

A new species of *Sicyopus* (Gobiidae) from Java and Bali

by

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Abstract. – *Sicyopus rubicundus* n. sp., a sicydiine goby, is described from specimens collected in streams of Java and Bali (Indonesia). It differs from other species of this amphidromous genus by a combination of characters including a first dorsal fin with five spines in both sexes, a second dorsal fin with one spine and nine segmented rays, an anal fin with one spine and nine segmented rays, and a distinctive body colour in male.

Résumé. – Une nouvelle espèce de *Sicyopus* (Gobiidae) d'Indonésie.

Sicyopus rubicundus n. sp., un gobie d'eau douce, est décrit de Java et Bali (Indonésie). Il diffère des autres espèces du genre par plusieurs caractères dont une première nageoire dorsale avec cinq rayons épineux chez les deux sexes, une seconde nageoire dorsale avec un rayon épineux et neuf segmentés, une nageoire anale avec un rayon épineux et neuf segmentés, et une coloration caractéristique du mâle.

Key words

Gobiidae
Sicyopus rubicundus
Indonesia
Freshwater
New species

During the past 35 years, numerous sicydiine gobies have been collected and identified from freshwater streams throughout the tropical Indo-Pacific. Nevertheless, many

islands of this region are undersampled (Watson *et al.*, 2007; Keith *et al.*, 2010; Thuesen *et al.*, 2011). Recently, a number of expeditions led by the Research Center for Biology-Indonesian Institute of Sciences (RC Biology-LIPI) into remote areas of Indonesia and related to collaborative work between the Institute for Research and Development (IRD), the RC Biology-LIPI and the National Museum of Natural History of Paris (MNHN), resulted in the discovery of several new species of freshwater Gobiodei (Keith *et al.*, 2011a; Pouyaud *et al.*, 2012; Keith *et al.*, 2012, 2014).

In *Sicyopus*, premaxillary and dentary jaw teeth are conical or caniniform, uniserial, and there are no horizontal teeth on the dentary. *Sicyopus* has widely spaced conical teeth in both jaws, most of them sharply recurved. It is also characterized by a narrow ascending process at the dorsal tip of the premaxilla. The tongue is free from the floor of the mouth. The pelvic disc is adherent to the belly between fifth rays only (Keith and Lord, 2011a).

The distribution of *Sicyopus* genus was recently updated to include the Indian and Pacific oceans following the discovery of *Sicyopus lord* in Madagascar (Keith *et al.*, 2011b).

It ranges from the eastern coast of Madagascar in the Indian Ocean to Fiji in the Pacific. Taillebois *et al.* (2014) showed the monophyly of *Sicyopus* (Keith *et al.*, 2011c) and their results on ancestral area reconstruction suggest that Sicydiinae might have emerged within the Indonesian shelf that may have been a key area in the diversification of some clades.

The purpose of this paper is to describe a new species of *Sicyopus* known from Java and Bali islands in Indonesia.

METHODS

Methods follow Keith and Marquet (2005). Measurements were taken with a dial calliper to the nearest tenth of a millimetre. All counts were taken from the right side. The size is given as standard length (SL). Teeth were counted to the right of the premaxillary symphysis. Abbreviations for institutions and collections cited follow <http://www.asih.org/resources/standard-symbolic-codes-institutional-resource-collections-herpetology-ichthyology>. Abbreviations for the cephalic sensory pore system follow Akihito (1986). BIF is the abbreviation of 'Barcoding of Indonesian Fishes', the collaborative work cited above.

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 ele-

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ments); P, pectoral fin rays; C, caudal fin rays (only branched rays are reported); LS, scales in lateral series counted from upper pectoral 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.

***Sicyopus rubicundus* n. sp.**
(Figs 1-2, Tabs I-IV)

Comparative material

The new species is compared with two *Sicyopus* species having a first dorsal fin with generally five spines, a second dorsal fin with one spine and nine segmented rays and an anal fin with one spine and nine segmented rays. These species are *Sicyopus jonklaasi* (Axelrod, 1972) and *Sicyopus*

discordipinnis Watson, 1995.

Sicyopus jonklaasi. – SMF 20401, 1 female, 31.1 mm SL, paratype; mountain stream in southwestern Sri Lanka, Dec. 1985, Aquarium Dietzenback. SMF 20403, 2 males, 31-35 mm SL, paratypes; mountain stream in southwestern Sri Lanka, Dec. 1985, Aquarium Dietzenback. SMF 20404, 1 female, 32.7 mm SL, paratype; mountain stream in southwestern Sri Lanka, Dec. 1985, Aquarium Dietzenback. SMF 20405, 3 males, 32.7-37.2 mm SL; mountain stream in southwestern Sri Lanka, Dec. 1985, Aquarium Dietzenback. SMF 20411, 2 males, 30.6-32.7 mm SL, paratypes, mountain stream in southwestern Sri Lanka, Dec. 1985, Aquarium Dietzenback. SMF 20413, 2 males, 33-34.3 mm SL; Elpitiya area, Atweltota, SW Sri Lanka.

