A new species of *Lentipes* (Gobiidae) from the Solomon Islands

by

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Abstract. – A new species of *Lentipes*, a freshwater Sicydiinae goby, is described from streams of Solomon Islands. It differs from other species of the genus by a combination of characters including an urogenital papilla lacking lateral lobes and retractable into a sheath-like groove, the number of pectoral fin rays, the number of scales, the number of tricuspid teeth in the upper jaw, and a specific body colour in male.

Résumé. – Nouvelle espèce de *Lentipes* (Gobiidae) des îles Salomon.

Une espèce nouvelle de *Lentipes,* gobie Sicydiinae d'eau douce, est décrite des îles Salomon. Elle diffère des autres espèces du genre par plusieurs caractères dont une papille urogénitale sans lobes latéraux et rétractable dans une cavité, le nombre de rayons aux nageoires pectorales, le nombre d'écailles, le nombre de dents tricuspides à la mâchoire supérieure et une coloration caractéristique des mâles.

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Key words
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There has been limited collection of freshwater organisms in the Solomon Islands. In the past decade, pioneer surveys for freshwater fish in the Solomon Islands were conducted by Boseto *et al*. (2007), Jenkins and Boseto (2007), Polhemus *et al*. (2008), Boseto and Sirikolo (2010) and Boseto *et al*. (2010). Clearly there is scope for more comprehensive collections. As part of a CEPF (Critical Ecosystem Partnership Fund) project held by the French Ichthyological Society, two field trips were recently organised: the first one on Choiseul Island, during three weeks in October 2014, and the second one on Kolobangara Island during two weeks in November 2015. During these surveys, a new species of *Lentipes* was discovered. The purpose of this paper is to provide a description of that species.

Compared to other sicydiine genera, *Lentipes* has a unique dentition pattern in having tricuspid premaxillary teeth in both males and females, but with generally 0-6 canine teeth at the posterior tip of the premaxilla in males (Keith *et al*., 2014). *Lentipes* also exhibits considerable morphological variation in the shape of the urogenital papilla (Keith *et al*., 2015). A recent study of sicydiine phylogeny based on DNA sequences supports the monophyly of the genus *Lentipes* and it is included in a clade along with two other monophyletic genera, *Akihito* and *Sicyopus* (Taillebois et *al*., 2014). *Lentipes* is distributed in the Pacific Ocean from Indonesia to Papua New Guinea, and from southern Japan to Hawaii and the Marquesas islands (Watson *et al*., 2002; Lynch *et al*., 2013; Keith *et al*., 2014, 2015).

METHODS

Measurements were taken with a dial caliper to the nearest tenth of a millimetre. All counts were taken from the right side. The size is given in standard length (SL). Teeth were counted to the right of the premaxillary symphysis. Abbreviations for institutions and collections cited follow the American Society of Ichthyologists and Herpetologists (http://www.asih.org/sites/default/files/documents/resources/symbolic_codes_for_collections_v5.0_sabajperez_2014.pdf). Abbreviations for the cephalic sensory pore system follow Akihito (1986).

Scale and fin ray counts are reported as: A, anal fin elements (includes flexible spine and segmented rays); D, dorsal fins (D1, first dorsal fin spines; D2, second dorsal fin elements); P, pectoral fin rays; C, caudal fin rays (only branched

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rays are reported); LS, scales in lateral series counted from upper pectora1 fin base, or anteriormost scale along lateral midline, to central hypural base; PD, predorsal midline scales counted from scale directly anterior to first dorsal fin insertion to the anteriormost scale; TRB, transverse series backward, refers to scales counted from the first scale anterior to second dorsal fin origin, in a diagonal manner, posteriorly and ventrally to the anal fin base or ventralmost scale; TRF, transverse series forward, refers to scales counted from the first scale anterior to second dorsal fin origin, in a diagonal manner, anteriorly and ventrally to the centre of abdomen or ventralmost scale; ZZ, zigzag series, refers to scales on the narrowest region of the caudal peduncle counted from the dorsalmost scale to the ventralmost scale in a zigzag (alternating) manner.

Figure 1. - *Lentipes kolobangara*. **A**: Male; **B**: Male; **C**: Female. A, C: photos C. Lord; B: photo P. Keith.

***Lentipes kolobangara* n. sp.**
(Figs 1-3, Tabs I-IV)

Material examined

Eleven specimens from Solomon Islands (6 males, 5 females); size range 22.7-33.3 mm SL (26.7-39.2 mm, total length, TL), largest male 24.8 mm SL, largest female 33.3 mm SL.

