STIPHODON JULIENI, A NEW SPECIES OF FRESHWATER GOBY (TELEOSTEI: GOBIOIDEI: SICYDIINAE) FROM RAPA, FRENCH POLYNESIA.

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ABSTRACT

Stiphodon julieni, new species, is described on the basis of 8 specimens collected from a high gradient stream on Rapa in French Polynesia. *Stiphodon julieni*, new species, is the largest species of *Stiphodon* known to occur in French Polynesia and is distinguished from all other congeners in French Polynesia by the following combination of characteristics: predorsal midline with 10-14 cycloid scales; lateral scales 31-36 reaching upper pectoral base; transverse series back (TRB) 8-9; transverse series forward (TRF) 9-12; upper jaw teeth 33-38.

STIPHODON JULIENI, UNE ESPÈCE NOUVELLE DE GOBIE DULÇAQUICOLE DE RAPA, POLYNÉSIE FRANÇAISE (TELEOSTEI : GOBIOIDEI : SICYDIINAE).

RÉSUMÉ

Stiphodon julieni, espèce nouvelle, est décrite à partir de 8 spécimens collectés dans une rivière de Rapa en Polynésie française. *Stiphodon julieni*, la plus grande espèce de *Stiphodon* connu de cette région, se distingue des autres espèces du même genre de Polynésie française par les caractéristiques suivantes : ligne médiane prédorsale à écailles cycloïdes avec 10 à 14 écailles ; 31 à 36 écailles le long de la ligne latérale ; 8 à 9 écailles en série transverse postérieure ; 9 à 12 écailles en série transverse antérieure ; 33 à 38 dents sur la mâchoire supérieure.

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INTRODUCTION

French Polynesia covers a vast area of the Central Pacific located near the eastern limits of the Indo-West Pacific Faunal Province. It consists of 118 islands from high volcanic islands to low coral islands and atolls. These various islands represent an emerged area of 3,629 km^2 scattered over an oceanic area of 2,500,000 km^2. The islands of French Polynesia are a part of five archipelagos (Austral Islands, also known as Tubuai Islands; Gambier Islands; Marquesas Islands; Society Islands; Tuamotu Archipelago) dispersed along a more or less northwest-southeast axis.

The importance of hydrographic networks on French Polynesia islands increases with their altitude and size. At one extreme there exist atolls with their highest elevation being only slightly above sea level with no trace of running fresh water, on the other hand the island of Tahiti has the greatest number of streams and the largest water sheds.

Thirty-seven species of freshwater fishes are known to occur in French Polynesian streams. Freshwater gobies are present in all four high island archipelagos and represented by 12 species considered to be French Polynesian endemics: four have been found only in the Austral Islands (*Stiphodon discotorquatus*, *Stiphodon julieni*, new species (Rapa), *Stenogobius randalli*, *Sicyopterus rapa*), at least eight species are known only from the Marquesas Islands (*Lentipes rubrofasciatus*, *Sicyopus bitaeniatus*, *Sicyopterus marquesensis*, *Stiphodon tuivi*, *Stenogobius marqueti*, *S. caudimaculosus*, *S.* cf. *caudimaculosus*, *S. squamosus*) (KEITH *et al*., 2002).

WATSON (1995) reviewed the *Stiphodon* of French Polynesia but no mention was made of any species occurring on the island of Rapa nor was there any mention in PARENTI and MACIOLEK (1996). With discovery of a new species of *Stiphodon* on the island of Rapa, the purpose of this paper is to provide a description of *Stiphodon julieni*, new species, a new freshwater goby known only from Rapa (Austral Islands), French Polynesia.

