Revision of Species in *Sicyopterus* (Gobiidae: Sicydiinae) Described by de Beaufort (1912), with a First Record of *Sicyopterus longifilis* from Japan

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Amphidromous gobies of *Sicyopterus* (Gobiidae: Sicydiinae) are distributed in tropical, subtropical, and temperate streams in the Indo-Pacific region. Two species, *Sicyopterus japonicus* (Tanaka, 1909) and *Sicyopterus lagocephalus* (Pallas, 1770), are known from Japan. In the present study, two specimens of an additional species were collected in Okinawa Island, in southern Japan. We compared morphologies of the type series of *Sicyopterus longifilis* de Beaufort, 1912 and *Sicyopterus brevis* de Beaufort, 1912 collected in Indonesia, with the specimens from Okinawa Island to revise the taxonomy of these species and to identify the Okinawan specimens. Syntypes of *S. longifilis* and *S. brevis* share many characters, including a unique mouth morphology. Although fin morphologies, tooth number, and the shape of the urogenital papilla differ between *S. longifilis* and *S. brevis* syntypes, these amount to normal sexual dimorphism of sicydine gobies. De Beaufort collected his specimens at the same locality on the same date. We conclude that the syntypes of *S. longifilis* and *S. brevis* are actually males and females of same species. Therefore, they are subjective synonyms, and we give precedence to the name *S. longifilis* as the first reviser under Article 24.2 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999). The two specimens from Okinawa Island were identified as *S. longifilis* and this is the first record of this species from Japan.

**Key Words:** *Sicyopterus*, Sicydiinae, Okinawa, taxonomy, synonym, first record.

Introduction

Amphidromous gobies of the subfamily Sicydiinae are mainly found in insular streams in the Indo-Pacific and Atlantic oceans, and have a marine pelagic larval phase (Keith and Lord 2011). *Sicyopterus* Gill, 1860 is composed of 27 species that are distributed widely from Comoros, in the western Indian Ocean to Hawaii and French Polynesia, in the central Pacific Ocean (Keith et al. 2015a, b). It contains the particularly widespread species *Sicyopterus lagocephalus* (Pallas, 1770) distributed throughout nearly the entire range of the genus excluding some marginal regions, such as Madagascar, central Japan, Hawaii, Rapa, and the Marquesas Islands (Watson et al. 2000; Keith et al. 2015b). This genus also includes species having a particularly long pelagic larval duration [4–9 months in *Sicyopterus japonicus* (Tanaka, 1909) and *S. lagocephalus*] (Iida et al. 2009). It has been suggested that larvae of *Sicyopterus* have great dispersal ability and that they can be transported even to distant islands (Zink et al. 1996; Iida et al. 2008, 2010; Lord et al. 2012). In *Stiphodon*, another diverse genus in the same subfamily, seven species have so far been recorded in Japan and records of rare species are considered to have arisen from larval transportation from Southeast Asia by ocean currents (Maeda et al. 2012a; Maeda and Saeki 2013; Maeda 2014). While only two species of *Sicyopterus* have been recorded in Japan (*S. japonicus* and *S. lagocephalus*; see Nakabo 2002, 2013), 13 species are known from the Philippines and Indonesia (Keith et al. 2015a, b). Given the dispersal capacity of this genus, it would not be surprising if other *Sicyopterus* species are found in Japan. One of the reasons that only two species have been recorded in Japan is the difficulty of identifying members of this genus, since its taxonomy is not well understood. Most Japanese researchers and fish hobbyists believe that Japanese *Sicyopterus* is composed only of these two species, and this mindset may have discouraged additional investigations.

In 2013, on Okinawa Island in the Ryukyu Archipelago of southern Japan, we collected two specimens of *Sicyopterus* that could not be identified as either *S. japonicus* or *S. lagocephalus*. Mouth structure is one of key characters for distinguishing species in this genus (Herre 1927; Allen 1991). The upper lips of the two Okinawan specimens lack a median cleft, but have a lateral cleft on each side of the lip. This feature is shared among several species, including *Sicyopterus longifilis* de Beaufort, 1912 and *Sicyopterus brevis* de Beaufort, 1912. However, diagnostic characters of these two species were insufficient to identify our Okinawan material. Therefore, in the present study we investigated the type series of *S. longifilis* and *S. brevis* to revise their taxonomy. Here we identify the Okinawan specimens and report them as a newly recorded species from Japan.
Materials and Methods