Sicyopus discordipinnis. – MNHN 2011-0047, 4 males, 31.7-34.4 mm SL; Bichain River, Papua, 19 Oct. 2010, Keith et al. coll. WAM P.27834-004, holotype, male, 25.4 mm SL; Letak Creek, 25 km southeast of Wewak, New Guinea, Papua New Guinea, 17 Oct. 1982, G.R. Allen & D. Coates coll. WAM P.32372-006, 3 males and 4 females, Papua New Guinea, Apatabuia River, above village; 30 Jan. 2003, G. Allen & T. Stevenson coll. WAM P.27834-005, paratypes, 2 females, 26.0-27.6 mm SL; same data as holotype. WAM P.28167-001, 2 males and 4 females, 29.3-34.3 mm SL; about 18 km southwest of Arawa on Panguna Road, Bougainville, Papua New Guinea, 4 Oct. 1983, G.R. Allen & R. Steene coll. NMBA 5075, male, 24.4 mm SL; Namamosa,

Table I. - Meristic counts in studied species of *Sicyopus*.

Lateral scales	30	31	32	33	34	35	36	37	38	39	40	41	42	43
<i>S. rubicundus</i>						1	3	1	1	2	2	2		
<i>S. discordipinnis</i>	1	–	1	2	2	4	3	2	1	1	–	–	2	1
<i>S. jonklaasi</i>			1	1	–	1	2	2	3	1				

Predorsal scales	0	1	2	3	4	Transverse back series	9	10	11	12	13	14	15	16
<i>S. rubicundus</i>	12					<i>S. rubicundus</i>		1	2	1	1	3	2	2
<i>S. discordipinnis</i>	16	1	2	1	1	<i>S. discordipinnis</i>	1	4	9	4	3			
<i>S. jonklaasi</i>	10	–	–	–	1	<i>S. jonklaasi</i>	4	4	1	1	1			

Transverse forward series	7	8	9	10	11	12	13	14	Zigzag scales	6	7	8	9	10	11	12
<i>S. rubicundus</i>			1	3	5	2	1		<i>S. rubicundus</i>					7	4	1
<i>S. discordipinnis</i>		1	1	4	5	3	4	3	<i>S. discordipinnis</i>			18	3			
<i>S. jonklaasi</i>	2	5	2	2					<i>S. jonklaasi</i>	1	5	3	2			

Table II. - Number of upper jaw teeth in studied species of *Sicyopus* (M: male; F: female).

Upper jaw teeth	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<i>S. rubicundus</i> M	2	–	4	1												
<i>S. rubicundus</i> F							1	–	2	–	2					
<i>S. discordipinnis</i> M		1	1	3	1	1	3	–	1							
<i>S. discordipinnis</i> F									1	1	1	2	3	1	–	1
<i>S. jonklaasi</i> M	1	2	2	2	1	1										
<i>S. jonklaasi</i> F							1	1	1							

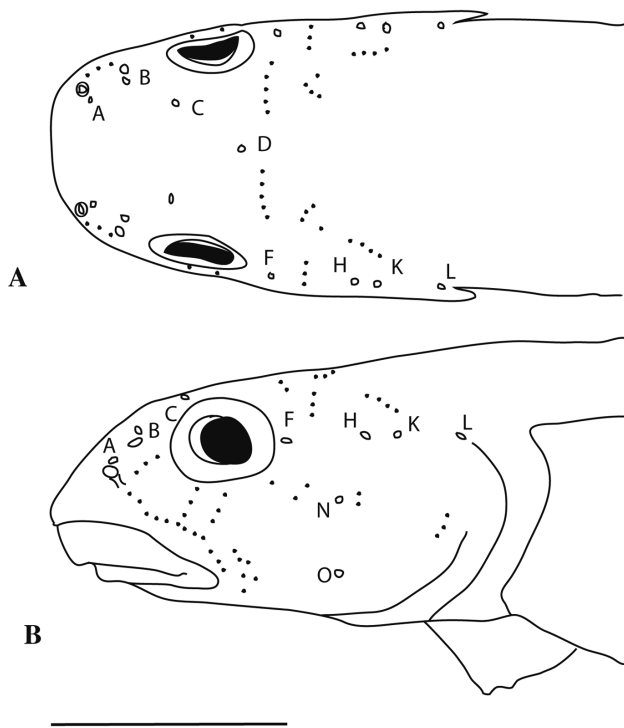


Figure 1. - Diagrammatic illustration of the head in *Sicyopus rubicundus* showing head pores and sensory papillae. **A**: Dorsal view; **B**: Lateral view. Scale bar = 5 mm.

