Scientific paper

A new species of *Sicyopus* (Teleostei: Gobiidae) from New Britain (Papua New Guinea)

by

Philippe KEITH* (1), Pita AMICK (3), Pagi S. TOKO (2) & Clara LORD (1)

Abstract. – A new species of *Sicyopus*, a sicydiine goby, is described from specimens collected in streams of New Britain (Papua New Guinea). It differs from other species of this amphidromous genus by a combination of characters including a second dorsal fin with one spine and ten segmented rays, fewer scales in lateral series and transverse back series, and smaller predorsal and caudal peduncle lengths.

Résumé. – Une nouvelle espèce de *Sicyopus* (Teleostei : Gobioidei) de Nouvelle-Bretagne (Papouasie-Nouvelle-Guinée).

Une nouvelle espèce de *Sicyopus,* un gobie d'eau douce, est décrit de Nouvelle-Bretagne (Papouasie-Nouvelle-Guinée). Il diffère des autres espèces de ce genre amphidrome par plusieurs caractères dont une seconde nageoire dorsale avec un rayon épineux et dix segmentés, moins d'écailles à la ligne latérale et en série transverse postérieure, et de plus petites longueurs prédorsale et du pédoncule caudal.

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During the past 35 years, numerous sicydiine gobies have been collected and identified from freshwater streams throughout the tropical Indo-Pacific. Nevertheless, many rivers and islands of this region are undersampled (Thuesen *et al*., 2011; Keith *et al*., 2015; Mennesson *et al*., 2016). Recently, several field trips led by the University of Papua New Guinea, the French National Museum of Natural History (MNHN), the National Museum and Art Gallery of Port Moresby and the French Ichthyological Society (SFI) in remote areas of New Britain (Papua New Guinea), have resulted in the discovery of several new species.

In *Sicyopus*, premaxillary and dentary jaw teeth are widely spaced, conical or caniniform and uniserial, most of them sharply recurved. *Sicyopus* 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, 2011; Keith *et al*., 2015). The number of *Sicyopus* species (7) was recently updated with the discovery of one species in Madagascar (Keith *et al*., 2011) and another one in Indonesia (Keith *et al*., 2014). This genus ranges from the eastern coast of Madagascar in the Indian Ocean to Fiji in the Pacific (Keith *et al*., 2015). Taillebois *et al*. (2014) showed the monophyly of *Sicyopus*.

The purpose of this paper is to describe a new species of *Sicyopus* known from New Britain (Papua New Guinea).

METHODS

Methods follow Keith *et al*. (2014). 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).

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

(1) Muséum national d'Histoire naturelle, Unité Biologie des organismes et écosystèmes aquatiques (BOREA 7208), Sorbonne Université, Université de Caen Normandie, Université des Antilles, CNRS, IRD, CP 026, 57 rue Cuvier, 75231 Paris CEDEX 05, France. [philippe.keith@mnhn.fr] [claralord@mnhn.fr].
(2) New Guinea Binatang Research Centre (BRC), PO Box 604, Madang 511, Madang Province, Papua New Guinea.
(3) Biological Sciences, Division SNPS, University of Papua New Guinea. [amick.peter@gmail.com]
* Corresponding author

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 belly 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; UJ, upper jaw teeth; LJ, lower jaw teeth.

Morphometrics measurements are as follow: PDL, predorsal length (% SL); PAL, preanal length (% SL); HL, head length (% SL); JL, jaw length (% SL); CPL, caudal peduncle length (% SL); CPD, caudal peduncle depth (% SL); BDa, body depth at anus (% SL); BDD1, body depth at first dorsal fin in males (% SL); SDFL, second dorsal fin length (% SL); AFL, anal fin length (% SL); CFL, caudal fin length (% SL).

Sicyopus beremeensis n. sp.

