

Lentipes solomonensis, a new species of freshwater goby (Teleostei: Gobioidae: Sicydiinae) from the Solomon Islands

Aaron P. Jenkins¹, Gerald R. Allen² and David Boseto³

1) Wetlands International-Oceania, Fiji Office, Faculty of Islands and Oceans, University of the South Pacific, Laucala Campus, Suva, Fiji Islands. E-mail: Jenkins_a@usp.ac.fj

2) Western Australian Museum, Locked Bag 49, Welshpool DC, WA 6986, Australia

3) Institute of Applied Sciences, University of the South Pacific, Laucala Campus, Suva, Fiji Islands

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Abstract

A new species of freshwater gobiid, *Lentipes solomonensis*, is described on the basis of 10 specimens, 18.2-26.9 mm SL, collected from Rendova, Ranongga and Makira Islands, Solomon Islands. The species is distinguished from its closest relatives by a combination of characters that include: dorsal rays VI-I, 9; anal rays I, 9; pectoral rays usually 16; membrane of last spine of first dorsal fin connected to base of second dorsal fin origin in males; upper jaw with 12-16 tricuspid teeth in males; single pair of broad and flattened lobes obscuring most of a pointed urogenital papillae in males and absent in females; female urogenital papillae rectangular and usually retracted into sheath-like groove; male upper lip and snout golden yellow, diffusing posteriorly into golden-yellow flecks along dorsal half of trunk to caudal peduncle; basal two thirds of dorsal and pectoral fins golden-yellow, second dorsal fin with pearl white spot outlining a small dark spot medially at ray one.

Zusammenfassung

Beschrieben wird die neue Art der Süßwassergrundeln *Lentipes solomonensis* auf der Grundlage von 10 Exemplaren mit 18,2 bis 26,9 mm SL, die auf den Salomon-Inseln Rendova, Ranongga und Makira gefangen wurden. Die Art unterscheidet sich von den nahe verwandten Arten durch eine Kombination von Merkmalen, darunter die folgenden: Rückenflossenstrahlen VI-I, 9; Analflossenstrahlen I, 9; Brustflossenstrahlen: gewöhnlich 16; Membran des letzten Stachels der ersten Rückenflosse verbunden mit der Basis der zweiten Rückenflosse bei Männchen; Oberkiefer mit 12 bis 16 tricuspidalen Zähnen bei Männchen; ein einzelnes Paar breiter, flacher Lappen, die bei Männchen den größten Teil der spitzen Urogenitalpapille verdecken und bei Weibchen fehlen; Urogenitalpapille bei Weibchen rechteckig und normalerweise in eine scheidenähnliche Kerbe versenkt; Männchen auf Oberlippe und Schnauze mit goldgelber Farbe; diese geht nach hinten in goldgelbe Flecken über, die sich über die dorsale Hälfte des Rumpfes bis zur Schwanzwurzel erstrecken; goldgelbe Farbe an den basalen zwei Dritteln der Rücken- und der Brustflosse; an der zweiten Rückenflosse perlweiße Flecken, die einen kleinen dunklen Fleck im mittleren Bereich des ersten Flossenstrahls umrahmen.

Résumé

Une nouvelle espèce de gobiidé d'eau douce, *Lentipes solomonensis* est décrite sur base de 10 spécimens, de 18,2 à 26,9 mm de LS, collectés aux îles Rendova, Ranongga et Marika, îles Salomon. Cette espèce se distingue de ses plus proches parentes par une série de caractères qui comprend: les rayons dorsaux VI-I, 9; les rayons de l'anale I, 9; les rayons de la pectorale, habituellement 16, la membrane de la dernière épine de la première dorsale reliée à la base de la naissance de la seconde dorsale pour les mâles; le maxillaire supérieur avec 12-16 dents tricuspides pour les mâles; une seule paire de lobes larges et aplatis couvrant la majeure partie d'une pupille urogénitale pointue pour les mâles et absente pour la femelle, la papille uro-génitale femelle rectangulaire et généralement rétractée dans un sillon en forme de gaine; la lèvre supérieure et le rostre du mâle jaune or, se divisant postérieurement en taches jaune or le long de la moitié dorsale du tronc vers le pédoncule caudal; les deux tiers de la base des nageoires dorsale et pectorale jaune or, la seconde dorsale pourvue d'une tache blanc perle contournant une petite tache noire médialement sur le premier rayon.