METHODS

Methods follow WATSON (1995). All counts and measurements were taken from the right side with a dial calliper to the nearest tenth of a millimetre, these include: SL measured from central hypural base to tip of snout; predorsal length, distance from anterior base of the first dorsal fin to tip of snout; preanal length, distance from origin of anal fin to tip of snout; head length, distance from posterior margin of gill cover to tip of snout; jaw length, distance from anterior tip of jaw at symphysis to posterior margin of upper jaw; caudal peduncle length, distance from posterior base of second dorsal fin to central hypural base; caudal peduncle depth, vertical distance at narrowest region of caudal peduncle; body depth at second dorsal origin, vertical distance from origin of second dorsal fin to belly between anus and anal fin, only calculated in males as females may vary considerably from gravid to non gravid condition; second dorsal fin length, distance from anterior origin of fin to tip of posterior most ray when depressed; caudal fin length, distance from central hypural base to tip of longest ray.

Counts of teeth in both upper and lower jaws taken from right side of symphysis; teeth in lower jaw always refer to symphyseal teeth, labial teeth are not counted.

Abbreviations used in the descriptive account follow WATSON (1995): A, anal fin; C, caudal fin, only counts of branched rays reported as rays not branched may be confused with posterior procurrent rays especially in small specimens; D, dorsal fins; D1, first dorsal fin; D2, second dorsal fin; LS, scales in lateral series, counted from upper pectoral base, or anterior most scale along lateral midline, to central hypural base; P, pectoral fin; PD,

predorsal midline, counted from scale directly anterior to first dorsal fin insertion to anterior most scale; TRB, transverse series back, refers to scales counted from first scale anterior to or directly adjacent to second dorsal fin origin (spine) in a diagonal manner, down and back to anal fin base; TRF, transverse series forward, refers to scales counted from first scale anterior to or directly adjacent to second dorsal fin origin (spine) in a diagonal manner down and forward to middle of belly or ventral most scale; ZZ, zigzag series, refers to scales on narrowest region of caudal peduncle counted from uppermost scale to lower most scale in a zigzag (alternating) fashion.

Abbreviations pertaining to cephalic sensory pore system follow AKIHITO (1986). Abbreviations used to designate institutions and collections cited follow LEVITON *et al*. (1985).

Counts and morphometrics summarized in Tables I-III.

Table I
Scale counts in species of *Stiphodon* known to occur in French Polynesia.

Tableau I
Nombre d'écailles chez les espèces de *Stiphodon* connus en Polynésie française.

	Lateral series																
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
S. julieni									1	1	2	2	1	1			
S. discotorquatus						1	-	1	-	1	-	1					
S. elegans							1	1	7	10	18	20	29	13	8	-	4
S. tuivi	1	6	5	3	8	6	9	11	7	6	8	4	7	3	2	1	1

	Transverse series back						
	8	9	10	11	12	13	14
S. julieni	4	4					
S. discotorquatus			4				
S. elegans		6	80	24	1		
S. tuivi			7	43	26	7	1

	Transverse series forward										
	9	10	11	12	13	14	15	16	17	18	19
S. julieni	2	2	3	1							
S. discotorquatus	1	1	-	1	-	-	1				
S. elegans	1	-	4	8	21	50	17	2	1		
S. tuivi				2	8	7	29	20	18	4	1

	Predorsal series															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
S. julieni											2	-	1	3	2	
S. discotorquatus			2	-	-	-	-	-	1	-	1					
S. elegans			2	-	1	-	1	3	7	12	15	23	33	11	2	1
S. tuivi	10	7	7	8	6	6	10	8	10	9	10	3	3	2	1	

Table II

Upper jaw teeth in species of *Stiphodon* known to occur in French Polynesia.

Tableau II

Nombre de dents sur la mâchoire supérieure chez les espèces de *Stiphodon* connus en Polynésie française.

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
S. julieni										1	1	2	2	1	1														
S. discotorquatus					1	-	-	-	2	1																			
S. elegans	3	5	7	7	15	15	26	13	10	6	5	1	1	-	-	-	2												
S. tuivi											2	-	1	6	1	12	7	14	7	11	6	6	7	4	4	2	2	-	1

Table III

Morphometrics in species of *Stiphodon* known to occur in French Polynesia expressed to nearest whole percent of standard length.

Tableau III

Caractéristiques morphométriques chez les espèces de *Stiphodon* connus en Polynésie française, exprimées en pourcentage de la longueur standard (arrondi à l'entier le plus proche).