(Fig. 1, Tab. I)

Comparative material

The new species is compared with *Sicyopus multisquamatus* de Beaufort, 1912, the only other species of *Sicyopus* having a first dorsal fin with six spines and a second dorsal fin with one spine and ten segmented rays (D VI-I,10), an anal fin with one spine and ten segmented rays (A I,10), and a pectoral fin with generally 17 rays. *Sicyopus multisquamatus* was redescribed by Watson (1995).

Sicyopus multisquamatus. – ZMA 110.982, holotype, female, 46.2 mm SL; small mountain creek near Honitetu, Ceram, Indonesia, 19 Feb. 1910, de Beaufort.

Material examined

Eleven specimens from New Britain (Papua New Guinea), totalling 8 males and 3 females; size range 39-56.8 mm SL (48.6-68.7 mm, total length), largest male 56.8 mm SL, largest female 50.5 mm SL.

Holotype. – MNHN 2016-0628, male (55.6 mm SL), Wani Creek, New Britain (Papua New Guinea), 03 Dec. 2015, Amick *et al*. coll.

Paratypes. – MNHN 2016-0629, 1 male, 1 female (45-48.6 mm SL). Same data as holotype. MNHN 2018-0717, 1 male (47 mm SL), Elnge Creek, New Britain (Papua New Guinea), 12 Nov. 2015, Amick *et al*. coll. MNHN 2018-0718, 5 males, 2 females (39-57 mm SL), Kumkom Creek, New Britain (Papua New Guinea), 13-17 Nov. 2015, Amick *et al*. coll.

Figure 1. – *Sicyopus beremeensis*. **A**: Male (49 mm); **B**: Female (45 mm) (photograph by P. Amick).

Diagnosis

The new species has a first dorsal fin with six spines in both sexes, a second dorsal fin with one spine and ten segmented rays, an anal fin with one spine and ten segmented rays, 17 pectoral fin rays and preopercular pores M', N and O'. Scales in lateral series 35-42, in predorsal series 0, and 12-15 in transverse back scale series.

Description

Scale counts, number of jaw teeth, morphometrics and fin lengths in *Sicyopus beremeensis* sp. nov. are given in table I. Below, the holotype counts are given first, followed, in brackets if different, by the paratypes' counts.

First dorsal fin (D1) with six spines in both sexes, second dorsal fin (D2) with one spine and ten segmented rays (D VI-I,10). Spines 5-6 longest and slightly filamentous in males, less in females. The base of first dorsal fin is not reaching the base of second dorsal fin origin in both sexes; distance between insertion of D1 and origin of D2 is about twice the eye diameter in female, less than the eye diameter in male. The anal fin has one flexible spine and mostly 10 segmented rays (A I,10) and is directly opposite to second dorsal fin. Pectoral fin rays 16(1)-17(10). Caudal fin with 14 branched rays with a posterior margin slightly rounded. Pelvic disc with 1 spine and 5 branched rays.

Table I. – Counts and morphomeristics of the new species. A, anal fin rays; D, dorsal fins rays; P, pectoral fin rays; C, caudal fin rays; PD, predorsal midline scales; TRB, transverse series backward scales; TRF, transverse series forward scales; ZZ, zigzag series scales; UJ, upper jaw teeth; LJ, lower jaw teeth; SL, standard Length; PDL, predorsal length (% SL); PAL, preanal length (% SL); HL, head length (% SL); JL, jaw length (% SL); CPL, caudal peduncle length (% SL); CPD, caudal peduncle depth (% SL); BDa, body depth at anus (% SL); BDD1, body depth at first dorsal fin in males (% SL); SDFL, second dorsal fin length (% SL); AFL, anal fin length (% SL); CFL, caudal fin length (% SL)).