Measurements and counts were taken from the left sides of the fish. Measurements were made point-to-point to the nearest 0.1 mm using a vernier caliper or a divider under a stereomicroscope, and were expressed as a percentage of standard length (SL). Measurements and counts followed Nakabo (2002), with the following modifications: body depths were measured at the origins of the pelvic and anal fins. First and second dorsal- and anal-fin lengths were measured from the origin of each fin to the farthest point when the fin was adpressed. Caudal-fin length was measured as the length of the central ray of the caudal fin. The interval between the first and second dorsal-fin bases was measured from the posterior end of the first dorsal-fin membrane to the second dorsal-fin origin. The length from the anus to the anal fin was measured from the center of the anus to the anal-fin origin. Scales in longitudinal series were counted from the middle of the posterior end of the hypurals to be-

Fig. 1. Syntypes of *Sicyopterus longifilis* de Beaufort, 1912 (ZMA 112562; A, 74.7 mm SL; B, 38.0 mm SL) and syntypes of *Sicyopterus brevis* de Beaufort, 1912 (ZMA 110981; C, 35.7 mm SL; D, 35.6 mm SL) (photo by K. Maeda).
hind the pectoral-fin base. Scales in transverse series were counted along a diagonal line extending posteriorly and ventrally from the first scale anterior to the second dorsal fin, including one scale on the dorsal midline and another scale at the anal-fin base. Circumpeduncular scales were counted along the circumference of the narrowest point of the caudal peduncle in a zigzag manner. Predorsal scales were counted on the dorsal midline from the origin of the first dorsal fin forward to the occipital region. Dentition terms follow Watson (2008). Symbolic codes used to represent collections and institutions follow Sabaj (2016).

**Sicyopterus de Beaufort, 1912**

*New Japanese name: Gizagiza-bouzu-haze*

(Figs 1, 2A, B, 3A, B, 4, 5, 6A, B; Tables 1–4)

**Sicyopterus longifilis** de Beaufort, 1912: 140 (type locality: Seram, Indonesia); de Beaufort 1913: 146; Koumans 1953: 232; Zhou and Gao 2011: 327; Keith et al. 2015b: 110.

**Sicyopterus brevis** de Beaufort, 1912: 141 [type locality: Seram, Indonesia; invalid, precedence given to *S. longifilis* (see Discussion)]; de Beaufort 1913: 147; Koumans 1953: 233; Keith et al. 2015b: 82.

**Sicyopterus lacrymosus** Herre, 1927: 303 (type locality: Luzon, Philippines).

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Table 1. Counts and measurement of specimens of *Sicyopterus longifilis* examined in the present study.

<table>
<thead>
<tr>
<th>Catalog number</th>
<th>ZMA 112562</th>
<th>ZMA 110981</th>
<th>URM-P 48275, 48276</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type status</th>
<th>Syntypes of <em>S. longifilis</em></th>
<th>Syntypes of <em>S. brevis</em></th>
<th>Non-type specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locality</td>
<td>Seram</td>
<td>Seram</td>
<td>Okinawa</td>
</tr>
<tr>
<td>Number and sex</td>
<td>2 males</td>
<td>2 females</td>
<td>2 females</td>
</tr>
<tr>
<td>Standard length (mm)</td>
<td>38.0–74.7</td>
<td>35.6–35.7</td>
<td>36.6–55.6</td>
</tr>
</tbody>
</table>

**Counts**

<table>
<thead>
<tr>
<th>Dorsal-fin rays</th>
<th>VI-1,10</th>
<th>VI-1,10–11</th>
<th>VI-1,10</th>
</tr>
</thead>
<tbody>
<tr>
<td>A rays</td>
<td>1,10</td>
<td>1,10</td>
<td>1,10</td>
</tr>
<tr>
<td>P rays</td>
<td>20</td>
<td>20–21</td>
<td>20</td>
</tr>
<tr>
<td>Branched rays in C</td>
<td>15*</td>
<td>16*</td>
<td>15</td>
</tr>
<tr>
<td>Segmented rays in C</td>
<td>17</td>
<td>17–18</td>
<td>17</td>
</tr>
<tr>
<td>Scales in longitudinal series</td>
<td>55–57</td>
<td>49–55</td>
<td>54–56</td>
</tr>
<tr>
<td>Scales in transverse series</td>
<td>18</td>
<td>18–19</td>
<td>17</td>
</tr>
<tr>
<td>Circumpeduncular scales</td>
<td>28</td>
<td>25–29</td>
<td>26–27</td>
</tr>
<tr>
<td>Predorsal scales</td>
<td>15–19</td>
<td>16</td>
<td>18–20</td>
</tr>
<tr>
<td>Dentary symphysal teeth</td>
<td>6–8</td>
<td>3</td>
<td>2–5</td>
</tr>
</tbody>
</table>