New Hanover, Bismarck Archipelago, Papua New Guinea, Nov. 1931, A. Bühler coll.

Material examined

Twelve specimens from Java and Bali, totalling 7 males and 5 females; size range 39-50 mm SL (45-58.5 mm, total length), largest male 47 mm SL, largest female 50 mm SL.

Holotype. – MZB 22123, male, 47 mm SL, Indonesia, Java, Banten, Kab Pandeglang, Cisihih, 8 Dec. 2013, Hubert *et al.* coll.; BIF 1485.

Paratypes. – MZB 22124, 2 males, 41-44 mm SL and 1 female, 45 mm SL, same data as holotype; BIF 1486, 1488, 1492. MZB 22125, 2 females, 42-44 mm SL, Indonesia, Java, Kab Sukabumi, Cisukawayana, 12 Dec. 2013, Hubert *et al.* coll.; BIF 1748, 1749. MNHN 2014-0133, 1 male, 39 mm SL, and 2 females, 47.5-50 mm SL, same data as holotype; BIF 1487, 1489, 1490. MNHN 2014-0139, 2 males, 39-43 mm SL, Indonesia, Java, Kab Sukabumi, Cisukawayana, 12 Dec. 2013, Hubert *et al.* coll.; BIF 1737, 1738. MNHN 2014-0140, 1 male, 41 mm SL, Indonesia, Bali, Kab Buleleng, waterfall Aling Aling, 261 m asl, 21 Apr. 2014; BIF 2708.

Diagnosis

The new species has a first dorsal fin with five spines in both sexes, a second dorsal fin with one spine and nine

segmented rays and an anal fin with one spine and nine segmented rays. The base of the first dorsal fin does not reach the base of the second dorsal fin origin in both sexes. The new species is also distinguished from congeners by 15 pectoral fin rays, more scales in zigzag series (10-12 vs. 7-9), a greater caudal peduncle depth (10-12 vs. 8-10%SL) and greater fins length.

Description

Scale counts in *Sicyopus rubicundus* n. sp. and related species are given in table I, number of upper jaw teeth in table II, morphometrics in table III and fin lengths in table IV. Below, the holotype counts are given first, followed, in brackets if different, by paratype counts.

First dorsal fin (D1) with five spines in both sexes, second dorsal fin (D2) with one spine and nine segmented rays (D V-I,9). Spines not filamentous in males and females, spines 3-4 longest. Base of first dorsal fin not reaching base of second dorsal fin origin in both sexes; distance between insertion of D1 and origin of D2 is about twice eye diameter. Anal fin with one flexible spine and 9-10 segmented rays (A I,9-10) and directly opposite second dorsal fin. Pectoral fin rays 15. Caudal fin with 13-15 branched rays with posterior margin slightly rounded. Pelvic disc with 1 spine and 5 branched rays.

Scales in lateral series 40 (35-41); scales may extend midlaterally anterior to the origin of first dorsal fin in male and female, and posteriorly to the hypural base. Scales usually ctenoid from hypural base to origin of the first dorsal fin. A few cycloid scales along dorsal and anal fin base. Scales along dorsum usually extending anteriorly along medial base of first dorsal fin. Ctenoid scales on anterior body region strongly ossified, each with 3-5 prominent cteni; ctenoid scales on posterior part of body with more and larger cteni (12-15). Scales in zigzag series 10 (10-12), transverse back series 15 (10-16), transverse forward series 11 (9-13). Predorsal midline naked. Head, breast, pectoral base and belly naked in most specimens. Lips smooth without cleft. The tongue is free from the floor of the mouth. Upper jaw teeth in one row, mostly conical in females with fewer canines and more teeth (12-16) than in males 8(6-9), mostly caniniform (Tab. II). Lower jaw teeth conical in females (range 3-11) and males 4(3-6).

Cephalic sensory pore system A, B, C, D, F, H, K, L, N and O; D single, with all others paired, oculoscapular canal separated into anterior and posterior canals between pores H and K (Fig. 1).