Sommario

Una nuova specie di gobide d'acqua dolce, *Lentipes solomonensis*, è descritto sulla base di 10 esemplari di 18.2-26.9 mm SL, raccolti alle isole Rendova, Ranongga e Makira, Isole Salomone. La specie si distingue dalle specie più vicine per una combinazione di caratteri che includono: VI-I, 9 raggi dorsali; I, 9 raggi anali; di norma 16 raggi pettorali; nei maschi la membrana dell'ultima spina della prima pinna dorsale è congiunta alla base dell'origine della seconda pinna dorsale; nei maschi la mascella ha 12-16 denti tricuspidi; nei maschi è presente un paio di larghi e appiattiti lobi oscuranti quasi completamente un'appuntita papilla urogenitale; la papilla urogenitale femminile è rettangolare e generalmente retratta in un solco a forma di guaina; nei maschi il labbro superiore e il muso sono giallo oro e la colorazione sfuma in puntini giallo-oro lungo la metà dorsale del tronco fino al peduncolo caudale; due terzi delle basi delle pinne dorsali e pettorali sono giallo-oro, la seconda dorsale ha una macchia bianco perla che delinea una piccola macchia scura sita in posizione mediale sul primo raggio.

INTRODUCTION

The gobiid genus *Lentipes* Günther, 1861 contains at least 14 freshwater species which are known from the tropical Central and Western Pacific, with the single exception of a West African species (Allen 1997, Allen 2001, Allen 2004, Chen 2004, Gill 1860, Maugé et al. 1992, Mukerji 1935, Risch 1980, Sakai & Nakamura 1979, Watson & Kottelat 1994, Watson & Allen 1999, Watson et al. 2002, Watson & Kottelat 2006). Similar to other members of the subfamily Sicydiinae, they are small, benthic dwellers that use their fused pelvic fins to attach to rocky substrates in rapidly flowing streams. *Lentipes* can be distinguished from other members of the subfamily by a unique dentition pattern with an upper jaw containing small tricuspid teeth in front and conical teeth on the sides and a lower jaw with small horizontal teeth in front only with conical teeth behind (Larson & Murdy 2001). The life history pattern of the genus is amphidromous which involves spawning in freshwater, hatched larvae drifting to the sea and then returning to freshwater as post-larval juveniles where most feeding and growth occurs (Way et al. 1998, Keith 2003). The genus is generally found in clear streams or rivers flowing through hilly terrain within 20-30 km of the ocean.

Recent studies of the freshwater ichthyofauna of Melanesian high islands including New Caledonia, Vanuatu, Papua New Guinea and Fiji (e.g. Keith et al. 2004 a, b, Allen 2004, Jenkins & Boseto 2005) reveal numerous previously undescribed taxa, particularly in the subfamily Sicydiinae. The freshwater ichthyofauna of the Solomon Islands remains poorly documented, although recent surveys by the authors in 2005 and 2006 have revealed a fauna characteristic of western Pacific oceanic islands (Jenkins 2007) and dominated in diversity by amphidromous gobies of the subfamily Sicydiinae. This paper describes a new species of *Lentipes* collected by the second and third author during a freshwater ichthyofaunal survey of Western Province, Solomon Islands in 2005. This is the first record of the genus *Lentipes* from the Solomon Islands, which co-occurs with *Lentipes kaeaa* Watson, Kieth & Marquet, 2002, originally described from New Caledonia and Vanuatu.

MATERIAL AND METHODS

The methods of counting and measuring are as follows: dorsal and anal rays – the last ray of the anal and second dorsal fins is divided at the base

and counted as a single ray; standard length (SL) – measured from the tip of the upper lip to the caudal-fin base; head length – measured from the tip of the upper lip to the upper rear edge of the gill opening; jaw length – measured between middle of upper jaw and its posterior margin; interorbital width – measured between the fleshy margins of the orbits; predorsal distance – measured between the tip of the upper lip and the base of the origin of the first dorsal fin; preanal distance – measured between the tip of the upper lip and the anal fin origin; prepelvic distance – measured between the tip of the upper lip and the origin of the pelvic fin; caudal peduncle depth is the least depth and caudal peduncle length is measured between two vertical lines, one passing through the base of the last anal ray and the other through the caudal fin base; male genital papillae length – measured between base of papillae and papillae tip. Lateral scales are counted in a longitudinal series from the upper pectoral base to the base of the caudal fin. Teeth are counted to the left of the symphysis. The alphabetical abbreviations used for cephalic sensory pores follow Akihito (1986).

Type specimens are deposited at the Western Australian Museum, Perth (WAM), the Australian Museum, Sydney (AMS) and the University of the South Pacific, Suva (USPS).

Lentipes solomonensis n. sp.

(Figs 1a-b; Table I)

Material: Ten specimens from the Solomon Islands totaling six males and four females, size range 26.9-18.2 mm SL, largest male 24.7 mm, largest female 26.9 mm, no gravid specimens.

Holotype: WAM P. 32956-001, male, 24.1 mm SL, Upper Toropi River, Rendova Island, Western Province, Solomon Islands (8°30'30.0"S 157°18'45.4"E), hand net, G. R. Allen and D. Boseto, 21 March 2005.

