



SHORT COMMUNICATION

## First Record of the Goby *Lentipes armatus* Sakai and Nakamura, 1979 (Teleostei: Gobiidae) in the Amburayan River in Benguet, Luzon Island, Philippines

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ABSTRACT

A species of goby, *Lentipes armatus* Sakai and Nakamura 1979, described as endemic to the Ryukyu Islands in Japan was recently discovered in the Amburayan River in Benguet, Luzon Island, Philippines. *Lentipes armatus* has been identified based on photographic and actual specimens from landed catch surveys in Atok, Kapangan, and Kibungan in the Province of Benguet. Morphological features, morphometric characters, and meristic counts of the collected specimens of the local population match those reported in the Ryukyu Islands in Japan. Moreover, genetic studies of the species confirmed its identification as *L. armatus*. Samples for the Deoxyribonucleic Acid (DNA) analysis and identification of this species were collected from the Amburayan River traversing the Municipalities of Atok, Kapangan, and Kibungan in the Province of Benguet. Therefore, the specimen described herein constitutes the first record of the species in the Cordillera. Furthermore, the occurrence of the *L. armatus* in the Amburayan River in the Cordillera, northern part of the Philippines, suggests its possible range expansion. The first record of the *L. armatus* in the Philippines was reported from the Taguibao River upstream of Sitio Bongodman (proper), in the east end of Ancicala, Province of Agusan del Norte, Mindanao Island. With this, it may also propose that the *L. armatus* is an indigenous fish species in the country, particularly thriving in the Amburayan River, Benguet and Taguibao River, Agusan del Norte, Philippines.

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Inland waters and freshwater biodiversity constitute a valuable natural resource in economic, cultural, aesthetic, scientific, and educational terms (Dudgeon et al. 2006). The Cordillera, being a landlocked region, only has freshwater resources in its inland waters. One of the inland waters in the Cordillera is the Amburayan River, which traces its source in the mountains of Benguet, particularly the Municipalities of Atok, Kibungan, and Kapangan.

The Philippines has about 361 freshwater fish species found in inland water bodies, with 181 considered as native aquatic species (Froese and Pauly 2019 as cited by Aya 2019). In addition, Barut (2014) stated that 330 species are Philippine endemics, with 48 genera and 127 being goby species. It is expected

that as the assessment activities on the freshwater resources of the country continue, new species of aquatic organisms, including those that abound the Cordillera, will be identified (Garcia et al. 2018).

Little is known about the diversity and status of endemic freshwater fishes, which are equally valuable as bio-indicators of ecosystem health and an integral part of our country's natural heritage (Fermin et al. 2014), and there are many unique freshwater fish species with unknown status (Garcia et al. 2018). As the stock assessment studies continue in the Cordillera, species identification is one problem encountered. Species identification is a requisite of management efforts since species that have not been correctly identified cannot be conserved and protected effectively (Nwani et al. 2011).

In this study, a species of goby, *Lentipes armatus* is identified from the Amburayan River using morpho-meristic measures and counts and DNA barcoding for validation.

Specimens of *Lentipes armatus* were collected by enumerators from the landing sites in the Amburayan River in Naguey, Atok, and Cuba, Kapangan in Benguet on September 1-10, 2015. The species was also documented by the National Stock Assessment Program (NSAP) enumerator assigned in Badeo, Kibungan, Benguet. However, given the species' scarcity and limited catch, there were no reports of landed catch of *Lentipes armatus* from Badeo, Kibungan landing site. Therefore, the samples collected were from the catches of the fishers in the landing sites monitored by the NSAP in Naguey, Atok and Cuba, Kapangan. From the samples collected, two specimens were preserved in 95% ethanol and sent to the National Fisheries Research and Development Institute (NFRDI) Genetic Fingerprinting Laboratory

(GFL) for genetic identification. A total of 20 female and 18 male specimens were collected and subjected to morphometric and meristic examination. Each specimen was examined for distinguishing morphological features described by Chen et al. (2007). Meristic counts of all specimens were also recorded. A vernier calliper was used to measure the morphometric measures of each specimen. Photographs of the species were also taken using a digital camera in the laboratory.

A total of 20 female and 18 male specimens were collected and subjected to morphometric and meristic examination, and two were subjected to DNA identification. The following combinations of features distinguished the specimen: first dorsal fin rays about equal without filaments, I/5-6, and 3-4 rays slightly longer in males; second dorsal fin rays I/10; anal soft rays, 10; and pectoral fin rays, 12-19. The morpho-meristic measurements of the samples are shown in Table 1. The male and female of the

Table 1. Morpho-meristic measurements in millimetres of the samples of *Lentipes armatus*.