**Measurements as % of standard length**

| Head length  | 25.0–25.2 | 25.8–26.9 | 23.8–25.4 |
| Snout length | 11.3–11.6 | 11.0–11.8 | 10.7–11.1 |
| Eye diameter | 4.1–5.3   | 5.3–5.9   | 4.2–4.6   |
| Postorbital length of head | 11.6–12.4 | 11.5–11.8 | 11.2–12.2 |
| Upper-jaw length | 11.3–11.9 | 12.9     | 10.7–11.3 |
| Body depth at P2 origin | 17.1–18.3 | 16.9–18.5 | 16.4–17.7 |
| Body depth at A origin | 19.0–19.2 | 20.2–21.0 | 18.3–19.8 |
| Depth at caudal peduncle | 12.9–13.5 | 12.9–13.4 | 13.1–13.9 |
| Length of caudal peduncle | 19.2–19.8 | 19.3–19.9 | 19.4–21.3 |
| Predorsal length | 31.2–34.2 | 36.0–36.7 | 34.4–34.9 |
| Length of D1 base | 21.0–21.1 | 22.5     | 20.5–21.9 |
| D1 length | 44.2–58.5 | 23.0–26.1 | 27.8–35.2 |
| Length of longest spine of D1 | 40.3–54.5 | 22.8–24.1 | 19.7–25.7 |
| Interval between D1 and D2 bases | 0–0.8 | 0.6 | 0.8–1.0 |
| Length of D2 base | 27.1–30.5 | 28.0–28.1 | 27.3–28.8 |
| D2 length | 43.7–50.2 | 35.1–37.8 | 35.2–38.4 |
| Length of longest ray of D2 | 18.7–27.0 | 14.6–16.0 | 14.2–14.4 |
| Preanal length | 51.6–51.7 | 51.7–54.3 | 51.6–53.6 |
| Length of A base | 28.2–30.0 | 24.7–25.5 | 25.1–26.2 |
| A length | 40.5–43.5 | 32.3–33.1 | 33.6–35.9 |
| Length of longest ray of A | 13.7–16.2 | 11.5–12.6 | 11.5–12.0 |
| Length from anus to A | 2.6–3.2 | 3.1 | 3.3–3.8 |
| Length of longest ray of P1 | 22.6–22.9 | 17.4–19.6 | 18.9–20.2 |
| C length | 27.9–28.6 | 24.4     | 21.4–23.8 |

D1, first dorsal fin; D2, second dorsal fin; A, anal fin; C, caudal fin; P1, pectoral fin; P2, pelvic fin. Values with an asterisk are based on one specimen (broken in other specimen).

Sicyopterus sp.: Lin 2007: 76.


Material examined. Syntypes of Sicyopterus longifilis: ZMA 112562, 2 males (38.0 and 74.7 mm SL; 48.6 and 95.6 mm in total length), upper course of Tubah River, West Seram, Indonesia, 27 February 1910, coll. L. F. de Beaufort [Although de Beaufort (1912) wrote that he described this species from three specimens (49–97 mm in total length), currently only two specimens are available (Nijssen et al. 1982)]. Syntypes of Sicyopterus brevis: ZMA 110981, 2
females (35.6 and 35.7 mm SL), upper course of Tubah River, West Seram, Indonesia, 27 February 1910, coll. L. F. de Beaufort. **Non-type specimens from Okinawa, Japan:** URM-P 48275, female (36.6 mm SL), a stream on the eastern slope of Okinawa Island, 18 June 2013, coll. K. Maeda; URM-P 48276, female (57.6 mm SL), a stream on the western slope of Okinawa Island, 28 June 2013, coll. T. Saeki.