Paratypes: WAM P. 32957-001, male, 23.7 mm SL, same data as holotype. AMS I 4461-001, male, 24.7 mm SL, Paorae Creek, Ranongga Island, Western Province, Solomon Islands (8°04'59.7"S 156°36'51.1"E), hand net, G. R. Allen and D. Boseto, 14 March 2005. AMS I.4462-001, female, 24.7 mm SL, Tarithau Creek, Makira Island, Western Province, Solomon Islands (10°28'40.3"S 161°55'33.3"E), hand net, G. R. Allen and D. Boseto, 11 March 2005. USP S 5793, male,

23.9 mm SL, female, 23.7 mm SL, Tarithau Creek, Makira Island, Western Province, Solomon Islands (10°28'40.3"S 161°55'33.3"E), hand net, G.R. Allen and D. Boseto, 11 March 2005.

Diagnosis: Second dorsal fin and anal fin 9 soft rays; pectoral rays usually 16; membrane of last ray of first dorsal fin connected to base of second dorsal fin origin in males; anterior portion of upper jaw with 12-16 tricuspid teeth in males, 24-32 in females; 3-5 conical teeth in posterior portion of both jaws in males and females; posterior 2-3 conical teeth enlarged and canine-like in males; single pair of broad and flattened lobes, obscuring most of

urogenital papillae in males and absent in females; female urogenital papillae rectangular and retracted into sheath-like groove; male upper lip and snout golden yellow, diffusing posteriorly into golden yellow flecks along dorsal half of trunk to caudal peduncle; basal two thirds of dorsal and pectoral fins golden yellow, second dorsal fin with pearl white spot outlining small dark spot medially at ray one.

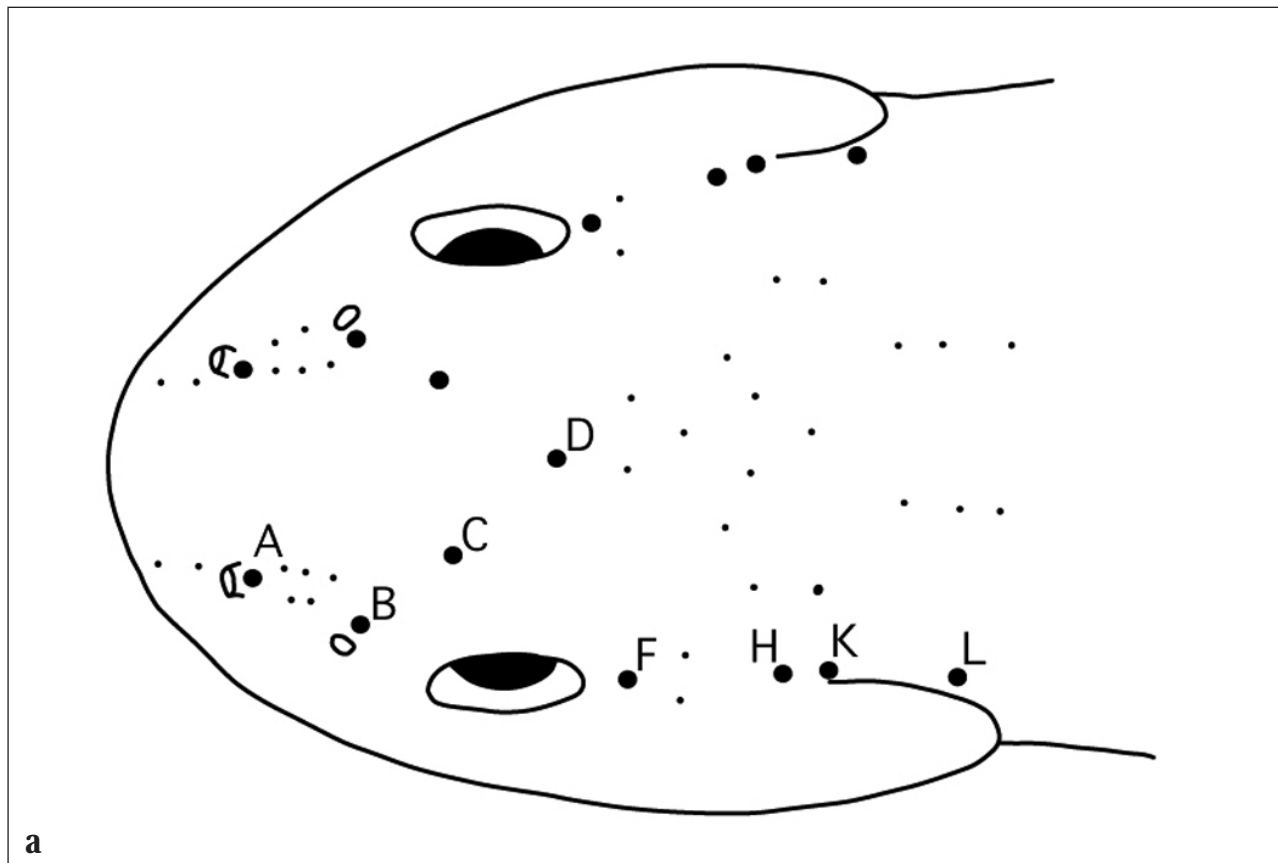
Description: Proportional measurements of selected type specimens are presented in Table I. Dorsal fins VI - I, 9, membrane of last spine of first dorsal fin connected to base of second dorsal fin origin in males and dorsal fins widely separated in



Fig. 1a-b. *Lentipes solomonensis*, Upper Toropi River, Rendova Island, Western Province, Solomon Islands, in-situ photographs of live specimens **a.** WAM P 32956-001, male holotype, 24.1 mm SL; **b.** USPS 5793, female paratype, 23.7 mm SL. Photos by G. Allen.

