

Stiphodon annieae, a new species of freshwater goby from Indonesia (Gobiidae)

by

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Abstract. – *Stiphodon annieae*, new species, is described on the basis of material collected from Halmahera (Indonesia). It is distinguished from all other congeners in having a bright blue and red color pattern in males, nine segmented rays in the second dorsal fin, 14 pectoral rays, 34–40 fine tricuspid premaxillary teeth, and a large head.

Résumé. – *Stiphodon annieae*, une espèce nouvelle de gobie d'eau douce d'Indonésie (Gobiidae).

Stiphodon annieae, espèce nouvelle, est décrite à partir de matériel collecté à Halmahera (Indonésie). Elle se distingue des autres espèces du genre par les couleurs brillantes rouge et bleue du mâle, par neuf rayons segmentés à la seconde nageoire dorsale, 14 rayons aux nageoires pectorales, 34 à 40 dents prémaxillaires tricuspidés et une grande tête.

Key words

Gobiidae
Stiphodon annieae
Indonesia
Halmahera
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, 1996; Watson *et al.*, 2007; Keith *et al.*, 2010; Thuesen *et al.*, 2011). Recently, a number of expeditions led by the Indonesian Institute of Sciences (LIPI) into remote areas of Indonesia and in collaboration with the Institute for Research and Development (IRD) and the National Museum of Natural History of Paris (MNHN), resulted in the discovery of further new species (Keith *et al.*, 2011a; Pouyaud *et al.*, 2012; Keith *et al.*, 2012).

Compared to other sicydiine genera, *Stiphodon* are unique among the Sicydiinae in having three anal pterygiophores anterior to the first haemal spine (Birdsong *et al.*, 1988); in all the other genera belonging to the group, there are only two. *Stiphodon* possesses tricuspid premaxillary teeth in both sexes. The ascending process on the premaxilla is narrow at the dorsal tip. The tongue is fused to floor of the mouth. The pelvic disc is adherent to the belly between fifth rays only and there are 13–17 pectoral rays (Keith and Marquet, 2007; Keith and Lord, 2011a; Maeda *et al.*, 2011). Taillebois *et al.* (2014) suggested that *Stiphodon* may be the sister group of all other Sicydiinae species, based on molecular evidence.

Stiphodon currently contains nearly 30 species, and is

distributed from southern Japan, Indonesia and Sri Lanka to New Caledonia and French Polynesia (Keith *et al.*, 2002; Watson *et al.*, 2005; Keith *et al.*, 2007; Keith *et al.*, 2009; Keith *et al.*, 2011b; Maeda and Tan, 2013; Maeda, 2014). The purpose of this paper is to provide a description of a new *Stiphodon* known from Halmahera (Indonesia).

METHODS

Methods follow Keith and Marquet (2007). Measurements were taken with a dial caliper to the nearest tenth of a millimeter. 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 Leviton *et al.* (1985). 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 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

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Figure 1. - *Stiphodon annieae* n. sp., Holotype, MZB 18930, male (21.5 mm SL), Hamahera, Indonesia; Hadiaty *et al.* coll. (Photo R. Hadiaty).

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.

***Stiphodon annieae*, n. sp.**
(Figs 1-2, Tabs I-III)

Comparative material

The new species is compared in text and tables with species having 13-14 pectoral rays, nine segmented rays in the second dorsal fin, and a red color pattern in males (bright red on body sides and part of fins). These are *Stiphodon rubromaculatus* Keith & Marquet, 2007, *S. birdsong* Watson, 1996, *S. surrufus* Watson & Kottelat, 1995 and *S. mele* Keith, Marquet & Pouilly, 2009.

Stiphodon mele Keith, Marquet & Pouilly, 2009. *Holotype*: MNHN 2008-1920, male (27.2 mm SL), Efate, Mele waterfall, 22 Jul. 2002, Vanuatu. Keith and Keith coll. *Paratypes*: MNHN 2008-1921, one male (21.1 mm SL), Gaua, Solomul River, 21 Jul. 2005, Vanuatu. Keith, Marquet and Keith coll. MNHN 2008-1922, two males, one female (21.1-25.3 mm SL), Santo, Patunar's Doline, Vanuatu, 14 Sep. 2006. Pouilly coll. MNHN 2008-1923, one female, (23.8 mm SL), Santo, Patunar resurgence, Vanuatu, 15 Sep. 2006. Pouilly coll. MNHN 2008-1924, one male, New Caledonia, North Province (26.2 mm SL). Keith *et al.* coll.

Material for *S. rubromaculatus*, *S. birdsong* and *S. surrufus*, is that listed in Keith and Marquet (2007).