	Holotype	Paratypes
P	17	16-17
D	VI 10	VI 10
A	I10	I9-10
C	14	14
LS	38	35-42
TRB	13	12-15
TRF	11	11-14
ZZ	11	11-13
UJ	6	7-12
LJ	6	4-6
PDL	32.4	32.7-37.8
PAL	58.3	59.7-64.8
HL	25.5	23.6-28.7
JL	13	11.4-14.5
CPD	10.3	9-11.4
CPL	14	12.8-16.2
BDD1	12.2	12.2-15
BDa	10.8	10.3-14.9
SDFL-male	39.6	34.5-41.4
AFL-male	34.9	29.9-34.1
CFL-male	25.9	19.3-23.2
SDFL-female	–	26.29.8
ALF-female	–	27.6-30.3
CLF-female	–	22.2-22.7

Scales in lateral series 38 (35-42); scales may extend midlaterally slightly 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 dorsum and anal fin base. In males, ctenoid scales on anterior body region ossified, each with 3-6 cteni; ctenoid scales on medium part of body with more cteni (6-10). In females, on anterior body region, scales mostly cycloid, as on the inferior part of the flanks. Ctenoid scales each with 3-6 cteni midlaterally. Scales in zigzag series 11 (11-13), transverse back series 13 (12-15), transverse forward series 11 (11-14). 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 slightly more teeth (8-12) than in males 6 (6-9), mostly caniniform. Lower jaw teeth conical in females (range 5-6) and males 6 (4-6). Labial teeth (10-14) present along the edge of lower jaw mostly enclosed in a fleshy sheath. Jaw, dorsal, caudal and anal fins longer in males.

Cephalic sensory pore system A', B, C, D, F, H', K', L', M', N and O'; D single, with all others paired, oculoscapular canal separated into anterior and posterior canals between pores H' and K'. Cutaneous sensory papillae not well developed and very variable among specimens. Several with papillae between pores M' and N and between pores F and D.

Urogenital papilla in male long and thin with pointed to rounded tip. Urogenital papilla in female rounded to rectangular.

Colour in preservative

Male. – Background cream to tan. Anterior part of head blackish dorsally and ventrally greyish. Body with usually three vertical black bands, including the head; second band below the first dorsal fin (this band is sometimes divided in two black parts slightly paler toward centre) and third band in front of the hypural crease. Lateral midline not well-marked. Nape brownish. 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 to blackish.

Female. – Mostly yellowish. Head and body greyish to whitish, snout dusky. Lateral midline with a diffuse greyish subcutaneous stripe. Inferior part of body whitish. Above midline body greyish. Dorsal rays and spines greyish. 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. 1)

The sexual dichromatism is well developed.

Male (Fig. 1A). – Head black from the snout to the nape, both dorsally and ventrally; lips black. Centre of the eye black, while eye circumference is bright orange. Body with orange and black alternating wide bands (3 black bands including the head and three orange bands). Each band visible dorsally, on the flanks and ventrally, forming large alternating rings around the body. First orange band covers the operculum and stretches to the first third of the pectoral fin. Pelvic sucker orange. Then, black band, twice as wide as the first orange band, stretches along entire base of first dorsal fin to anterior base of anal fin. Second orange band along entire length of anal fin. Third black band stretched from posterior base of anal fin to caudal peduncle. Caudal peduncle and first third of the caudal fin orange, forming the last band. Caudal fin black, slightly translucent, with a bright blue border dorsally. Pectoral fins black. Anal fin bright orange with a black border. Posterior border of scales clearly pigmented, dark orange to black on the black bands and bright orange on the

orange bands. Male colour can vary in brightness according to courtship ritual.

Female (Fig. 1B). – Female colour less variable than in males. Overall body brownish to greyish. Head dark brown from snout to nape. Lips dark brown. Centre of eyes black, while circumference is light brown to orange. Body brownish dorsally and rather grey on the flanks. Belly whitish from pelvic sucker to anterior base of anal fin. Black longitudinal stripe stretching from under the eye to the posterior border of the caudal fin. Pectoral fins beige-yellow and translucent. Caudal fin greyish translucent. Anal fin bright red.

Distribution

Currently known from freshwater streams in New Britain (Papua New Guinea).