Table I. Proportional measurements of selected type specimens of *Lentipes solomonensis* expressed as percentage of the standard length.

	Holotype WAM P.32956-001	Paratype WAM P.32957-001	Paratype AMS I.4461-001	Paratype AMS I.4462-001	Paratype USPS 5793	Paratype USPS 5793
Standard length (mm)	male 24.1	male 23.7	male 24.7	female 24.7	male 23.9	female 23.7
Body depth at pelvic fin	15.1	12.2	11.4	12.4	12.1	
Body depth at anal fin-origin	14.4	11.3	11.4	11.4	11.6	13.1
Head length	27.6	25.6	25.3	25.4	24.8	25.5
Snout length	8.8	7.2	8.4	7.3	10.9	8.0
Eye diameter	7.2	5.7	6.7	6.1	5.7	6.1
Fleshy interorbital width	9.4	9.5	6.1	5.1	6.1	5.1
Jaw length	13.0	11.5	9.4	8.5	12.8	8.0
Depth of caudal peduncle	9.9	9.7	8.6	9.7	8.1	8.9
Length of caudal peduncle	23.3	17.3	21.7	23.4	19.4	24.5
Predorsal distance	39.1	35.5	30.1	27.0	37.0	34.5
Preanal distance	62.1	62.6	61.4	60.3	62.0	59.2
Prepelvic distance	24.8	22.6	20.1	25.4	18.5	22.6
2 nd dorsal-fin base	25.6	24.7	17.9	27.1	32.9	18.1
Anal fin base	26.3	22.3	20.9	20.7	19.7	24.9
Pectoral-fin length	21.2	22.1	18.2	19.6	22.5	20.3
Pelvic-fin length	16.6	16.2	15.5	16.6	15.2	16.7
Caudal-fin length	21.2	18.2	22.3	22.5	22.9	22.3
Genital papillae length	3.8	3.1	3.2	na	3.0	na



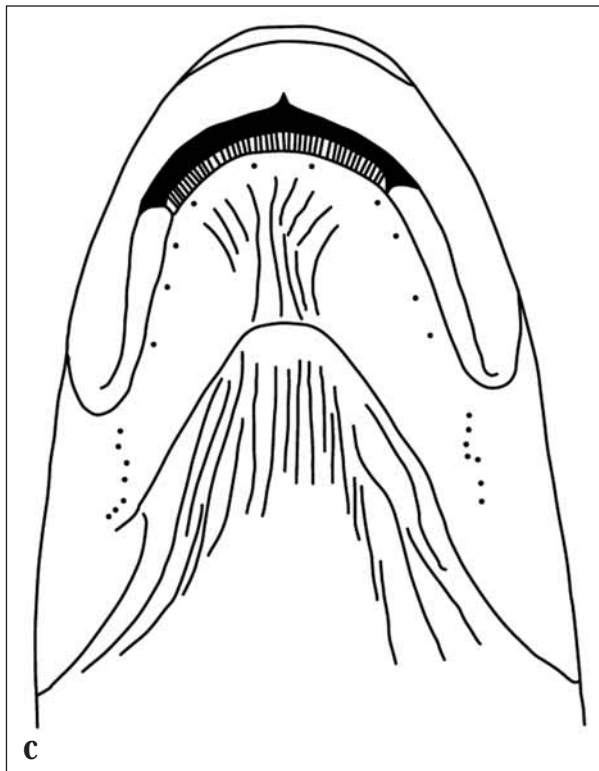
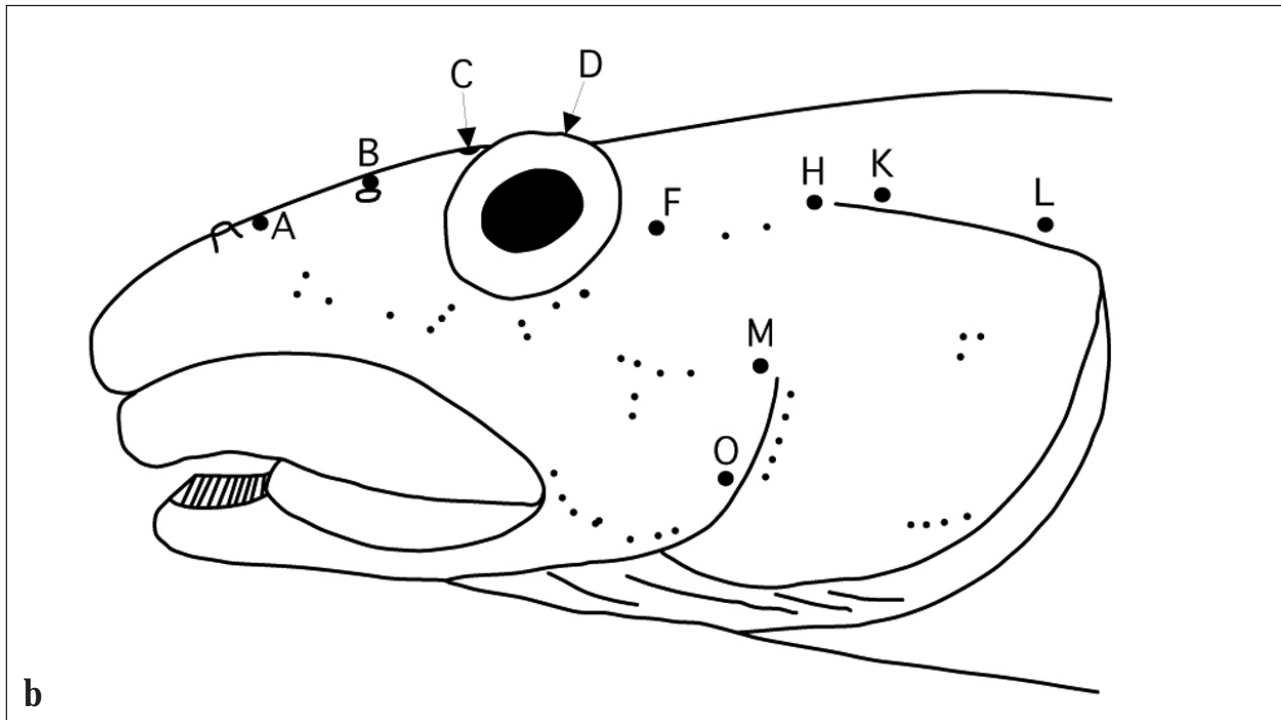