**Diagnosis.** Upper lip without median cleft, but with a lateral cleft on each side of lip; margin of upper lip between lateral clefts minutely serrated. Without tubercle behind median cleft. Ridge beneath the upper lip only with feeble papillae. Premaxillary teeth tricuspid. First dorsal-fin spines, especially second to fifth spines, long and filamentous in males. Posterior tip of first dorsal fin often exceeding base of last soft ray of second dorsal fin in males. Second to fourth spines of first dorsal fin in females somewhat elongate, but the tip of fin not extending to middle of second dorsal-fin base. Membranes notched between spines in female. Second dorsal fin usually with one spine and ten soft rays. Caudal fin with 17–18 (usually 17) segmented rays, including 15–16 branched rays. Pectoral fin with 20–21 rays. Scales in longitudinal series 49–57. Scales on nape and occipital region considerably smaller than scales on lateral sides of body.

**Description of syntypes of *Sicyopterus longifilis***. Two males (Fig. 1A, B; Table 1). Body elongate, cylindrical anteriorly and somewhat compressed posteriorly. Snout round and protruding beyond upper lip. Anterior naris short and tubular, posterior naris not tubular. Mouth inferior with upper jaw projecting beyond lower jaw. Upper lip without median cleft, but with a lateral cleft slightly posterior to the middle of each side of the lip. Margin of upper lip minutely serrated between lateral clefts. Premaxillary teeth fine and tricuspid. Dentary with six or eight canine-like symphyseal teeth and a row of horizontal teeth enclosed in a thick, fleshy sheath. First dorsal fin with six spines; spines elongate and filamentous (third spine longest) and posterior-most point of first dorsal fin (tip of third spine) extending to the base of the eighth soft ray of the second dorsal fin in the smaller specimen (38.0 mm SL) and exceeding the base of the last soft ray of the second dorsal fin in the larger one (74.7 mm SL). Second dorsal fin with one spine and ten soft rays; fifth or sixth soft ray longest. Anal fin with one spine and ten soft rays; ninth soft ray longest. Caudal fin rounded, with 17 segmented rays, including 15 branched rays. Pectoral fin with 20 rays. Pelvic fins joined to form a strong cup-like disk with fleshy frenum. Occipital region (posterior three-fourths) and body scaled, but pectoral-fin bases naked. Ctenoid scales covering lateral and dorsal sides of body. Scales on nape and occipital region cycloid and considerably smaller than scales on lateral sides of body. Belly covered with cycloid scales. Anteriormost several scales on side of body (behind pectoral-fin base) cycloid. Cycloid scales also occurring on first and second dorsal-fin bases, anal-fin base, caudal-fin base, and proximal part of caudal fin. Scales in longitudinal series 55 or 57; scales in transverse series 18; circumpeduncular scales 28; predorsal scales 15 or 19. Urogenital papilla rounded. A drawing of *S. longifilis* (probably one of the syntypes) was provided by de Beaufort (1913). Although pigmentation is somewhat indistinct due to over a century of preservation, major markings are visible in the syntypes: two brown Y-shaped bars laterally on body below second dorsal-fin base, followed by two brown oblique bars laterally on caudal peduncle. Dusky brown triangular bar below eye. One indistinct brown blotch on middle of membrane between third and fourth spines of first dorsal fin. Dusky brown triangular marking on middle of pectoral fin. Proximal part of pelvic fin brown in smaller specimen. No distinct markings on second dorsal, anal, and caudal fins.

**Description of syntypes of *Sicyopterus brevis***. Two females (Fig. 1C, D; Table 1). Morphologies corresponding to syntypes of *S. longifilis*, but having fewer dentary symphyseal teeth (3 vs. 6 or 8 in *S. longifilis*), shorter spines on first dorsal fin (posteriormost point of first dorsal fin extending to base of spine or second soft ray of second dorsal fin vs. extending to or exceeding posterior part of second dorsal fin), second spine longest in first dorsal fin (vs. third spine), anterior rays longer in second dorsal and anal fins (vs. middle or posterior rays longest), smaller first and second dorsal, anal, caudal, and pectoral fins (vs. larger fins), rounded square urogenital papilla with slightly concave posterior margin (vs. rounded), and no distinct markings on body and fins (vs. some markings visible).