	Predorsal length													
	28	29	30	31	32	33	34	35	36	37	38	39	40	
S. julieni	1	1	3	2	-	1								
S. discotorquatus				1	-	1	-	-	2					
S. elegans			4	7	14	24	27	21	13	2	-	-	1	
S. tuivi				10	12	16	20	15	11	2				
	Preanal length													
	47	48	49	50	51	52	53	54	55	56	57	58	59	
S. julieni (male)			1	3	-	1								
S. julieni (female)						1	1					1		
S. discotorquatus (male)					1	1								
S. discotorquatus (female)										1	-	1		
S. elegans (male)	2	2	1	5	12	10	11	5	2	1				
S. elegans (female)		1	2	2	1	3	2	7	8	9	11	7	8	1
S. tuivi (male)			3	5	6	12	20	8	6	5				
S. tuivi (female)					1	1	4	2	4	4	4	2	1	

	Head length								Jaw length						
	18	19	20	21	22	23	24	25	5	6	7	8	9	10	11
S. julieni	2	2	1	2	1				1	-	6	1			
S. discotorquatus				3	1					1	1	-	2		
S. elegans	1	2	16	23	34	26	7	4		1	47	37	24	4	1
S. tuivi	1	1	22	35	27	10	2				18	37	23	9	1

	Caudal peduncle length									
	17	18	19	20	21	22	23	24	25	26
S. julieni			2	-	2	3	1			
S. discotorquatus						3	1			
S. elegans	3	1	8	48	30	22	4	5	-	1
S. tuivi	3	6	12	28	22	10	5	-	1	

	Caudal peduncle depth										Body depth at second dorsal origin in males					
	7	8	9	10	11	12					11	12	13	14	15	16
S. julieni			5	3							1	5				
S. discotorquatus			1	3								1	1			
S. elegans	14	6	35	41	15	1						7	19	13	8	2
S. tuivi		4	17	54	13						3	6	20	22	7	4

	Second dorsal fin length, males																			
	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
S. julieni											1	-	1	2	-	-	1		
S. discotorquatus				1	-	-	-	-	1										
S. elegans	2	1	2	-	1	2	-	4	2	4	4	5	8	2	2	2	3	4	2
S. tuivi	1	-	-	-	1	9	8	7	11	13	5	4	5	1					

	Second dorsal fin length, females											
	28	29	30	31	32	33	34	35	36	37	38	39
S. julieni				1	1	-	-	1				
S. discotorquatus	1	1										
S. elegans		2	5	7	7	9	7	13	8	3	-	1
S. tuivi		1	5	4	7	4	1					

	Anal fin length, males																			
	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
S. julieni											1	2	1	1					
S. discotorquatus							2												
S. elegans	1	-	1	1	1	1	1	6	3	2	5	10	6	4	3	1	-	1	1
S. tuivi			4	3	3	8	13	8	13	7	2	3	1						

	Anal fin length, females											
	29	30	31	32	33	34	35	36	37	38	39	40
S. julieni			1	1	-	-	-	1				
S. discotorquatus						1	1					
S. elegans	1	1	1	6	2	7	13	13	7	7	3	1
S. tuivi		2	2	5	2	2	2	4	1	2		

	Caudal fin length													
	17	18	19	20	21	22	23	24	25	26	27	28	29	30
S. julieni (male)					1	1	1	-	2					
S. julieni (female)	3													
S. discotorquatus (male)				1	-	-	-	-	-	-	1			
S. discotorquatus (female)						1	1							
S. elegans (male)				2	2	1	1	5	13	13	7	1	3	3
S. elegans (female)				4	5	7	14	19	10	2				
S. tuivi (male)				1	1	2	19	13	14	10	4	1		
S. tuivi (female)					2	6	8	4	2					

Comparative material

Stiphodon discotorquatus Watson, 1995: MNHN 1994-48 (holotype), male (26.1 mm SL), MNHN 1994-49 (paratypes), 2 females (19.4-21.1 mm), Rurutu, Austral Islands, March 1985, G. Marquet; MNHN 1989-1767 (paratype), male (23.0 mm), Tubuai, Austral Islands, March 1985, G. Marquet.