Sex	Male	Female
No. of Specimen	18	20
Dorsal Fin Rays		
1st	5 - 6	5
2nd	10	10
Anal Soft Rays	10 - 12	9 - 11
Pectoral Fin Rays	12 - 19	12 - 18
Total Length	47.8 – 72.4 (52.14)	42.1 – 70.05 (50.63)
Standard Length	39.5 – 52.3 (42.31)	32.1 – 52.3 (41.91)
Head Length	7.8 – 8.9 (7.52)	5.05 – 12 (8.54)
Pre-dorsal Length	10.45 – 16.45 (13.42)	10.4 – 18.45 (15.11)
Snout to 2nd Dorsal Origin	20.15 – 28.9 (25.50)	20.25 – 29.3 (25.30)
Snout to Anus	23.85 – 28.15 (25.65)	20 – 29.85 (23.61)
Snout to Anal Fin Origin	24.6 – 28.55 (26.64)	17.1 – 33.55 (25.34)
Caudal Fin Length	6 – 12.75 (8.18)	5.15 – 11 (8.14)
Pectoral Fin Length	6 – 9.1 (7.33)	5 – 11 (8.40)
Pelvic Fin Length	5.3 – 10 (6.51)	5 - 5 8.35 (6.37)
Body Depth of Pelvic Origin	3 – 9 (5.10)	4 – 7.5 (5.55)
Body Depth in Maximum	4.05 – 7.15 (6.07)	4 – 9.3 (6.69)
Snout Length	2 – 4.1 (3.43)	2.2 – 7.4 (3.84)
Eye Diameter	1.25 – 1.7 (1.64)	1 – 2.5 (1.58)
Post Orbital Length	2 – 4 (2.80)	1.9 – 3.15 (2.41)
Cheek Depth	2 – 3.45 (2.47)	2 – 4.05 (3.29)
Head Width in Upper Gill Opening	3.9 – 5.4 (4.43)	3 – 7.1 (4.84)
Head Width in Maximum	6.1 – 9 (7.71)	5.35 – 9.05 (7.18)

species have different coloration. The male has a greenish-blue body and belly, whereas the female has a brown, somewhat translucent body and a pale belly. The male's head is colored red, whereas the female is brown. The male body has a red band, whereas the female has no such coloration. The male has a reddish second dorsal fin and anal fin, with the dorsal fin having a black line along with the tips of the second dorsal fin. A round, deep black spot is found in the soft membranes between the first and second dorsal fin. The caudal fins and pectoral fins of both males and females are unmarked but greenish-blue in males and brown in females.

The identification of *L. armatus* was inferred from a monophyletic cluster in the Neighbour Joining tree (Figure 1) generated and supported by a bootstrap value of 100%. In addition to this, genetic distances among the sequences of the two specimens and reference sequences for *L. armatus* showed that the specimens have 0.5% and 0.7% genetic distances, respectively, with the species. These distances are below the threshold value set at 3.5% for species delineation. The threshold value was set at 3.0%–3.5% for species delineation among the included sequences (Ward et al. 2009). The result of the DNA analysis also shows that the samples that are of different body coloration are of common species, as shown in Figure 2.

The specimens described in this paper constitute the first record of the *Lentipes armatus* in the Amburayan River in Benguet, Philippines. The discovery of the species in the Amburayan River suggests an expansion of its geographical range. It also confirms the hypothesis of Chen et al. (2007) that the *L. armatus* can occur in the Philippines since the country is along the major passway of Kuroshio current via the coast of eastern Taiwan and towards

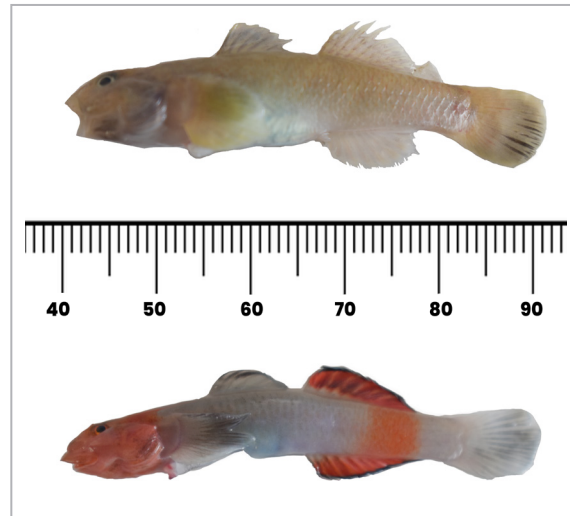


Figure 2. Male (bottom) and female (top) specimen of *Lentipes armatus* caught in the Amburayan River, 2018

Ryukyus Isles, including Iriomote Is., Ishigaki Is., Okinawa Is., and Amami O-Shima of Southern Japan.

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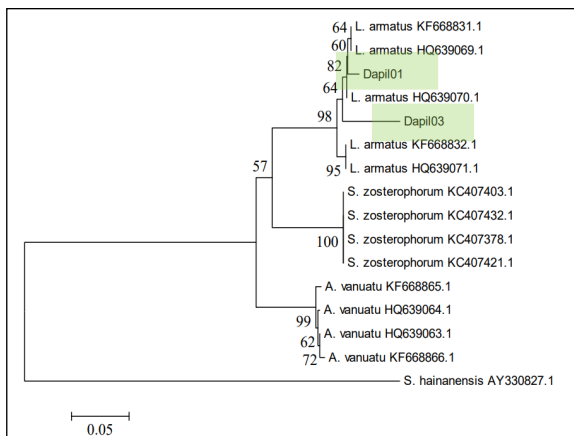


Figure 1. Neighbouring joining tree as a result of the DNA Analysis made by the NFRDI GFL.

## AUTHOR CONTRIBUTIONS

**Tauli M:** Conceptualization, Methodology, Formal Analysis, Investigation, Resources, Writing-Original Draft. **Garcia MP:** Conceptualization, Methodology, Formal Analysis, Writing-Review and Editing, Funding acquisition. **Podeque JR:** Investigation, Resources. **Signey LL:** Writing-Review and Editing, Project administration, Funding acquisition. **Sarmiento K:** Methodology, Formal Analysis. **Santos MD:** Methodology, Formal Analysis, Resources.

## CONFLICTS OF INTEREST

To the best of our knowledge, no conflict of interest exists.

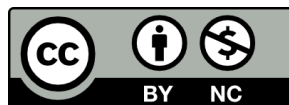
## ETHICS STATEMENT

No animal or human studies were carried out by the authors.

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