**Description of non-type specimens from Okinawa***. Two females (Fig. 2A, B, 3A, B, 4, 5, 6A, B; Table 1). Morphologies correspond to syntypes of *S. brevis*. Some additional characters which were not examined in the type series of *S. longifilis* and *S. brevis* are described below. Second to fourth spines of first dorsal fin elongate (second spine longest) and membranes deeply notched between second and third, third and fourth, and fourth and fifth spines. Cephalic sensory pore system A’, B, C, D(S), F, H, L’, M’, N,
and O’ (Fig. 4). Oculoscapular canal not interrupted. Pre-
opercular canal with three pores (M’, N, and O’). Cutane-
ous sensory papillae developed over dorsal, lateral, and ven-
tral surface of head (Fig. 4).

In preservative, dorsal and lateral background yellow-
ish brown, ventral side cream. Triangular black marking
extending from ventral margin of eye to posterior end of
mouth. Two dusky brown Y-shape bars laterally on body
below second-dorsal-fin base, followed by two oblique bars
laterally on caudal peduncle. First dorsal fin translucent
with gray mottling on posterior part. Second dorsal fin
translucent with gray mottling on proximal three fourths
and with a pale gray line on distal margin. Anal fin trans-
lucent with a submarginal gray line. Caudal fin translucent
with subdorsal and subventral pale gray lines; pale gray
spots on proximal two thirds of middle rays. Pectoral fin
gray, but dorsal and ventral parts translucent in larger speci-
men; pectoral fin translucent and only proximal part gray in
the smaller specimen. Pelvic fin translucent.

Color in life variable (Figs 5, 6A, B and field observa-
tions). Dorsal and lateral background brown, ventral side
whitish. Seven dusky brown blotches on dorsal side from
posterior part of occipital region to caudal peduncle, ante-
rior blotches somewhat indefinite, third to fifth ones sub-
divided. Dorsal and lateral side of head mottled with small
dusky brown markings. Dusky brown longitudinal stripe
extending from tip of snout to below eye and to dorsal part
of pectoral fin base, stripe continuing along lateral midline
of body. Four dusky brown blotches along lateral midline
of posterior part of body. Triangular black marking below
eye sometimes highlighted. Markings of head and body
often became indistinct (Fig. 5C). Dorsal, anal, and caudal
fins translucent to yellowish or orange; markings similar to
those of preserved specimens. Distal parts of second to fifth
spines of first dorsal fin pale orange to bluish white. Anal fin

Fig. 4. Arrangement of cephalic sensory pores and cutaneous
sensory papillae in Sicyopterus longifilis (URM-P 48276). C and
D(S) are dorsal. AN, anterior naris; PN, posterior naris.

Fig. 5. Underwater photographs of Sicyopterus longifilis females (A and B, URM-P 48276, C and D, URM-P 48275) on Okinawa Island. A,
28 June 2013; B, 27 June 2013; C and D, 3 June 2013 (photo by T. Saeki).
with bluish-white edge. Narrow bluish-white lines dorsally along subdorsal gray line and ventrally along subventral gray line of caudal fin. Dorsal and ventral parts of pectoral fin with orange tint; gray and cream dots on proximal part. Pelvic fin translucent.

**Occurences and habitats in Okinawa.** This taxon is very rare. In addition to the two individuals collected in 2013 (described above), one individual was observed in July, 2014 (not collected). These three specimens were found in different streams, although detailed localities are not shown here due to the conservation perspective. Two of them are on the eastern slope and the other is on the western slope of the island. These three sites are located from 0.4–1.3 km from the upper limit of the estuary, respectively, and all sites are lower than 10 m a.s.l. They were observed with two con-
geners, *Sicyopterus lagocephalus* and *Sicyopterus japonicus*, some other amphidromous gobioiids, including *Stiphodon percnopterygionus* Watson and Chen, 1998, *Awaous melanocephalus* (Bleecker, 1849), and *Rhinogobius nagoyae* Jordan and Seale, 1906, and the diadromous *Kuhlia marginata* (Cu-
vier in Cuvier and Valenciennes, 1829).