Material examined

Two males collected from Halmahera (Indonesia) with a size range of 21.5-22.7 mm SL.

Holotype. MZB 18930, male (21.5 mm SL), S. Wosea, DS. Sawai, Weda Tengah, Halmahera, Maluku, Indonesia; 22 Jan. 2010, Hadiaty, Wowor and Sopian coll.

Paratype. MNHN 2014-0132, male (22.7 mm SL), same data as holotype.

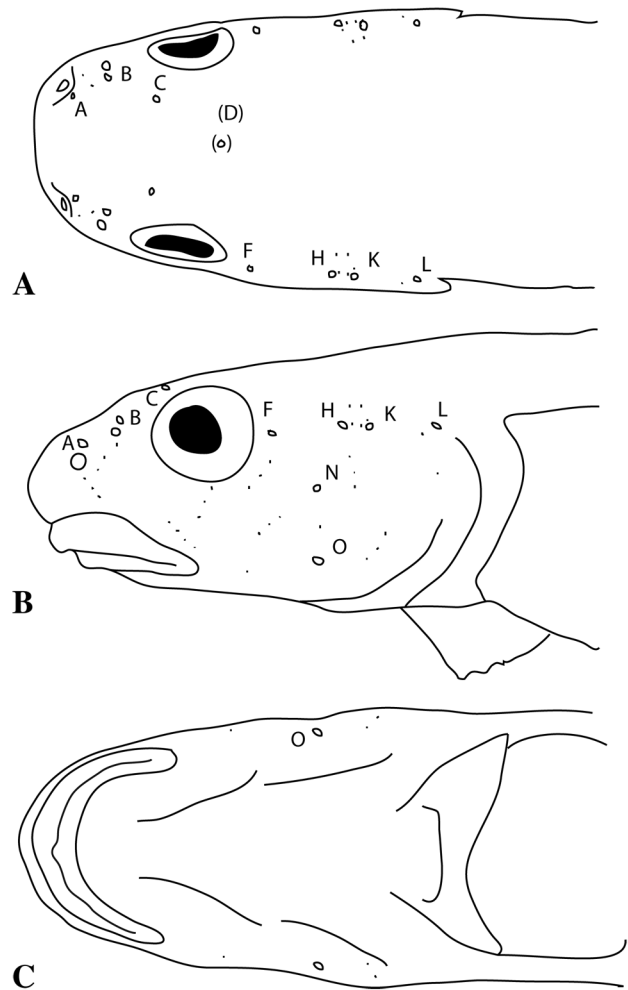


Figure 2. - Diagrammatic illustration of head in *Stiphodon annieae* n. sp. (male) showing head pores and sensory papillae. A: Dorsal view; B: Lateral view; C: Ventral view.

Diagnosis

The new species is a small *Stiphodon* with 14 pectoral rays, nine segmented rays in the second dorsal fin, 34-40 premaxillary teeth. No scales in the head and nape. The head and the jaw are long. The typical colouration of males is bright red, mottled with a blue pattern on the back.

Description

Scale counts in *Stiphodon annieae* n. sp. and related species are given in table II, number of premaxillary teeth in table I, and morphometrics in table III. Below, the holotype

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

Dorsal fins VI-I,9; D1 separate from and higher than D2; spine 3 elongate. Anal fin I,10 and directly opposite to second dorsal fin. Pectoral fin is with 14 rays, uppermost rays extending beyond membrane but not appearing feathery or silky, lowermost 1 or 2 rays simple; fin oblong with posterior margin rounded. Caudal fin with 12-13 branched rays, posterior margin rounded. Pelvic disc always with 1 spine and 5 stout and heavily branched segmented rays. Fifth rays joined together in their entire length forming a strong adhesive

Table I. - Premaxillary teeth in *Stiphodon annieae* n. sp. and related species.

Premaxillary teeth	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
<i>S. annieae</i>										1	-	-	-	-	-	1					
<i>S. mele</i>												1	1	1	1	1	1				
<i>S. rubromaculatus</i>			1	2	2	1	-	1													
<i>S. birdsong</i>				1	-	2	6	8	10	14	8	3	7	2	1	3	-	-	1	-	1
<i>S. surrufus</i>	1	1	1	-	-	-	-	1	-	2	-	1									

Table II. - Scale counts in *Stiphodon annieae* n. sp. and related species.