Stiphodon elegans (Steindachner, 1880): NWM 57858-2 (lectotype), female (28.4 mm SL), NWM 57858-1 (paralectotype), male (28.1 mm), NWM 57858-3 (paralectotype), female (25.2 mm), NWM 57858-4 (paralectotype), female (20.9 mm), Society Islands, 1874; CAS 67521, 5 (29.9-34.5 mm), 2 males, 3 females, American Samoa, Tutuila Island, Papa Stream, 28 Mar. 1978, C. Couret; CAS 67524, male (31.3 mm), American Samoa, Tutuila Island, Leaveave N., 6 Oct. 1971, J.A. Maciolek; CAS 67525, 4 females (21.8-25.3 mm), American Samoa, Tutuila Island, Leafu-Leone, 100 m above falls, 12 Oct. 1971, J.A. Maciolek; CAS 67539, 2 (38.4-40.5 mm) 1 male, 1 female,

American Samoa, Tutuila Island, Fangaolu Stream about 500 m above hospital at 30 m elevation, 5 Oct. 1971, J.A. Maciolek; CAS uncat., female (25.9 mm), American Samoa, Tutuila Island, Leafu-Leone, 7 Oct. 1971, J.A. Maciolek; LACM 35511-1, 14 (19.5-36.4 mm), 5 males, 9 females, Western Samoa, Apia, Fatumia pool in lava rock at Methodist Mission Church, west side island, 8 Jun. 1975, W. Lasky; IRSNB 12.826, 4 (24.4-33.2 mm), 2 males, 2 females, Society Islands, Tahiti, Tiarei-Mahaena district, rivière Faa-Rahi; 21 Aug. 1939, G. A. de Witte; MNHN 1989-1761, 16 (12.5-37.4 mm), 13 females, 3 juveniles; MNHN 1989-1769, 15 males (23.4-36.9 mm): Society Islands : Moorea, 12 Oct. 1984, G. Marquet; MNHN 1989-1762, 33 (17.7-40.3 mm), 28 females, 4 males, 1 juvenile; MNHN 1989-1768, 17 males (22.5-42.2 mm), Tubuai Islands, Rurutu, March 1985, G. Marquet; MNHN 1992-118, 2 males (35.2-36.9 mm), Society Islands, Moorea, rivière Opunohu, Oct. 1984, G. Marquet; USNM 51775 (holotype for *Vailima stevensoni* JORDAN and SEALE, 1906), male (37.7 mm), Western Samoa, Apia, Gasegase River at Vaimosa; USNM 236407, female (28.4 mm), American Samoa, Tutuila Island, Papa Stream (Pala Lagoon) ca. 300 m above mouth, 28 Mar. 1978, C. Couret; USNM 236408, female (31.5 mm), USNM 236409, male (30.9 mm), American Samoa, Tutuila Island, Vapito Stream at Pago Pago ca. 100 m above mouth, 6 Apr. 1978, C. Couret; USNM 236411, male (24.4 mm), American Samoa, Tutuila Island, Vaipito Stream at Pago Pago ca. 1.3 km above mouth, 23 Mar. 1978, C. Couret.

Stiphodon tuivi Watson, 1995: MNHN 1989-1766 (holotype), male (27.6 mm SL), Nuku Hiva, Dec. 1986, G. Marquet; MNHN 1994-50 (paratypes), 31 males (15-32.2 mm), same data as holotype; MNHN 1989-615 (paratypes), 21 (11.9-25.1 mm), 1 male, 18 females, 2 juveniles, Ua Huka, P.O.M.; MNHN 1989-1763, 5 (paratypes) (21.4-27.7 mm), 1 male, 4 females, Ua Pou, Dec. 1986, G. Marquet; MNHN 1989-1765 (paratypes), 11 (12.1-25.6 mm), 9 females, 2 juveniles, Ua Huka, 20 Dec. 1986, G. Marquet; MNHN 1989-1764 (paratypes), 53 (13.9-29.8 mm), 51 males, 2 juveniles, Hiva Oa, Jan. 1987, G. Marquet; MNHN 1994-511 (paratypes), 8 (12.6-28.1 mm), 7 males, 1 juvenile, same data as holotype; SMF 20431 (paratypes), 9 males (22.6-28.5 mm), Marquesas Islands, 1982, O. Zimmerman.