Fig. 2a-c. Diagrammatic illustration of head showing cephalic sensory pore system and cutaneous sensory papillae of *Lentipes solomonensis*; a. dorsal view; b. lateral view; c. ventral view. Alphabetical designations used for sensory pores follow Akihito (1986).

females, spines not filamentous; anal fin I, 9 with anterior origin directly opposite dorsal ray 2; pectoral fins 16 (16 in four paratypes 17 in two paratypes), its posterior margin rounded, lower two rays unbranched; pelvic fins I, 5; pelvic fins joined between fifth rays for their entire length, forming a thick circular disc adherent to the belly; 13 branched and 9-12 unbranched caudal rays, caudal fin with a rounded margin, its length and width about equal when spread out.

Head, breast, nape and belly without scales; scalation sexually dimorphic; lateral scales 8-10 in males, 13-15 in females; cycloid scales thin and partially embedded, only present on caudal peduncle, caudal fin base and along septum to anal fin base; embedded ctenoid scales in males on anterior half of body, strongly ossified, with 3-5 prominent spinules, ctenoid scales observed only rarely on septum in females; circumpeduncular scales 12; gill rakers (2+0+2) rudimentary and without ossification.

Upper lip smooth except for a medial cleft; dentition sexually dimorphic, anterior portion of upper jaw with 12-16 tricuspid teeth in males, 24-32 in females, in males 4-5 conical teeth, first 2 almost straight and posterior 2-3 enlarged, curved and canine-like teeth on each side, females without canine-like teeth in upper jaw; front of lower jaw with horizontal dentary tooth plate and inner row of 8-10 conical teeth in males, posterior 2 enlarged,

Table II. Comparison of pectoral-fin ray counts for *Lentipes solomonensis* and *L. multiradiatus*.

	Pectoral-fin rays					
	15	16	17	18	19	20
<i>L. solomonensis</i>		6	4			
<i>L. multiradiatus</i>			3	20	13	2

curved and canine-like, 0-1 small conical teeth in lower jaw in females, labial teeth correspond to tricuspid teeth in upper jaw; males with lower jaw slightly larger than females (11-13% of HL vs 8-9% HL).

Cephalic sensory pore system A, B, C, D, F, H, K, L, M and O, pore D singular with all others paired, oculoscapular canal divided into anterior and posterior canal between pores H and K (Fig. 2). Cutaneous sensory papillae not well developed on the head, no sensory papillae between pores H and K; males with vertical rows of papillae along flanks, not on caudal peduncle, papillae not apparent on female flanks or caudal peduncle.

Urogenital papilla in males slender and pointed distally, a single pair of broad and flattened lobes obscuring most of urogenital papillae (Fig. 3); female urogenital papillae rectangular in appearance and retracted into a sheath-like groove, urogenital lobes not apparent in females.