Ecology

Sicyopus beremeensis was collected in small, rapid and boulder-strewn mountain streams with rocky bottoms at altitudes ranging between 300 and 900 m asl. It is assumed to be amphidromous as the other members of the subfamily (Keith, 2003).

Comparison

Sicyopus beremeensis (D VI-I,10 A I,10, and P 17) differs from: *Sicyopus auxilimentus* Watson & Kottelat, 1994 (D VI-I,9 A I,9 and P 14-15) from South Japan to Indonesia; *Sicyopus lord* Keith, Marquet & Taillebois, 2011 (D VI-I,9 A I,9 and P 15) from Madagascar; *Sicyopus rubicundus* Keith, Hadiaty, Busson & Hubert, 2014 (D VI-I,9 A I,9 and P 15) from Sunda Islands; *Sicyopus zosterophorus* (Bleeker, 1856) (D VI-I,9 A I,9-10 and P 15-16) widespread in the Pacific; *Sicyopus discordipinnis* Watson, 1995 (D V-I,9 A I,9 and P mostly 15) from Moluccas to Solomon; and *Sicyopus jonklaasi* Klausewitz & Henrich, 1986[1] (D V-I,9 A I,9-10 and P mostly 16) from Sri Lanka. See Keith *et al*. (2014, 2015).

Sicyopus beremeensis differs from *S. multisquamatus* in having fewer scales in lateral series (35-42 *vs*. 47), transverse back series (12-15 *vs*. 16) and predorsal series (0 *vs*. 4), smaller predorsal length (32-38 *vs*. 40 %SL) and caudal peduncle length (13-16 *vs*. 18) and fewer teeth in lower jaw (4-6 *vs*. 10).

[1] Note concerning *Sicyopus jonklaasi*: in the description of *Gobius jonklaasi,* the text and pictures of Axelrod (1972) (pages F300.10 to 13) clearly refers to *Sicyopterus lagocephalus*, which would suggest *Sicyopus jonklaasi* is a different species and should be attributed to Klausewizt and Henrich, 1986 and not to Axelrod (1972). So, *Sicyopus jonklaasi* Klausewizt & Henrich, 1986 was not incorrectly treated as valid by several authors as stated by Fricke *et al*., 2018.

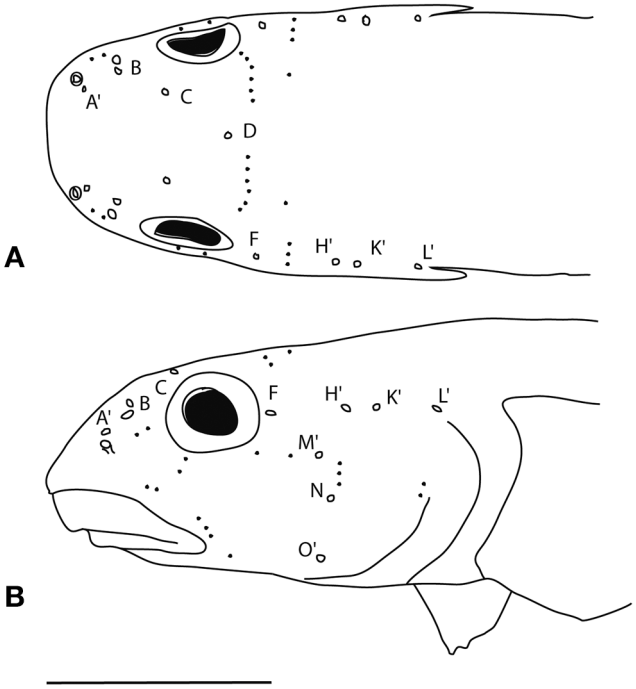

Figure 2. – Diagrammatic illustration of the head in *Sicyopus beremeensis* showing head pores. **A**: Dorsal view; **B**: Lateral view. Scale bars = 5 mm.

Etymology

The new species is named after Bereme village, to thank the local community for its warm welcome during our fieldworks.

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