***Stiphodon julieni* n. sp.** (Figures 1-4, Tables I-III)

Material examined

8 specimens from a single coastal stream draining the island of Rapa in French Polynesia totalling 5 males and 3 females with a size range of 43.8-53.4 mm SL, largest male 50 mm, largest female 53.4 mm.

Holotype

MNHN 2002-3, male (49.8 mm SL), Panui River (27°35968 S - 144°21078 W), Rapa, French Polynesia), G. Marquet coll., June 2001.

Paratypes

MNHN 2002-4, male (47.3 mm SL), MNHN 2002-5, male (48.1 mm SL), MNHN 2002-6, male (50 mm SL), MNHN 2002-7, male (47.3 mm SL), MNHN 2002-8, female (53.4 mm SL), MNHN 2002-9, female (47.8 mm SL), MNHN 2000-10, female (43.7 mm SL), same data as holotype.

Diagnosis

Largest species of *Stiphodon* found in French Polynesia. Predorsal midline with 10-14 cycloid scales. Belly always with cycloid scales close to anus. Lateral scales (LS) 31-36 reaching upper pectoral base. Transverse series back (TRB) 8-9. Transverse series forward (TRF) 9-12. Upper jaw with 33-38 tricuspid teeth, modally 35-36. Head and body

ventrally dusky in males, mostly immaculate in females. Pelvic disk dusky in males with dusky blotches medially; in females pelvic disk generally without pigmentation.

Description

D VI-I, 8 (1), VI-I, 9 (7); D1 in males usually slightly higher than D2 with fourth spine elongate, third spine long and filamentous; A I, 10 (6) - I, 11 (2), directly opposite to D2; P 13 (3), 14 (5); C almost always with 13 branched rays, posterior margin rounded; pelvic fins with 5 heavily branched rays and one spine, both fins joined to between fifth rays their entire length to form a strong cup like disk adherent to belly between fifth rays only, between spines a strong well developed fraenum between. LS usually 33-34 (31-36), always complete from hypural base to upper pectoral base, ctenoid from hypural base forward to just posterior to upper pectoral base; scales posterior to hypural base almost always cycloid, seldom with few ctenoid; TRB usually 8-9; TRF usually 10-11 (9-12); PD usually 13-14 (10-14) always cycloid; belly always with cycloid scales close to anus; cheek, opercle, breast and pectoral base naked.

Teeth in upper jaw tricuspid with central cusp slightly longer than lateral cusps, all cusps pointed, usually 35-36 (33-38) in number; lower jaw teeth small and conical in females (0-4), males with fairly large canine like teeth (4-7). Cephalic sensory system pore always A, B, C, D, F, H, K, L, M, and O, with pore D singular and all others paired. Cephalic sensory system is illustrated in Figure 1.

Sexual dimorphism well developed. Urogenital papilla depressed on males, same width distally as basally with two small projections at each side of tip (Figure 2a); females similar (Figure 2b). Males with longer unpaired fins, especially second dorsal and anal fins, as well as filamentous third dorsal spine.

Color in preservation

Sexual dichromatic colour patterns well developed in both sexes.