Color in preservation: Males: Body beige to tan, lighter on caudal peduncle and belly region; dark mottled pigmentation on snout and diamond shaped dark marking on nape; thin, uneven dark line from snout tip across gill cover to pectoral fin base; three thin vertical bands extend ventrally from septum and continue around belly and urogenital region; a shortened fourth band lies behind the pectoral fin; small spot on dorsal caudal peduncle absent in some specimens; pectoral and caudal fins with lightly speckled rays, first and second dorsal fins grey to blackish, second dorsal fin with a black spot medially at ray 1 and a second small spot medially on ray 2 that is absent in subadult specimens; proximal half of anal fin darkly pigmented, distal half clear; pelvic fins clear; urogenital base, pectoral and caudal fin bases dusky.

Females: Body mostly white, lightly peppered with melanophores on dorsal half; diamond-shaped dark marking on nape; opercle with a blackish triangle patch; midlateral stripe slightly ventral to septum, turning upwards on caudal peduncle and terminating medially at caudal fin base in a small spot, small saddle marking on dorsal caudal peduncle; urogenital region dusky; dorsal, pectoral and caudal fins lightly speckled, anal and pelvic fins without pigmentation.

Color in life: Males (Fig. 1a): upper lip and snout golden yellow, diffusing posterior to eye into

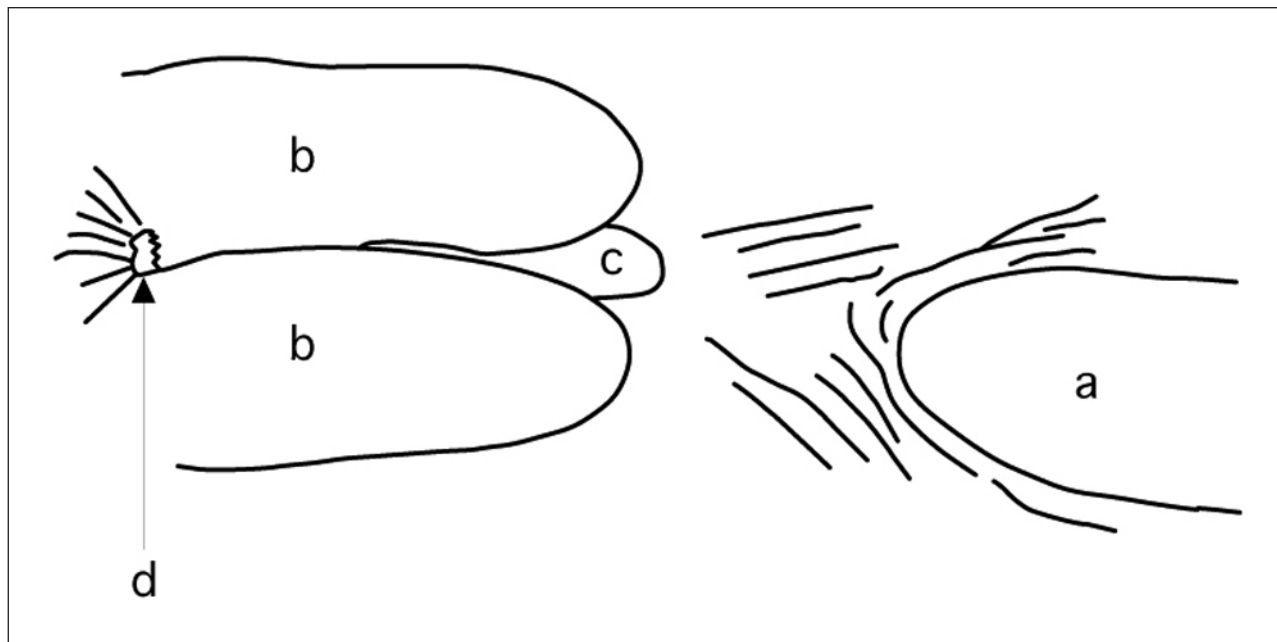


Fig. 3a-d. Ventral view of male urogenital papilla of *Lentipes solomonensis*; a. anal fin; b. urogenital lobes; c. urogenital papilla; d. anus.

golden yellow flecks along dorsal half of trunk to caudal peduncle, becoming tan mid-laterally, basal two thirds of first and second dorsal fins and pectoral fins golden yellow, dorsal third pearl white, second dorsal fin with pearl white spot outlining small dark spot on first two-three rays. Subadult colors and dark pigment markings are muted.

Females: (Fig. 1b) opaque with scattered golden yellow speckling on second dorsal, pectoral and caudal rays.