**Discussion**

**Revision of species described by de Beaufort (1912).** De Beaufort (1912) described *S. longifilis* and *S. brevis* as new species with four other new goby species from streams in West Seram and the reef of Saonek, a small island to the south of Waigeo, in Indonesia. The next year, he re-
described these two species with a drawing of *S. longifilis* (see de Beaufort 1913). The significant differences between *S. longifilis* and *S. brevis*, based on these descriptions, are fin morphologies (*S. longifilis* having larger first and sec-
ond dorsal and pectoral fins). The enormous development of filamentous spines in the first dorsal fin of *S. longifilis* seemed to have drawn de Beaufort’s attention. We examined the syntypes of these two nominal species and confirmed the differences in fin morphology above, but we failed to find any other significant differences except number of den-
tary symphyseal teeth (6–8 in *S. longifilis* vs. 3 in *S. brevis*), the shape of urogenital papilla, and some additional differences in fin morphology: shapes of second dorsal and anal fins (middle or posterior rays longest in *S. longifilis* vs. anterior rays longest in *S. brevis*) and the size of caudal fin (*S. longifilis* having larger fins). All of these differences in fin morphology, tooth number, and shape of the urogenital pa-
pilla are generally seen between males and females of sub-
family Sicydiinae, as typical sexual dimorphism (Watson et al. 2000; Maeda et al. 2012a, b, 2015; Maeda and Tan 2013; Maeda 2014; Maeda and Palla 2015).

The syntypes of *S. longifilis* are males and those of *S. brevis* are females. All were collected by de Beaufort at the same locality on the same date (February 27th, 1910). De Beaufort (1912) stated that the syntypes of *S. brevis* were collected on February 27th, 1911, but this must be an error because the collections were made in 1909–1910 (de Beau-
fort 1912). The correct date must be February 27th, 1910,

the same as that of the *S. longifilis* syntypes. We conclude that the author mistook males and females of a single spe-
cies as different species, describing the male specimens as *S. longifilis* and female specimens as *S. brevis*. There are many examples in which males and females of single sicy-
diine species were formerly regarded as different species [e.g., *Lentipes concolor* (Gill, 1860) and *L. seminudus* Gün-
ther, 1880; *Microcycydiu atropurpureum* Herre, 1927 and *M. formosum* Herre, 1927 (see Maciolek 1977; Maeda et al. 2012b)]. Therefore, we consider *S. longifilis* and *S. brevis* to be synonyms. Because these two names were published on the same date in the same work, we give precedence to the name *Sicyopterus longifilis* as the first reviser under Article 24.2 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999).

*Sicyopterus longifilis* shares a distinctive upper lip mor-
phology (without median cleft but with a lateral cleft on each side of the lip) not only with *S. brevis*, but also with several other species: *S. pugnans* (Ogilvie-Grant, 1884) from Savaii, Samoa, *S. lacrymosus* Herre, 1927 from northern Luzon, Philippines, *S. panayensis* Herre, 1927 from Panay, Philippines, *S. calliochromus* Keith, Allen, and Lord, 2012 from Papua, Indonesia, and *S. squamosissimus* Keith, Lord, Busson, Sauri, Hubert, and Hadiaty, 2015 from Java, Indo-
nesia. Although Herre (1927) stated that the upper lip of his new species, *S. lacrymosus*, is entire (i.e., without a cleft), Koumans (1940), who reexamined nine syntypes of *S. lac-
rymosus*, reported that they actually have a feeble cleft on each side and concluded that the types agreed fully with *S. longifilis*. Koumans (1953) regarded *S. lacrymosus* as a junior sym-
onym of *S. longifilis*. Keith et al. (2015b) included both *S. panayensis* and *S. lacrymosus* among synonyms of *S. longi-
filis*. Type specimens of *S. lacrymosus* and *S. panayensis* were destroyed at the Bureau of Science in Manila during World War II (Pietsch and Anderson 1997; Kottetel 2013). Based on descriptions in Herre (1927) and Koumans (1940, 1953), we agree with Keith et al. (2015b) who listed *S. lacrymosus* and *S. panayensis* as junior synonyms of *S. longifilis*, because there are no significant morphological differences between them.

*Sicyopterus* sp. in Lin (2007: 76) and *Sicyopterus* sp. 1 in Zhou and Gao (2011: 329) are also identified as *S. longifilis*, based on the mouth and fin morphologies and color of the body and fins of the fishes in photographs shown in these books.

*Sicyopterus pugnans* differs from *S. longifilis* by having bi-
cuspis teeth on the premaxilla (Ogilvie-Grant 1884; Akihito and Meguro 1979) (vs. tricuspid in *S. longifilis*) as well as by its unique coloration (e.g., drop-like black marking below the eye vs. triangular mark in *S. longifilis*). *Sicyopterus squa-
mosissimus* differs from *S. longifilis* by having more scales in the longitudinal and transverse series and along the predo-
soral midline (Keith et al. 2015a). *Sicyopterus calliochromus* differs from *S. longifilis* by having fewer branched rays in the caudal fin (13 vs. 14–16) and the distinctive gold and black striped pattern of males (Keith et al. 2012).

