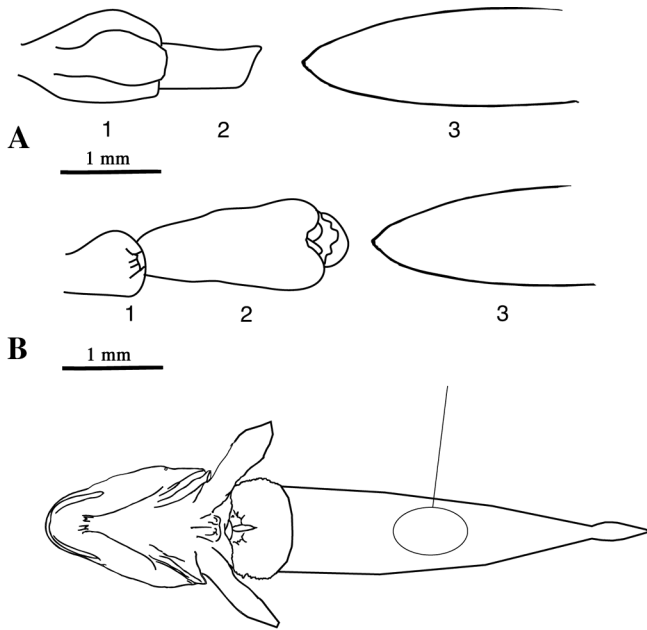


Figure 2. - Diagrammatic illustration of urogenital papilla in mature specimens of *Akihito futuna*. **A**: Male; **B**: Female; 1. anus; 2. urogenital papilla; 3. anal fin. [Illustration des papilles urogénitales chez des individus matures. **A** : Mâle ; **B** : Femelle ; 1. anus ; 2. papille urogénitale ; 3. nageoire anale.]

membrane. Anal fin rays and membrane dusky. Pectoral fin rays and membrane dusky.

Ecology

Akihito futuna is found in swift clear streams with rocky bottom. The site where the specimens were found is situated at an altitude of 147 m. *In vivo* observations have shown that they often swim in open water and are not always on the bottom of the river. Feeding habits have not been studied in depth but the few specimens examined seemed to feed on aquatic insects and crustacean (Atyidae).

Distribution

Akihito futuna is currently known only from Futuna Island.

Comparison

Akihito futuna differs from *A. vanuatu* because it has less premaxillary teeth in males (4-7 vs 7-17), less tricuspid premaxillary teeth (4-7 vs 30-37) in females and more caniniform premaxillary teeth (2-4 vs 0-1) in females. It has also lower scale counts in lateral scales in females (19-20 vs 24-32), in transverse back series in males (0 vs 0-2) and females (8-9 vs 9-14), and in transverse forward series in females (5 vs 8-9). *A. futuna* differs from *A. vanuatu* in having also less predorsal scales in females (0 vs 0-2), and a higher predorsal length in females (38-40 vs 34-38).

Etymology

The new species is named for Futuna Island and is defined as a noun in apposition.



Figure 3. - *Akihito futuna*. **A**: Male, paratype MNHN 2006-0776; Futuna Island, Vanifao River; 15 Oct. 2004; Keith, Marquet, Sasal, Labrousse coll. (picture by P. Keith); **B**: Female, paratype MNHN 2006-0776; Futuna Island, Vanifao River; 15 Oct. 2004; Keith, Marquet, Sasal, Labrousse coll. (picture by C. Ferrara).

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REFERENCES

- BIRDSONG R.S., 1975. - The osteology of *Microgobius signatus* Poey (Pisces: Gobiidae), with comments on other gobiid fishes. *Bull. Florida State Mus., Biol. Sci.*, 19: 135-186.
- KEITH P. & G. MARQUET, 2005. - *Sicyopus (Smilosicyopus) sasali*, a new species of freshwater goby from Futuna Island (Teleostei: Gobioidae: Sicydiinae). *Cybium*, 29(4): 389-394.
- KEITH P. & G. MARQUET, 2006. - *Stenogobius keletaona*, a new species of freshwater goby from Futuna Island (Teleostei: Gobioidae). *Cybium*, 30(2): 139-143.
- KEITH P. & G. MARQUET, 2007. - *Stiphodon rubromaculatus*, a new species of freshwater goby from Futuna Island (Teleostei: Gobioidae: Sicydiinae). *Cybium*, 31(1): 45-49.
- LEVITON A.E., GIBBS R.H., HEAL E. & C.E. DAWSON, 1985. - Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia*, 1985: 802-832.
- WATSON R.E., 1999. - Two new subgenera of *Sicyopus*, with a redescription of *Sicyopus zosterophorum* (Teleostei: Gobioidae: Sicydiinae). *Aqua, J. Ichthyol. Aquat. Biol.*, 3: 93-104.
- WATSON R.E., KEITH P. & G. MARQUET, 2007. - *Akihito vanuatu*, a new genus and new species of freshwater goby from the South Pacific (Gobioidae: Sicydiinae). *Cybium*, 31(3): 341-349.

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