Holotype. – MNHN 2015-473, male (24.8 mm SL), Kolobongara Island, Solomon Islands, Poitete River; 14 Nov. 2015, Keith, Lord, Boseto, Marquet *et al*. coll.

Paratypes. – MNHN 2015-474, 5 males (22.7-23.8 mm SL) and 2 females (26.4-30.3 mm SL), same data as holotype. MNHN 2015-475, 3 females (28.2-33.3 mm SL), Kolobongara Island, Solomon Islands, Poitete River; 15 Nov. 2015, Keith, Lord, Boseto, Marquet *et al*. coll.

Comparative material

The new species is compared with *Lentipes* species having no enlarged lobes associated with the urogenital papillae or elongate finger like projections in males, having a urogenital papilla in male that is retractable into a sheath-like groove, and having 17 or more pectoral rays. These species are *Lentipes armatus* Sakai & Nakamura, 1979, *Lentipes mekonggaensis* Keith & Hadiaty, 2014, *Lentipes multiradiatus* Allen, 2001 and *Lentipes venustus* Allen, 2004.

Lentipes armatus Sakai & Nakamura, 1979. – 21 specimens from Ishigaki City, Ishigaki Island, Okinawa Prefecture, Ryukyu Islands, Japan. BLIH 1983379, male (34.2 mm SL); Ara River; 10 Jul. 1983. BLIH 1989134, male (39.0 mm SL), BLIH 1989142, female (37.4 mm SL); Ara River; 26 Aug. 1989. BLIH 1989795, 1 male, 1 female (34.0-36.6 mm SL); Ara River; 17 Oct. 1989. BLIH 1991375, female (42.9 mm SL), BLIH 1991686, 2 females (41.4-46.9 mm SL); Ara River; 2 Jul. 1991. NSMT P.29315, paratype, male (34.9 mm SL); Arakawa River; 3 Sep. 1974. URM P3842, 5 males, 5 females (33.1-45.2 mm SL); Miyara River; 29 May 1982. URM P4533, female (41.9 mm SL); Ara River; 4 Sep. 1982. URM P4872, male (37.9 mm SL); Miyara River; 16 Sep. 1982.

Lentipes mekonggaensis Keith & Hadiaty, 2014. – MZB 21473 (holotype), male (34.4 mm SL), Indonesia, Sulawesi Tenggara province, Kolaka Utara regency, Wawo district, Tinukari village, Sungai Tepasa, ('sungai' is river in Bahasa Indonesia); 30 Jun. 2011, Hadiaty, Wowor & Sopian coll. MZB 21474 (paratypes), 2 males (29.3-30.9 mm SL) and 3 females (43.4-46.3 mm SL), same data as holotype. MNHN 2013-0653 (paratypes), 2 males (29.3-32.0 mm SL), same data as holotype. MNHN 2013-0652 (paratypes), 3 females (37.6-39.0 mm SL), same data as holotype.

Lentipes multiradiatus Allen, 2001. – WAM 32370.003, 1 male, 3 females (30.0-37.0 mm SL); Papua New Guinea, Awaetowa River, D'Entrecasteaux Islands, Fergusson Island,

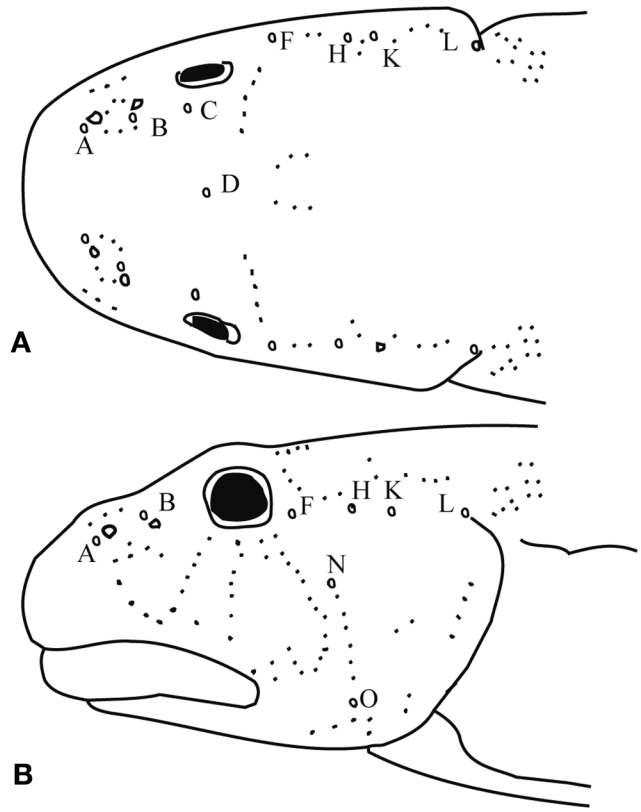

Figure 2. - Diagrammatic illustration of head in *Lentipes kolobangara* (male) showing head pores and sensory papillae. **A**: Dorsal view; **B**: Lateral view.