**Identification of Japanese species of Sicyopterus.** Two
specimens collected from Okinawa Island (URM-P 48275 and 48276) are identified as S. longifilis, because their morphologies corresponded well to the syntypes of S. brevis, which taxon is now a junior synonym of S. longifilis. We propose a new Japanese name for this fish, "Gizagiza-bouzu-haze" for the specimens collected from Okinawa. It is derived from serrated ("gizagiza" in Japanese) margin of the upper lip. "Bouzu-haze" means sicydiine goby.

*Sicyopterus longifilis* is known from Indonesia (Seram, Babar, Ambon) (de Beaufort 1912; Koumans 1930), Philippines (Luzon, Panay, Negros, and Mindanao) (Herre 1927), Papua New Guinea, Solomon Islands (Keith et al. 2015b), Taiwan (Lin 2007; Zhou and Gao 2011), and southern Japan (Okinawa) (present study). This is the first record of this species from Japan. Okinawa Island is the northernmost known habitat for S. longifilis, but it is very rare on this island.

Two species, *Sicyopterus japonicus* and *S. lagocephalus* had previously been known in Japan (Nakabo 2002, 2013), and they are common in Okinawan streams. These two species share a characteristic mouth structure: the upper lip has a deep median cleft and a lateral cleft slightly posterior to the middle of each side of the lip. It has a prominent tubercle immediately behind the median cleft and the ridge beneath the upper lip has a row of protuberances (Fig. 3C). *Sicyopterus longifilis* is easily distinguished from these two species based on mouth structure, as it lacks a median cleft on the upper lip, and it also lacks a tubercle behind the median cleft. The ridge beneath the upper lip has only feeble papillae (Fig. 3A, B).

Although the mouth structure is very useful to identify *S. longifilis*, it is difficult to observe in situ, unless a high-quality close-up photograph is taken (Fig. 6A). However, *S. longifilis* is still distinguishable from the much more abundant *S. japonicus* and *S. lagocephalus*, even without relying upon the mouth structure. The body color of *S. longifilis* females is similar to that of *S. lagocephalus* females, but differs in having seven, poorly defined dusky blotches on the dorsal side from the posterior part of the occipital region to the caudal peduncle (vs. eight, more distinct blotches in *S. lagocephalus*; Fig. 6B, C), and the lateral blotches are also more indefinite (vs. seven clear blotches aligned along the lateral midline of the body in *S. lagocephalus*; Fig. 6B, C). *Sicyopterus japonicus* is distinguished from other taxa by having 7–11 well-defined diagonal bands on the body (the anterior ones extending from the dorsum postero-ventrally and the posterior ones extending from the dorsum antero-ventrally; Fig. 2D). However, since the body color of these three species is quite variable (Figs 5, 6), it is necessary to carefully monitor them and to understand the range of vari-
Table 2. Counts of soft rays in the second dorsal fin of *Sicyopterus longifilis*, *Sicyopterus japonicus*, and *Sicyopterus lagocephalus*.

<table>
<thead>
<tr>
<th>Species</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Sicyopterus longifilis</em></td>
<td>—</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><em>Sicyopterus japonicus</em></td>
<td>1</td>
<td>13</td>
<td>—</td>
</tr>
<tr>
<td><em>Sicyopterus lagocephalus</em></td>
<td>—</td>
<td>—</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 3. Pectoral-fin ray counts of *Sicyopterus longifilis*, *Sicyopterus japonicus*, and *Sicyopterus lagocephalus*.

<table>
<thead>
<tr>
<th>Species</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Sicyopterus longifilis</em></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><em>Sicyopterus japonicus</em></td>
<td>1</td>
<td>13</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><em>Sicyopterus lagocephalus</em></td>
<td>—</td>
<td>—</td>
<td>8</td>
<td>5</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 4. Counts of branched rays in the caudal fin of *Sicyopterus longifilis*, *Sicyopterus japonicus*, and *Sicyopterus lagocephalus*.