Urogenital papilla in male long and thin with pointed to rounded tip. Urogenital papilla in female rounded. Jaw, dorsal, caudal and anal fins slightly longer in males.

Table III. - Morphometrics in studied species of *Sicyopus* expressed to the nearest whole percent of standard length (M: male; F: female).

Predorsal length	33	34	35	36	37	38	39	Preanal length	53	54	55	56	57	58	59	60	61	62	63
<i>S. rubicundus</i>	1	3	2	2	4			<i>S. rubicundus</i>					2	1	5	1	2	1	
<i>S. discordipinnis</i>		4	6	5	4	1	1	<i>S. discordipinnis</i>			1	2	–	4	5	5	1	1	1
<i>S. jonklaasi</i>	1	2	2	–	5	–	1	<i>S. jonklaasi</i>	1	1	2	1	4	–	2				

Head length	19	20	21	22	23	24	25	26	27	28
<i>S. rubicundus</i>	1	–	4	1	2	1	3			
<i>S. discordipinnis</i>					5	8	6	2	1	1
<i>S. jonklaasi</i>			1	5	1	1	1	1	–	1

Jaw length	8	9	10	11	12	13	14	Caudal peduncle length	15	16	17	18	19	20	21
<i>S. rubicundus</i> M				2	3	1	1	<i>S. rubicundus</i>	1	2	3	4	2		
<i>S. rubicundus</i> F			3	2				<i>S. discordipinnis</i>			1	1	8	6	2
<i>S. discordipinnis</i> M					2	8	1	<i>S. jonklaasi</i>	1	3	3				
<i>S. discordipinnis</i> F			3	7											
<i>S. jonklaasi</i> M				3	5	1									
<i>S. jonklaasi</i> F	1	–	1												

Caudal peduncle depth	8	9	10	11	12	Body depth in males at origin of second dorsal fin	10	11	12	13	14	
<i>S. rubicundus</i>			7	4	1	<i>S. rubicundus</i>				2	4	1
<i>S. discordipinnis</i>			9	11		<i>S. discordipinnis</i>				1	8	2
<i>S. jonklaasi</i>	4	4	3			<i>S. jonklaasi</i>	1	6				

Table IV. - Fin lengths in studied species of *Sicyopus* expressed to the nearest whole percent of standard length (M: male; F: female).

Second dorsal fin length	24	25	26	27	28	29	30	31	32	33	34	35
<i>S. rubicundus</i> M					1	1	–	1	2	1	–	1
<i>S. rubicundus</i> F					2	1	1	–	1			
<i>S. discordipinnis</i> M			1	2	–	3	3	1				
<i>S. discordipinnis</i> F		1	5	3	1							
<i>S. jonklaasi</i> M			1	1	3	3	–	–	1			
<i>S. jonklaasi</i> F	1	–	1									

Anal fin length	23	24	25	26	27	28	29	30	31	32	33	34	35
<i>S. rubicundus</i> M							1	–	3	1	–	1	1
<i>S. rubicundus</i> F				2	1	–	–	1	1				
<i>S. discordipinnis</i> M				1	4	3	2	1					
<i>S. discordipinnis</i> F	1	1	3	4	1								
<i>S. jonklaasi</i> M				3	1	3	1	1					
<i>S. jonklaasi</i> F	1	1											

Caudal fin length	18	19	20	21	22	23	24	25
<i>S. rubicundus</i> M				1	2	3	1	
<i>S. rubicundus</i> F		3	1	–	1			
<i>S. discordipinnis</i> M		2	2	2	2	1		
<i>S. discordipinnis</i> F	1	1	2	3	3			
<i>S. jonklaasi</i> M	1	2	2	–	1	1	1	1
<i>S. jonklaasi</i> F	1	1						

Colour in preservative

Male. – Background of head and body greyish. Snout dusky. Head ventrally greyish. Lateral midline not well-marked. All scales on flanks and caudal peduncle with black margins. Nape greyish. Caudal fin rays greyish. Dorsal and

anal fins greyish to blackish, with a lighter basal part. Pelvic disk, pectoral rays and pectoral fin base greyish.