Affinities: The genus *Lentipes* contains 14 previously described species: *L. concolor* (Gill, 1860) from the Hawaiian Islands, *L. andamanicus* (Mukerji, 1935) from the Andaman Islands, *L. armatus* Sakai & Nakamura, 1979 from Ishigaki Island, Japan, *L. bandama* Risch, 1980 from Western Africa, *L. rubrofasciatus* Maugé, Marquet & Laboute, 1992 from the Marquesas Islands, *L. whittenorum* Watson & Kottelat, 1994 from Bali, Indonesia, *L. watsoni* Allen, 1997 from southern Papua New Guinea, *L. dimetrodon* Watson & Allen, 1999 and *L. crittersius* Watson & Allen, 1999 from Northern Irian Jaya, Indonesia, *L. multiradiatus* Allen, 2001, from northern New Guinea, *L. kaeae* Watson, Kieth & Marquet, 2002 from New Caledonia, Vanuatu and Fiji, *L. venustus* Allen, 2004 from the D'Entrecasteaux Islands, Papua New Guinea, *L. mindanaoensis* Chen, 2004 from southern Philippines and *L. adelphizonatus*

Watson & Kottelat, 2006 from Halmahera, Indonesia. In addition, Eschmeyer's Catalog of Fishes, electronic version (updated April 23, 2008) lists *L. bustamantaei* Boulenger, 1916 from the Gulf of Guinea and *L. candy* Watson & Allen, 1999 from the Caroline Islands. These additional species are not included in our listing of valid species as *L. bustamantaei* is now considered a synonym of *Sicydium bustamantaei* Greef, 1884 (Pezold et al. 2006) and *L. candy* was never described and is therefore considered *nomen nudum*.

Based on the presence of a single pair of male bilobed genital structure and similar frequency distributions in proportional measurements as seen in Table I (compared to Watson et al. 2002, Allen 2004, Chen 2004, Watson & Kottelat 2006), *L. solomonensis* appears most similar to the sympatric *L. kaeae* (Fig. 4). These species differ as follows: in *L. kaeae* the male dorsal fins are widely separated (vs connected by a membrane), second dorsal and anal fin usually 10 (vs usually 9), female genitals do not retract into a sheath-like groove (vs retractable), and distinct color differences in adult males (red snout and red lateral bar vs gold snout and fins; no outline of spot on dorsal fin (vs broad white outline). *L. kaeae* was originally described from the eastern slope region of North Province on New Caledonia and streams in Vanuatu, but is also



Fig. 4. *Lentipes kaeae*, Tarihau Creek, Makira Island, Western Province, Solomon Islands, in-situ photo of live specimen, USPS 5794, male, 28.5 mm SL. Photo by G. Allen.

known on the basis of recent collections from Taveuni Island, Fiji and Makira and Ranongga Islands in the Solomon Islands. This makes this species the most broadly distributed member of the genus within the South Western Pacific (Fig. 5).

Based on male color patterns and dorsal fins being connected by a membrane, *L. solomonensis* is most similar to *L. multiradiatus* (Fig. 6) with bar markings on the nape as well as a small spot on at the beginning of the second dorsal fin with broad white or turquoise outline. However, the gold yellow color on male *L. solomonensis* differs from the grey-brown and mauve of *L. multiradiatus*. Based on a comparison with 38 specimens (including the holotype) of *L. multiradiatus*, the species are further separated by *L. multiradiatus* possessing no bilobed genital structure (*vs* bilobed genital structure), usually 18-19 pectoral rays (*vs* usually 16, see Table II) and males 22-24 tridentic teeth (*vs* males 12-16 tridentic teeth). Females of *L. solomonensis* and *L. multiradiatus* may be separated by pectoral ray counts (usually 16 *vs* usually 18-19), usually possessing conical teeth in the lower jaw (*vs* conical teeth usually absent), urogenital papillae generally retracted into sheath-like groove (*vs* usually extended) and an apparently smaller maximum size (26.9 *vs* 40.2 mm SL). *L. multiradiatus* was origi-

nally described from near Jayapura, Papua Province (Indonesia), but is also known on the basis of recent collections from Yapen Island (also Papua Province) and Milne Bay Province (D'Entrecasteaux Islands and Misima), Papua New Guinea.

Distribution and habitat: This species was collected in clear, rocky streams running through rainforest from 30-230 m elevation in the Solomon Islands on Makira, Ranongga and Rendova Islands.

Etymology: Named for the type locality, combined with the Latin suffix *-ensis*, meaning from or of Solomon Islands.

Key to the South West Pacific species of the genus *Lentipes*

- 1a. Second dorsal fin usually with 10 soft rays....2
- 1b. Second dorsal fin usually with 9 soft rays; male upper lip and snout golden yellow, diffusing into golden-yellow flecks along dorsal half of trunk to caudal peduncle; basal two thirds of dorsal and pectoral fins golden yellow.....*L. solomonensis*
- 2a. Second dorsal with small dark spot medially at first ray in males, females with dark stripe along lower side3
- 2b. Second dorsal without small dark spot medially