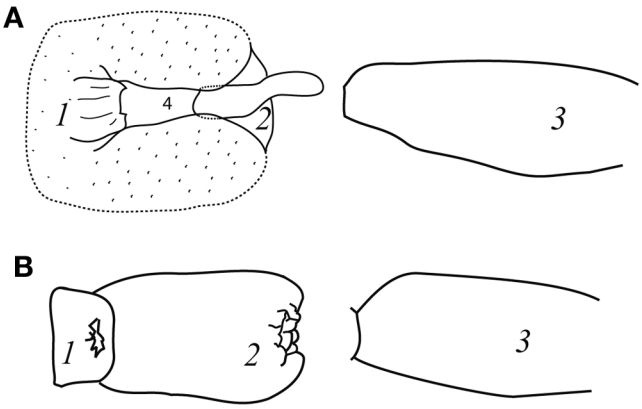

Figure 3. - Diagrammatic illustration of urogenital papilla in *Lentipes kolobangara*. **A**: Male; **B**: Female. 1: anus; 2: urogenital papilla; 3: anal fin; 4: groove.

09°30.907'S 150°52.04'E, 27 Jan. 2003; Allen & Stevenson coll. WAM 32374.002, 5 males, 1 female (25.7-37.5 mm SL); Papua New Guinea, Dibuwa River D'Entrecasteaux Islands, Normanby Island, Yeluyelua Village 10°02.77'S 151°14.883'E, 30 Jan. 2003; Allen coll.

Lentipes venustus Allen, 2004. – WAM 32372.001 (paratypes) 1 male, 1 female (24.0-28.8 mm SL); Papua New Guinea, Apatabuia River, D'Entrecasteaux Islands, Normanby Island Bunama Village, 10°07.067'S 150°09.12'E, 30 Jan. 2003; Allen & Stevenson coll. MNHN, uncatalogued, 4 males, 3 females, Papua, crique Bichain 19 Oct. 2010; Keith *et al*. coll.

Other comparative specimens are those cited in Lynch *et al*. (2013) and Keith *et al*. (2014).

Table I. - Number of pectoral rays for *Lentipes* species.

	15	16	17	18	19	20
L. adelphizonus		1	1	1		
L. argenteus		2	8	1		
L. armatus			1	12	8	
L. caroline		21				
L. concolor	1	21	27	7		
L. crittersius					1	
L. dimetrodon	5	1				
L. ikeae		4	7			
L. kaaea			24	4		
L. kolobangara			2	9		
L. mekonggaensis					5	6
L. mindanaoensis		5	5			
L. multiradiatus			3	20	13	2
L. rubrofasciatus	2	5	1			
L. solomonensis		6	4			
L. venustus			3	5	1	
L. watsoni		3	7			
L. whittenorum			3	5	2	

Diagnosis

The new species has 17-18 pectoral rays, a second dorsal fin I10, an anal fin I9-10, and few scales in zigzag (7-9), transverse forward (1-6) and transverse back series (4-8). The urogenital papilla is retractable into a sheath-like groove in male and is without lobes or other expanded tissue. The male is characterised by few tricuspid teeth in the upper jaw (8-15) and 2-5 recurved canines posterior to tricuspid teeth, ctenoid scales on anterior body region strongly ossified, and the base of the first dorsal fin not reaching the base of the second dorsal fin origin. The male has also a specific body colour with a red slim mustache on the snout reaching the eye and the base of the pectoral fins and the first third of their membrane are red.

Description

The number of pectoral rays in species of *Lentipes* are given in table I, the number of upper jaw teeth in table II, meristic counts in table III, and morphometrics expressed to the nearest whole percent of standard length in table IV.

Below, the holotype counts are given first, followed in brackets, if different, by paratype counts.

First dorsal fin (D1) with six flexible spines, second dorsal fin (D2) with one flexible spine and ten segmented rays

Table II. - Number of upper jaw teeth in studied species of *Lentipes*.