Female. – Mostly yellowish to whitish. Head and body greyish to whitish, snout dusky. Lateral midline with a diffuse greyish subcutaneous stripe. Inferior part of body yel-

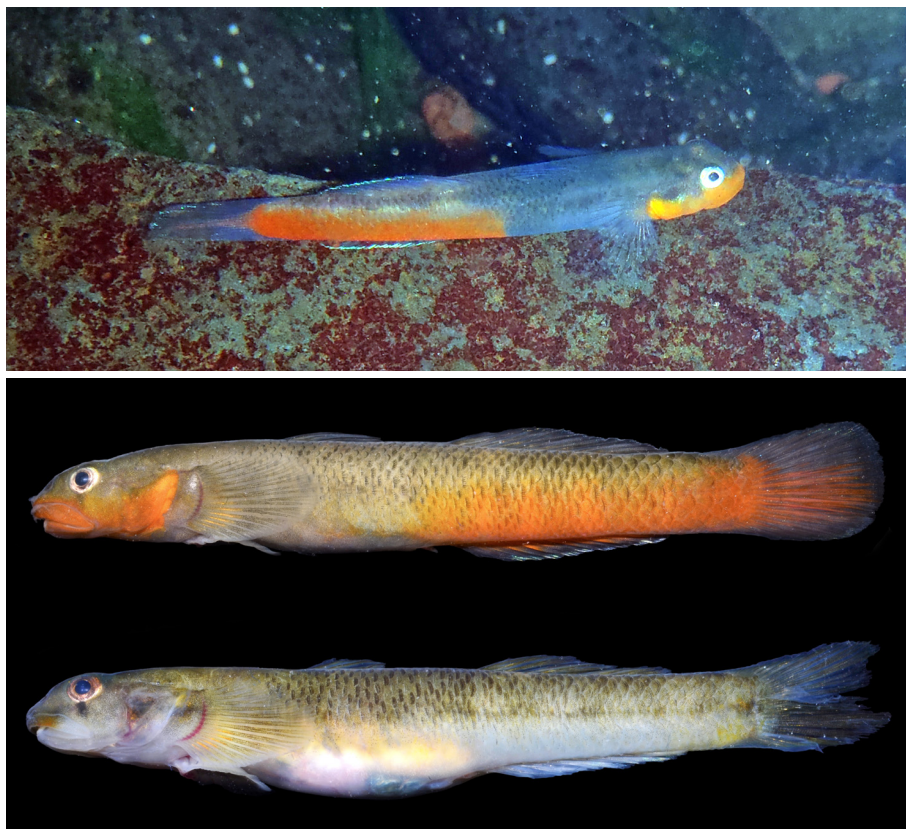


Figure 2. - *Sicyopus rubicundus*. A: Male, Bali, Photo P. Keith; B: Above: male, holotype MZB 22123 (BIF 1485); below: female, paratype MNHN 2014-0133 (BIF 1489), Photo N. Hubert.

lowish. Above midline body greyish. All scales on flanks and caudal peduncle with black margins. Dorsal rays and spines blackish. Caudal fin rays greyish as is the membrane and distal margin. Anal fin whitish to greyish. Pelvic disc not pigmented. Pectoral rays and membrane greyish to whitish.

Colour in life (Fig. 2)

Male. Background of body greyish. Lateral parts of head, lips and snout reddish. Dorsal margin of head greyish. Ventral half of head, opercle and pectoral base reddish. Two indistinct dusky stripes along the upper part of the body. Orange-red colour on the body from about the anal fin origin to the caudal fin. All scales on flanks and caudal peduncle with black margins. Second dorsal and anal fins with a blue-edged black line and an orange base; or translucent. Caudal fin with red centre and two blue-edged black lines, one on upper part and one on lower part; or translucent. First dorsal fin and pectoral fins translucent.

Female. Colour less variable in females than males. Greyish to brownish with dusky markings appearing similar to that in preservation. Upper lip slightly reddish.

Distribution

Currently known from freshwater streams in Java and Bali, Indonesia.

Ecology

Sicyopus rubicundus was collected in small, rapid and boulder-strewn mountain streams with rocky bottoms at altitudes ranging between 100 and 500 m asl. It is assumed to be amphidromous as the other members of the subfamily (Keith, 2003; Keith and Lord 2011b).

Comparison

Sicyopus rubicundus differs from *S. jonklaasi* in having conical and caniniform teeth in female *versus* tricuspid and caniniform teeth, 15 pectoral fin rays *versus* 16-17, more scales in zigzag series (10-12 *versus* 6-9), and a first dorsal fin with five spines in both sexes *versus* generally five to six spines in females and five in males. It differs from *S. discordipinnis* in having more scales in zigzag series (10-12 *versus* 8-9), a greater caudal peduncle depth (10-12 *versus* 9-10% SL), a longer second dorsal fin in female (28-32 *versus* 25-28% LS), a first dorsal fin with five spines in both sexes *versus* generally five to six spines in males and five in females.

Etymology

The new species is named *rubicundus* for ruddy, rubicund, referring to the bright red throat and belly.

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