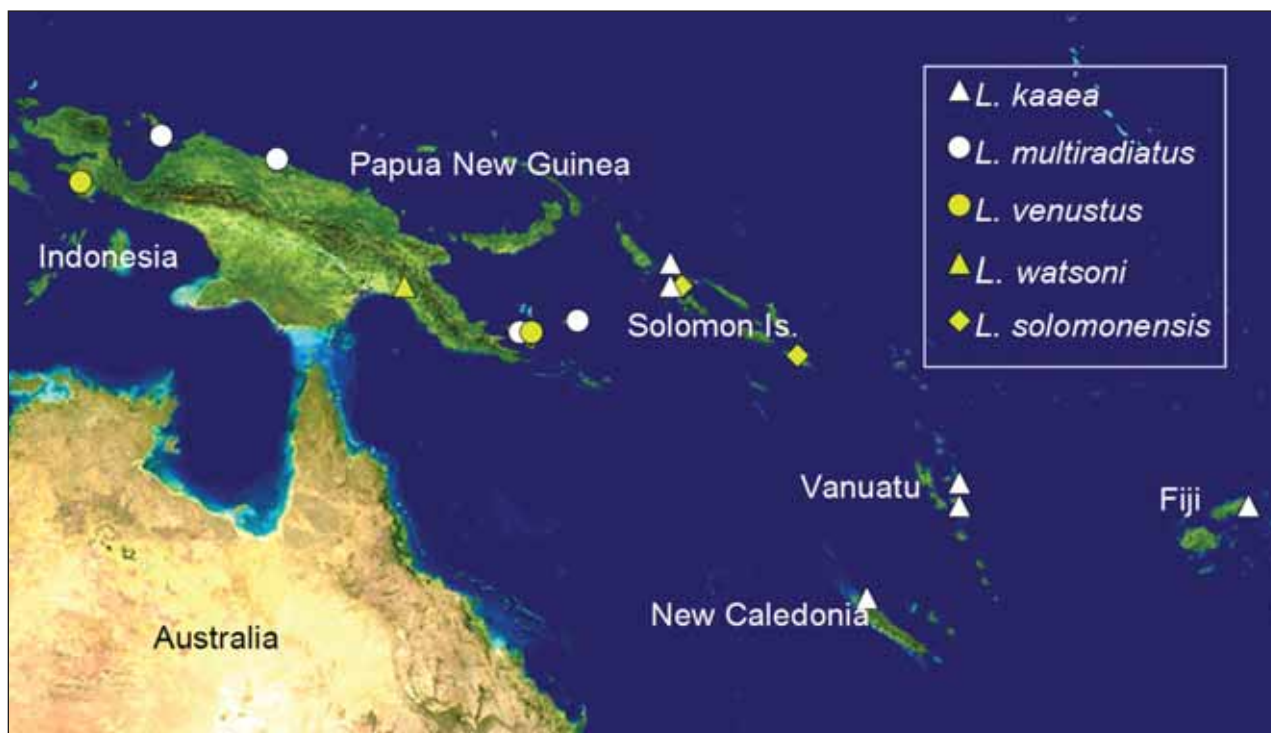


Fig. 5. Satellite map of the southwestern Pacific showing distribution of *Lentipes* species.

- at first ray in males, females with faint or lacking stripe along lower side; male red lower half of head and turquoise blue-green nape
-*L. venustus*
- 3a. Urogenital lobes present in males and females; males with red snout and red mid-lateral bar below second dorsal
-*L. kaaea*
- 3b. Urogenital lobes absent in males and females..
-4
- 4a. First dorsal fin connected basally to second dorsal fin in males; pectoral rays usually 18-19; males grey brown with mauve on side of belly
-*L. multiradiatus*
- 4b. First dorsal fin not connected to second dorsal fin in males; pectoral rays usually 16-17; males green, upper lip, patch below eye and second dorsal fin bright orange
-*L. watsoni*

Comparative material (*Lentipes multiradiatus*): Papua Province, Indonesia – MZB 10902 (holotype), 27.4 mm SL, Danyamo Stream, Cyclops Nature Reserve near Jayapura; WAM P.31793-001, 3 specimens, 27-30 mm SL, Reifafeif River, Yapen Island. Solomon Islands – USPS 5794, 4 specimens, 21.3-22.4 mm SL. Milne Bay Province, Papua New Guinea – WAM P.32355-001, 2 specimens, 33-34 mm SL, Tuabeda River, Goodenough

Island, D'Entrecasteaux Islands; WAM P.32367-001, 4 specimens, 20-23 mm SL, Kenyana Creek, Misima Island; WAM P.32370-003, 13 specimens, 30-40.2 mm SL, Awaetowa River, Fergusson Island, D'Entrecasteaux Islands; WAM P. 32372-002, 4 specimens, 20-22 mm SL, Apatabuia River, Normanby Island, D'Entrecasteaux Islands; WAM P.32374-002, 7 specimens, 24-32 mm SL, Dibuwa River, Normanby Island, D'Entrecasteaux Islands.

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Fig. 6. *Lentipes multiradiatus*, Tuabeda River, Goodenough Island, Papua New Guinea, aquarium photo of live specimen, male, 30.0 mm SL. Photo by Gerald Allen.

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