	Triscuspid teeth																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
L. kolobangara males								1	-	-	-	3	-	1	1		
L. kolobangara females																	
L. armatus males																	
L. armatus females																	
L. mekonggaensis males										2	–	–	1	–	1	1	
L. mekonggaensis females																	
L. multiradiatus males								2	2	1	–	–	–	–	–	1	
L. multiradiatus females																	
L. venustus males	1	–	–	1	–	1	–	–	1	–	–	–	–	1			
L. venustus females																	

	Triscuspid teeth (continued)																
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
L. kolobangara males																	
L. kolobangara females				1	1	1	1	-	1								
L. armatus males	2	–	2	3	1	1	–	–	–	1							
L. armatus females											1	–	–	1	1	5	3
L. mekonggaensis males																	
L. mekonggaensis females							2	–	1	1	–	–	1	1			
L. multiradiatus males																	
L. multiradiatus females									2	–	–	–	–	1	1	–	1
L. venustus males																	
L. venustus females							1	2	1								

	Conical teeth							
	0	1	2	3	4	5	6	7
L. kolobangara males			1	1	3	1		
L. kolobangara females	5							
L. mekonggaensis males			1	1	2	–	1	
L. mekonggaensis females	6							
L. armatus males				1	4	2	2	1
L. armatus females	11							
L. multiradiatus males				2	2	2		
L. multiradiatus females	5							
L. venustus males			1	–	1	2	1	
L. venustus females	3	1						

(D VI-I,10). Anal fin with one flexible spine and 9-10 segmented rays (A I,9-10) and directly opposite to second dorsal fin. Base of first dorsal fin not reaching base of second dorsal fin origin in both sexes; the distance between D1 and D2 is nearly equal to the eye diameter in male; spines not filamentous in both sexes. Pelvic fins constitute a strong adhesive disc adherent to abdomen between all five rays. Pectoral fin with 17-18 rays, ventralmost 1st or 2nd ray simple; posterior margin slightly rounded. Caudal fin (C) with 13 branched rays.

Sexual dimorphism well developed. Differences are noted in scale number and arrangement between sexes. Female generally with more scales lightly embedded and mainly cycloid; scales may extend anteriorly along the anteriormost part of the flanks; lateral scales (LS) (28-32); scales in transverse backwards (TRB) series (6-8) and in transverse forward series (TRF) (4-6); zigzag scales (ZZ) (7-9). Males have mainly ctenoid scales, strongly ossified with prominent spines (5-7) on anterior body region from pectoral base to D1, and few cycloid scales on the flanks and the caudal peduncle; lateral scales (LS) 28(23-30); scales in transverse backwards (TRB) series 6(4-6) and in transverse forward series (TRF) 4(1-4); zigzag scales (ZZ) 8(7-8). Head, breast, nape and belly without scales in both sexes. Upper lip with a small median cleft. Upper jaw teeth distinctly tricuspid anteriorly, males 8(8-15), females (21-26). Premaxilla in males with 5(2-5) recurved canines posterior to tricuspid teeth; females without teeth posterior to tricuspid teeth. Teeth in lower jaw recurved and canine in males 6(3-6); no teeth in females. Cephalic sensory pore system A, B, C, D, F, H, K, L, N and O; pore D singular with all others paired (Fig. 2); oculoscapular canal divided into anterior and posterior canals between pores H and K. Cutaneous sensory papillae present on head.

Urogenital papilla in males slender and pointed distally without associated lobes or expanded tissue (Fig. 3A), urogenital papilla retractable into a sheath-like groove; female urogenital papilla rec-

Table III. - Meristic counts in studied species of *Lentipes*.

	Lateral scales																							
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
L. kolobangara						1	1	-	2	-	2	1	2	1	1										
L. mekonggaensis											2	–	2	1	4	2									
L. armatus									2	2	4	2	5	3	1	1	1								
L. multiradiatus																1	–	1	1	1	2	2	1	1	1
L. venustus	1	–	–	–	1	–	1	–	2	1	–	–	–	1	–	1									

	Zigzag scales						
	7	8	9	10	11	12	13
L. kolobangara	3	7	1				
L. mekonggaensis			3	5	2	1	
L. armatus			5	9	4	2	1
L. multiradiatus			2	4	3	2	
L. venustus		1	4	3	1		

	Scales in transverse backwards														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L. kolobangara			3	2	3	1	2								
L. mekonggaensis										4	5	2			
L. armatus										2	2	5	7	4	1
L. multiradiatus											3	4	–	2	
L. venustus	2	–	–	–	1	2	–	1	2						

	Scales in transverse forwards																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
L. kolobangara		1	3	1	2	2	2											
L. mekonggaensis								1	2	1	3	2	1					
L. multiradiatus								1	2	2	5							
L. venustus	2	–	2	2	–	–	2	1										

tangular in appearance (Fig. 3B) and not retractable into a sheath-like groove.