Lateral scales	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
<i>S. annieae</i>							1	1																	
<i>S. mele</i>			2	-	-	1	1	-	1	2															
<i>S. rubromaculatus</i>					1	1	2	1	-	2															
<i>S. birdsong</i>	1	-	2	6	3	7	5	8	6	5	4	2	4	2	-	2	2	2	-	1	1	1			
<i>S. surrufus</i>											1	-	-	1	1	-	-	-	-	1	1	-	-	-	1

Transverse back	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>S. annieae</i>							2						
<i>S. mele</i>	1	1	3	2	1								
<i>S. rubromaculatus</i>					2	4	1						
<i>S. birdsong</i>						4	3	3	14	16	14	7	1
<i>S. surrufus</i>								2	-	2	2	1	

Transverse forward	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>S. annieae</i>							1	1											
<i>S. mele</i>	3	2	-	-	-	-	1	1											
<i>S. rubromaculatus</i>		2	2	1	2														
<i>S. birdsong</i>	2	-	2	6	2	7	7	13	9	5	4	4	1	1	-	-	-	-	1
<i>S. surrufus</i>	1	-	-	-	1	-	-	-	-	3	-	-	2						

Predorsal (M: male, F: female)	0	1	2	3
<i>S. annieae</i> M	2			
<i>S. mele</i> M	5			
<i>S. mele</i> F	1	1		
<i>S. rubromaculatus</i> M	6			
<i>S. rubromaculatus</i> F	1			
<i>S. birdsong</i> M	32			
<i>S. birdsong</i> F		55		
<i>S. surrufus</i> M	3			
<i>S. surrufus</i> F		2	-	1

Table III. - Morphometric values for *Stiphodon annieae* n. sp. and related species expressed to the nearest whole percent of standard length.

Predorsal length	33	34	35	36	37	38	39	40
<i>S. annieae</i>			1	–	1			
<i>S. mele</i>		2	1	1	1	–	–	1
<i>S. rubromaculatus</i>	1	2	2	2				
<i>S. birdsong</i>	2	7	20	23	13	2		
<i>S. surrufus</i>			2	1	2	1		

Preanal length	48	49	50	51	52	53	54	55	56	57	58	59
<i>S. annieae</i>	1	–	1									
<i>S. mele</i>						1	–	4	1	1		
<i>S. rubromaculatus</i>				1	–	2	–	2	–	2		
<i>S. birdsong</i>			1	–	3	9	6	10	9	11	10	7
<i>S. surrufus</i>					1	2	2	–	1			

Head length	18	19	20	21	22	23	24	25	26
<i>S. annieae</i>								1	1
<i>S. mele</i>	2	1	1	2	1				
<i>S. rubromaculatus</i>			3	4					
<i>S. birdsong</i>		5	25	22	11	5			
<i>S. surrufus</i>				2	–	4			

Jaw length	6	7	8	9	10	11	12
<i>S. annieae</i>					1	–	1
<i>S. mele</i>	1	2	3	1			
<i>S. rubromaculatus</i>	1	–	2	4			
<i>S. birdsong</i>	6	37	23	1			
<i>S. surrufus</i>		1	2	2	1		

Caudal peduncle depth	7	8	9	10	11	12
<i>S. annieae</i>	1	–	1			
<i>S. mele</i>		1	3	3		
<i>S. rubromaculatus</i>	1	1	5			
<i>S. birdsong</i>			3	36	33	2
<i>S. surrufus</i>			1	–	4	1

Caudal peduncle length	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>S. annieae</i>			1	1										
<i>S. mele</i>		2	2	1	–	1	–	1						
<i>S. rubromaculatus</i>				2	2	2	1							
<i>S. birdsong</i>								1	5	12	25	15	10	2
<i>S. surrufus</i>										1	1	–	4	

Body depth at second dorsal origin in males	9	10	11	12	13	14
<i>S. annieae</i>				2		
<i>S. mele</i>		1	3	–	1	
<i>S. rubromaculatus</i>	1	3	2			
<i>S. birdsong</i>			20	11	–	1
<i>S. surrufus</i>			1	–	1	1

Second dorsal fin length (M: male, F: female)	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
<i>S. annieae</i> M					1	–	1									
<i>S. mele</i> M								1	–	1	–	1	2			
<i>S. mele</i> F				1												
<i>S. rubromaculatus</i> M						1	1	–	1	1	1	–	1			
<i>S. rubromaculatus</i> F																
<i>S. birdsong</i> M						1	–	3	5	8	6	4	2	1	–	1
<i>S. birdsong</i> F				2	9	9	9	5	–	1						
<i>S. surrufus</i> M												1	1	1		
<i>S. surrufus</i> F					1	1	–	1								

Table III. Continued.