<table>
<thead>
<tr>
<th>Species</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Sicyopterus longifilis</em></td>
<td>—</td>
<td>—</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><em>Sicyopterus japonicus</em></td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td><em>Sicyopterus lagocephalus</em></td>
<td>2</td>
<td>11</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

The distribution of each species. Although we did not observe live male *S. longifilis*, Lin (2007), Zhou and Gao (2011), and Keith et al. (2015b) provided some images of *S. longifilis* males. According to these, the basic markings of the males are similar to those of females, and males can be distinguished from *S. lagocephalus* and *S. japonicus* males by some characteristics as the females. Males display characteristic nuptial colors. Nuptial male *S. longifilis* display blue-green or silver on the sides of the body, while *S. lagocephalus* usually has light blue on the sides, deep blue on the venter, and whitish on dorsal sides of the body, and *S. japonicus* never displays blue or silver. Morphology of the first dorsal fin is also a useful character. The second to fourth spines of the first dorsal fin of *S. longifilis* females are elongate and membranes between the spines are deeply notched. The spines of males are quite long and filamentous. Although spines of males and females of *S. lagocephalus* and *S. japonicus* are also often elongate (especially in larger males), the first dorsal fin of these two species is triangular or falcate (vs. palmate in *S. longifilis*). Still, it should be noted that spines of small individuals are not elongate in all species.

If the fish is captured, identification can be verified by the following characters, in addition to mouth structure.

1) Using combined fin-ray counts in the second dorsal fin (D2) and pectoral fin (P1): *S. longifilis*, D2 I, 10–11 (usually I, 10); P1, 20–21 (usually 20); *S. japonicus*, D2 I, 9–10 (usually 10); P1, 17–18 (usually 18); and *S. lagocephalus*, D2 I, 11; P1, 19–20 (Tables 2, 3).

2) *Sicyopterus longifilis* usually has 15 branched rays in the caudal fin, while *S. lagocephalus* and *S. japonicus* usually have 14 branched rays (Table 4).

3) Scales on the occipital region and nape of *S. longifilis* are remarkably smaller than the scales on the side of the body (vs. those of *S. lagocephalus* and *S. japonicus* which are of similar size to the lateral scales).

**Comparative material.** *Sicyopterus japonicus*: URM-P 48265, male (67.3 mm SL), Okinawa Island, 7 June 2013; URM-P 48266, juvenile (35.2 mm SL), Okinawa Island, 7 June 2013; URM-P 48267, female (59.3 mm SL), Okinawa Island, 17 May 2014; URM-P 48268, female (69.0 mm SL), Okinawa Island, 17 May 2014; URM-P 48269, female (91.3 mm SL), Okinawa Island, 17 May 2014; URM-P 48270, female (73.5 mm SL), Okinawa Island, 17 May 2014; URM-P 48272, female (45.0 mm SL), Okinawa Island, 5 June 2014; URM-P 48273, male (64.4 mm SL), Okinawa Island, 5 June 2014; URM-P 48274, male (61.5 mm SL), Okinawa Island, 5 June 2014; URM-P 48734, female (90.8 mm SL), Okinawa Island, 30 April 2016; URM-P 48735, 1 male (63.4 mm SL), Okinawa Island, 30 April 2016; URM-P 48736, male (92.0 mm SL), Okinawa Island, 11 June 2017; URM-P 48737, male (99.7 mm SL), Okinawa Island, 11 June 2017; URM-P 48738, female (81.7 mm SL), Okinawa Island, 11 June 2017. *Sicyopterus lagocephalus*: URM-P 48255, male (47.5 mm SL), Okinawa Island, 10 November 2008; URM-P 48256, male (48.6 mm SL), Okinawa Island, 10 November 2008; URM-P 48257, male (40.3 mm SL), Okinawa Island, 14 September 2009; URM-P 48258, male (34.2 mm SL), Okinawa Island, 11 October 2012; URM-P 48259, female (34.9 mm SL), Okinawa Island, 8 June 2013; URM-P 48260, female (30.2 mm SL), Okinawa Island, 18 June 2013; URM-P 48261, female (52.6 mm SL), Okinawa Island, 12 December 2013; URM-P 48262, male (38.3 mm SL), Okinawa Island, 5 September 2014; URM-P 48263, female (40.6 mm SL), Okinawa Island, 1 October 2014; URM-P 48264, female (41.1 mm SL), Okinawa Island, 17 October 2014; URM-P 48731, male (57.4 mm SL), Okinawa Island, 20 April 2016; URM-P 48732, male (50.2 mm SL), Okinawa Island, 20 April 2016; URM-P 48733, male (48.2 mm SL), Okinawa Island, 20 April 2016.

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