Colour in preservation

Males. – Body greyish; slightly dusky and with three vertical black stripes between second dorsal and anal fins. First dorsal fin appears greyish. Second dorsal fin with a black spot medially; membrane between spine and ray 1 mostly without pigment. The area between the second dorsal and the anal fin is reddish. Caudal fin with greyish rays; membrane mostly without pigment. Anal fin base clear. Pelvic disc dusky whitish. First third of pectoral fin and pectoral fin base slightly reddish to dusky.

Females. – Mostly grey. Head dusky on upper part; body darkest midlaterally on caudal peduncle; sometimes a yellow band along lateral midline. Opercle with a blackish patch. A yellow patch is present at the base of the pectoral fins as at the first fourth of these fins and as at the base of the caudal fin. Dorsal rays and spines greyish; membrane without pigment. Caudal fin rays dusky; membrane without pigment. Pelvic disc not pigmented but the anterior part of the frenum is yellowish.

Colour in life (Fig. 1)

Males (Fig. 1A, B). – Background of body greyish on the flanks, brownish on the dorsum. The trunk has generally three blackish vertical bars. The base of the second dorsal fin is red; the upper part is white with a small black dot on the anterior region. A red area is present on the flanks, just below the second dorsal fin and reaching the anal fin. The snout has a red slim mustache reaching the eye. The base of the pectoral fins and the first third of their membrane are red. The pectoral fin rays are goldish. The base of the anal fin is white and the remainder is blue.

Females (Fig. 1C). – Greyish to brownish with yellowish markings appearing similar to that in preservation.

Distribution

Currently known only from the Solomon Islands of Choiseul, Kolobangara, Ranongga and Makira.

Ecology

Lentipes kolobangara was collected in swift, clear, high-gradient streams with a rocky and boulder-strewn bottom between 50 and more than 600 m above sea level. It is

Table IV. - Morphometrics in studied species of *Lentipes* expressed to the nearest whole percent of standard length.

	Predorsal length													
	32	33	34	35	36	37	38	39	40	41	42	43	44	45
L. kolobangara			1	2	2	3	1	2						
L. mekonggaensis			1	1	1	2	3	1	–	2				
L. armatus	1	–	–	–	–	2	3	7	6	2				
L. multiradiatus				1	–	2	1	–	2	2	–	–	2	1
L. venustus				2	1	–	2	1	1	1	–	–	1	

	Preanal length												
	53	54	55	56	57	58	59	60	61	62	63	64	65
L. kolobangara males	2	-	2	-	-	1	1						
L. kolobangara females	1	-	-	-	2	-	-	2					
L. mekonggaensis males									3	1	1		
L. mekonggaensis females									2	–	3	1	
L. armatus males					1	–	4	3	1	2			
L. armatus females							1	–	4	2	3	1	
L. multiradiatus males				1	1	1	–	–	–	1	–	1	1
L. multiradiatus females				1	–	–	–	–	1	1	1	1	
L. venustus males					1	1	2	–	1				
L. venustus females					1	1	–	1	1				

	Head length										**Jaw length**							
	20	21	22	23	24	25	26	27	28	29	8	9	10	11	12	13	14	15
L. kolobangara males	1	1	2	2							1	2	3					
L. kolobangara females	5										4	1						
L. mekonggaensis males						2	1	1	–	1							3	2
L. mekonggaensis females		1	–	2	–	2	1						1	3	1			
L. armatus males					3	6	1									9	1	
L. armatus females			8	3								3	7	1				
L. multiradiatus males				1	–	1	2	2							2	–	1	3
L. multiradiatus females				1	3	1								1	3	1		
L. venustus males					1	1	1	2							2	2	1	
L. venustus females			3	1											2	1	1	

	Caudal peduncle length											**Caudal peduncle depth**				
	10	11	12	13	14	15	16	17	18	19	20	8	9	10	11	12
L. kolobangara males	2	1	3										3	3		
L. kolobangara females		3	1	1									4			
L. mekonggaensis males					1	1	1	2					1	1	3	
L. mekonggaensis fem.			2	1	1	1							2	4		
L. armatus males										6	4		1	3	6	
L. armatus females								1	3	6	1		3	6	1	
L. multiradiatus males					1	1	3	1						3	3	1
L. multiradiatus females					2	3						1	2	1	1	
L. venustus males				1	2	2								1	2	2
L. venustus females				2	2								1	1	2	

presumed to be amphidromous as is the majority of the subfamily (Keith, 2003; McDowall, 2007).