Males: Background of body white to light brown; ventrally dusky; midlaterally 11 to 13 blackish bars from below first dorsal fin to posterior margin of caudal peduncle; entire body dusky laterally along dorsum, scales edged in black; Background of head light brown, ventrally greyish; snout, cheek and lower opercle greyish; upper lip whitish; lower lip whitish; head ventrally blackish; breast white with scattered blackish pigment. First dorsal fin spines with 4-6 blackish blotches, except third spine with 8-10 blotches, membrane dusky; second dorsal fin spine and rays with 2-4 blackish blotches; caudal fin with whitish spots, distal margin clear; anal fin with spine and rays free of pigment shading to blackish anteriorly adjacent to rays; pelvic disk dusky inside; pectoral fin with 6-9 bars formed by blackish pigmentation most prominent on rays.

Females: Background yellowish to tan; belly without pigment; ventrally caudal peduncle dusky; midlaterally a blackish band breaks up into a row of 8-12 blackish bars, ending as spot at hypural base; dusky brownish band extending from behind eye to upper caudal peduncle, most prominent from eye to below origin of first dorsal fin, band breaks up into a series of faint blotches and bars. Background of head yellowish to tan; ventrally, head usually without pigment including lower opercle, preopercle and lip; blackish brown band extending from snout to central pectoral base; upper lip with whitish margin; upper opercle dusky brown. First dorsal fin with 2-4 blackish spots centred on spines but occurring on membrane; second dorsal fin patterned similarly to first dorsal fin, dusky between second and posterior most rays; caudal fin with blackish blotch on central base, 4-7 bars formed by brownish pigment, most prominent on rays; anal fin with dusky brown rays, between rays and spine; pelvic disk free of pigment; pectoral fin without dusky brown bars.

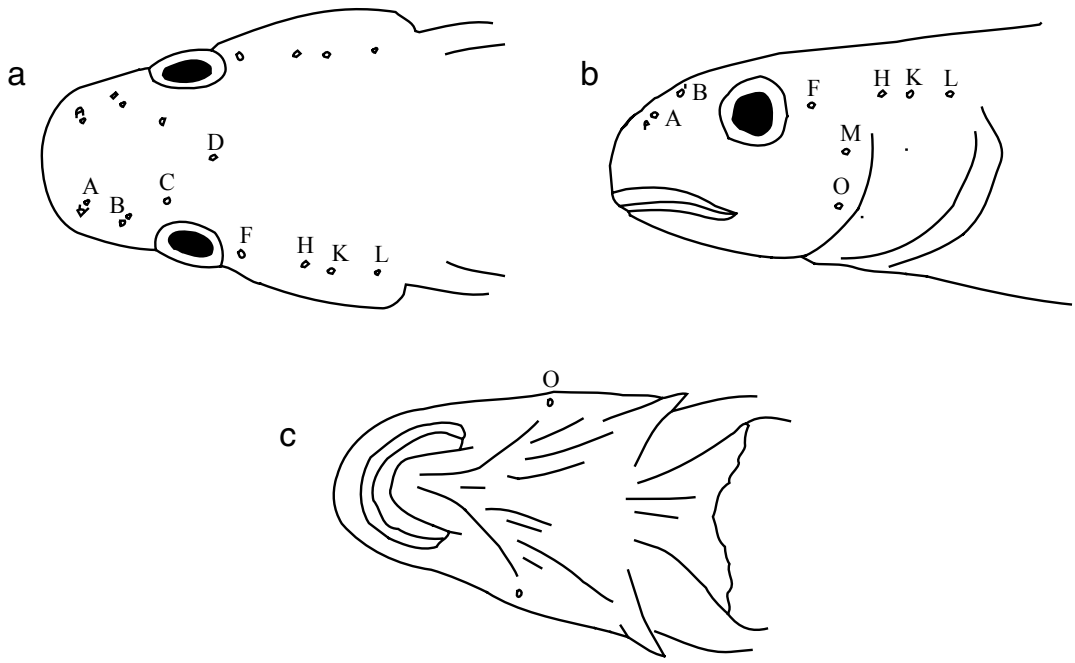

Figure 1
Diagrammatic illustration of head showing cutaneous sensory papillae and cephalic sensory pore system in *Stiphodon julieni*; a: dorsal view; b: lateral view; c: ventral view.