Anal fin length (M: male, F: female)	27	28	29	30	31	32	33	34	35	36	37	38	39	40
<i>S. annieae</i> M				1	–	1								
<i>S. mele</i> M											2	–	1	1
<i>S. mele</i> F		1	–	–	1									
<i>S. rubromaculatus</i> M									2	2	1	–	–	1
<i>S. rubromaculatus</i> F							1							
<i>S. birdsong</i> M									1	6	8	7	6	4
<i>S. birdsong</i> F	1	–	–	–	1	4	12	12	5	1				
<i>S. surrufus</i> M												1	–	2
<i>S. surrufus</i> F		1	1	–	–	1								

Caudal fin length (M: male, F: female)	17	18	19	20	21	22	23	24	25	26	27
<i>S. annieae</i> M			1	–	–	–	1				
<i>S. mele</i> M			1	–	–	1	2				
<i>S. mele</i> F		2									
<i>S. rubromaculatus</i> M	1	1	–	3	–	1					
<i>S. rubromaculatus</i> F	1										
<i>S. birdsong</i> M				1	3	3	2	2	2		
<i>S. birdsong</i> F				1	1	8	6	1			
<i>S. surrufus</i> M										1	2
<i>S. surrufus</i> F					1	–	2				

disc; disc adherent to belly between fifth rays only; between spines a strong fleshy frenum.

Scales in lateral series 18(19), those on caudal peduncle and the flanks below D2 are ctenoid and they become cycloid below the first dorsal fin in males. Anteriormost scale along midline nearly below posterior part of D1 or anterior part of D2.

Scales in transverse backward series 9. Scales in transverse forward series 6(7). Scales in zigzag series 9. No scales in predorsal midline in male. Head, breast, nape, belly and pectoral base are without scales.

Premaxillary teeth 34–40, fine and tricuspid, tridentiform with central cup longer than lateral cups. Dentary symphyseal teeth in males 1–2, conical to caniniform, stronger and larger than other teeth.

Cephalic sensory pore system A, B, C, D, F, H, K, L, N and O; pore D missing in one specimen, single when present; all others are paired (Fig. 2). Oculoscapular canal separated into anterior and posterior canals between pores H and K. Cutaneous sensory papillae developed over lateral surface of head and body.

Urogenital papilla in males somewhat rectangular with a rounded distal tip.

Colour in preservation

Male. Background of body whitish to yellowish; scales along and above midline and below second dorsal fin yellowish; belly entirely blackish. Background of head, chin and preopercle brownish. Inferior part of head and isthmus

entirely blackish to brownish. Top of head brownish. Pectoral fins hyaline with a black patch at their base. Occipital region with brownish pigment. Preopercle behind eye brownish. First and second dorsal fins whitish; anal and caudal fins whitish; pelvic disk whitish.

Female. Unknown, but male and female of *Stiphodon* usually have different colour patterns (Watson *et al.*, 2005; Keith *et al.*, 2007; Maeda and Tan, 2013; Maeda, 2014).

Colour in life (Fig. 1)

Male. Bright red on body sides. Many blue spotted areas from different sizes on dorsal part of body, from below first dorsal fin to caudal one. Top of head greyish with many red spots. A blue to green line passes below the eye from snout to pectoral fin. Area below this line from chin and isthmus to pectoral and pelvic fin bases is black. Dorsal fins bright red with few black spots on rays. Second dorsal fin with a distal blue line. Caudal fin bright red with a half blue line along margin, and a second one in the uppermost part. Pectoral fins hyaline with a black patch at their base. Belly whitish.

Female. Unknown.

Comparison

Stiphodon annieae n. sp. differs from *S. mele*, *S. rubromaculatus*, *S. birdsong* and *S. surrufus* in having no blackish stripes (aligned spots) on dorsal fins (or just few irregular spots) vs. having well marked regular blackish stripes (aligned spots), a longer head (25–26 vs. 18–23%SL) and jaw length (10–12 vs. 6–10%SL), and a different colour pattern in

male. It differs also from *S. rubromaculatus* in having more premaxillary teeth (34-40 vs. 27-32), and from *S. mele* and *S. surrufus* in having shorter second dorsal (30-32 vs. 33-38/37-39%SL) and anal fins (30-32 vs. 37-40/38-40%SL) in males.

Distribution

Currently known only from Halmahera (Indonesia).

Ecology

Like other Sicydiinae, *Stiphodon anniaeae* n. sp. was found in a clear, high gradient stream with rocky bottom. It lives on the bottom of the river, on top of rocks. It is assumed to be amphidromous (Keith, 2003; Keith and Lord, 2011b).

Etymology

The new species is named for Annie, the first author's wife, in recognition of her patience and unfailing support during all field trips in Pacific Islands.

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