Comparison

Lentipes kolobangara differs from *L. armatus*, *L. venustus* and *L. multiradiatus* in having, in males, the base of the first dorsal fin not reaching the base of the second dorsal fin origin *vs*. reaching the base of the second dorsal fin origin and a specific body colour in male with a red slim mustache on the snout reaching the eye and the base of the

Table IV. - Continued.

	Body depth in males at second dorsal origin							
	11	12	13	14	15	16	17	18
L. kolobangara	2	-	1	2	1			
L. mekonggaensis				2	3			
L. armatus	1	–	1	1	1	2	2	2
L. multiradiatus	2	–	1	3				
L. venustus			1	1	2	–	1	

	Second dorsal fin length														
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
L. kolobangara males	3	-	1	1	1										
L. kolobangara females	1	3	-	1											
L. mekonggaensis males				1	–	1	–	1	–	1	1				
L. mekonggaensis females				5	1										
L. armatus males					1	1	2	3	1	2					
L. armatus females		1	4	4	2										
L. multiradiatus males				1	–	1	1	–	–	2					
L. multiradiatus females						1	1	–	–	3					
L. venustus males					1	1	–	–	–	1	–	–	1	–	1
L. venustus females				2	1	–	1								

	Anal fin length											**Caudal fin length**								
	23	24	25	26	27	28	29	30	31	32	33	18	19	20	21	22	23	24	25	26
L. kolobangara males				4	1	1									2	-	-	3	-	1
L. kolobangara females		1	1	1	1	-	1							1	1	-	1	2		
L. mekonggaensis males					1	1	1	–	1	1							1	2	–	2
L. mekonggaensis females	1	1	–	1	1	2							2	2	–	1	–	1		
L. armatus males					1	2	3	3	–	1		1	–	–	1	3	5			
L. armatus females	1	–	5	3	2									1	6	3	1			
L. multiradiatus males			1	–	3	–	–	1	1						2	–	2	1	1	
L. multiradiatus females			1	1	1	–	1	–	–	1			1	1	1	–	–	1	1	
L. venustus males			2	1	–	–	–	–	–	1	1		1	–	–	–	1	1	–	2
L. venustus females					1	–	2					1	–	–	2	1				

pectoral fins and the first third of their membrane are red. Furthermore, it differs also from *L. armatus* in having fewer tricuspid teeth in the upper jaw in males (8-15 *vs*. 18-27) and female (21-26 *vs*. 28-34), fewer scales in zigzag series (7-9 *vs*. 9-13) and transverse back series (4-8 *vs*. 11-16); from *L. multiradiatus* in having fewer scales in zigzag series (7-9 *vs*. 9-12), transverse back series (4-8 *vs*. 12-15) and transverse forward series (1-6 *vs*. 7-10); from *L. venustus* in having fewer scales in zigzag series (7-9 *vs*. 8-11), smaller head length in males (20-23 *vs*. 24-27%LS) and females (20 *vs*. 22-23%LS) and smaller jaw length in males and females (8-10 *vs*. 12-14%LS). Finally, it differs from *L. mekonggaensis* in having fewer pectoral rays (17-18 *vs*. 19-20), fewer scales in zigzag series (7-9 *vs*. 9-12), transverse back series (4-8 *vs*. 11-13) and transverse forward series (1-6 *vs*. 7-12).

Etymology

The name of the species is dedicated to Kolobangara Island, where most of the specimens were caught. Kolobangara also means, in Kolobangara Island dialect, 'water king' which is suited for this colourful species.

Remarks

Streams of the Solomon Islands are particularly rich in *Lentipes* species, as four species are known from this area including: *L. solomonensis* and *L. kaaea,* both with enlarged lobes associated with the urogenital papillae in male, and *L. multiradiatus* and *Lentipes kolobangara* (Keith *et al*., 2015; this paper), both having a urogenital papilla in male that is retractable into a sheath-like groove and without enlarged lobes. Jenkins *et al*. (2008) provided a picture of this last

species but named it *L. kaaea,* despite the difference in urogenital papillae.

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