Figure 1
Schéma de la tête montrant les papilles sensorielles et le système de pores céphaliques chez *Stiphodon julieni* ; a : vue dorsale ; b : vue latérale ; c : vue ventrale.

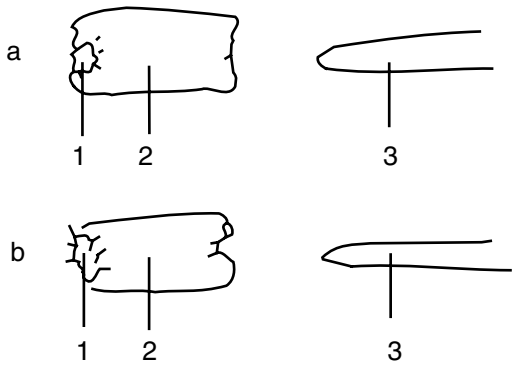

Figure 2
Diagrammatic illustration of urogenital papilla in *Stiphodon julieni*; 1: anus; 2: urogenital papilla; 3: anal fin; a: male; b: female.

Figure 2
Schéma de la papille urogénitale chez *Stiphodon julieni* ; 1 : anus ; 2 : papille ; 3 : nageoire anale ; a : mâle ; b : femelle.

Color in life

Males: Head and body mostly blackish blue, nape with few white speckles; from snout a white band extends posterior to eye becoming two rows of white spots finally becoming a single row of white spots at origin of caudal peduncle terminating at dorsal region of hypurals base; ventral to white band on head a blackish band; head ventrally greenish to aquamarine; body with a black midlateral band becoming 9 or 10 blackish bars separated by white posterior to origin or second dorsal and anal fins; belly greenish to aquamarine. Dorsal fins with spines and rays blackish with bright white bars and spots that may extend onto membrane, membrane mostly reddish, basally membrane blackish, distal margin of second dorsal fin whitish. Caudal fin blackish with blue basally, rays with numerous white spots and streaks, dorsal margin clear. Anal fin greenish, spine and rays black, near distal margin a black band, distal margin white. Pelvic disk blackish, distal margin white. Pectoral fin rays with alternating spots of black and white, membrane clear.

Females: Head and body mostly white; black midlateral band extending from tip of snout to central hypurals base; between pectoral and caudal fins may appear as blackish blotches separated by white; dorsum of head and body olive; body and head ventral to midlateral band white. Dorsal fins with black and white spines and rays, membrane clear, first dorsal fin with membrane pink to red distally. Caudal fin rays black and white, membrane clear. Anal fin, spine and rays black and white, distal margin white. Pelvic disk opaque white. Pectoral fin rays mostly clear with few dusky spots, membrane clear.

Distribution

Known only from Rapa, French Polynesia.

Ecology

Collected in a clear, relatively swift rainforest stream, close to the coast.

Comparisons

Stiphodon julieni appears to be closest to *Stiphodon elegans* and *Stiphodon discotorquatus*. It differs from *Stiphodon elegans* in having more teeth in upper jaw, fewer scales in transerve series back and transerve series forward, and in having greater predorsal and anal length. It differs from *Stiphodon discotorquatus* in having more teeth in upper jaw, fewer scales in transerve series back, more scales in predorsal series and in having greater predorsal and anal length.

Etymology

The new species name honors our two Juliens (Julien Keith and Julien Marquet) in appreciation of their extensive collection effort in freshwaters throughout French Polynesia and in particular in Austral Islands.

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Figure 3
Stiphodon julieni **n. sp., male MNHN 2002-7, Panui River, Rapa, French Polynesia, (photograph by E. Vigneux).**

Figure 3
Stiphodon julieni **n. sp., mâle MNHN 2002-7, rivière Panui, Rapa, Polynésie française, (photo de E. Vigneux).**

Figure 4
Stiphodon julieni **n. sp., female MNHN 2002-8, Panui River, Rapa, French Polynesia (photograph by E. Vigneux).**

Figure 4
Stiphodon julieni **n. sp., femelle MNHN 2002-8, rivière Panui, Rapa, Polynésie française (Photo de E. Vigneux).**