



FIRST RECORD OF HALF-SMOOTH GOLDEN PUFFER *LAGOCEPHALUS SPADICEUS* (RICHARDSON, 1845) (TETRAODONTIDAE) FROM WEST COAST OF INDIA

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Abstract: *Lagocephalus spadiceus* (Richardson, 1845) is reported for the first time from west coast of India (Kerala coast). *L. spadiceus* can be distinguished from its closely-related species *Lagocephalus guentheri* Miranda Ribeiro, 1915 by the shape and colour of the caudal fin. Records indicate that this species occurs along the east coast of India and is characterized by two lateral lines comprising of lateral and ventral elements, spinules on the dorsal side forming a rhomboidal or elliptical patch and caudal fin lunate, yellowish brown colour, with white tip; upper rays are relatively projected than the lower rays.

Key words: Tetraodontidae, puffer, west coast, Kerala

INTRODUCTION

The puffer fish family Tetraodontidae is diverse with 189 species and 28 genera in the family (Oliveira *et al.*, 2006) inhabiting the continental shelf, and is found over sandy or muddy substrates. The half-smooth golden puffer *Lagocephalus spadiceus* (Richardson) has a wide-spread distribution throughout the tropical Indian and Pacific Oceans (Froese and Pauly, 2016). This species is harvested for human consumption in East and Southeast Asia (Brillantes *et al.*, 2003). Puffers of the genus *Lagocephalus* Swainson, 1839 is globally distributed in warm shallow waters; however classification at the species level in *Lagocephalus* has not yet been studied in detail, causing confusion in the status of several species including *L. cheesemani*, *L. gloveri*, *L. spadiceus*, and *L. wheeleri* (Matsuura *et al.*, 2011). *L. spadiceus* is similar to *L. guentheri* and *L. gloveri* in general appearance. Randall (1995) reported on the difference of the spinule patch on the back between *L. guentheri* and *L. spadiceus*. The description of Matsuura *et al.* (2011) also demonstrates clear differences between *L. guentheri* and *L. spadiceus*. Puffer fishes are fatal due to the presence of neurotoxin called tetrodotoxin (TTX) in its body organs like liver, gonad, skin, muscle and testis. Along the Asian coast puffer fish poisoning is

considered to be the common cause of fish poisoning (Chew *et al.*, 1983). Not all species of puffer fish are actually poisonous and these species are preyed upon by larger fish, sharks and also humans. Since *Lagocephalus spadiceus* are considered nontoxic, large numbers of these fishes are transported from Kerala to Tamilnadu, where they are used as a delicacy. In India earlier these species were considered as trash fishes and were either discarded in the sea because it cause large destruction to nets or used to make manure.

Although, workshave been reported on *L. spadiceus* on its breeding biology (Sirisha and Rao, 2005a), feeding biology (Sirisha and Rao, 2005b), length-weight relationship (Sirisha and Rao, 2005c) and biochemical studies on muscle tissues (Rao and Sirisha, 2013), there is no information available on the detailed description of this species from India.

MATERIALS AND METHODS

The specimenS of *L. spadiceus* were collected from Sakthikulangara harbour, Kollam district, south-west coast of Kerala. The specimens were collected from a trawler operating along the Kerala coast and the voucher specimen (DABFUK/FI/286) is

deposited in the museum collections of the Department of Aquatic Biology and Fisheries, University of Kerala.

Morphological as well as anatomical characters of the specimen were considered for identification, along with molecular studies using standard DNA barcoding procedures by sequencing the mitochondrial DNA COI. Taxonomical identification was confirmed based on the observations of colourations, rhomboidal patch of prickles on the head region, and morphometric and meristic characters. These specimens were identified as *L. spadiceus* belonging to the family Tetraodontidae due to the characteristic four teeth, and lack of pelvic fin. The record of *L. spadiceus* from Sakthikulangara was the first record of the species from west coast of India.

DESCRIPTION

Phylum: Chordata

Class: Actinopterygii

Order: Tetraodontiformes

Family: Tetraodontidae

***Lagocephalus spadiceus* (Richardson, 1845)**
(Fig. 1)

Locality: Sakthikulangara

Materials collected: 70

Body elongate, head broad usually large. Mouth with four large teeth, two on the upper jaw and two on the lower jaw forming a beak like structure. Lips fleshy with papillae. Eyes usually large. Two lateral lines comprising of lateral and ventral elements. Spinules on the dorsal side forming a rhomboidal or elliptical patch; starting anteriorly between the nasal organ and ending at the region dorsal to the posterior part of the pectoral fin and do not reach the dorsal fin origin. Body olive green on the dorsal side, with silvery yellow on the sides and whitish below. A silver-white band running on the side of the body. Ventral side white with spinules extending up to the anal region. Gill opening black. Caudal fin uninate, yellowish brown, with white tip. Upper rays relatively projected than the lower rays. Fins without spiny rays. Dorsal fin rays 12, Anal fin rays 11, Pectoral fin rays 16-17 and Caudal fin rays 12-13.

The taxonomic characters and colouration are well in accordance with descriptions of Ben Tuvia (1953) and Golani *et al.* (2002).

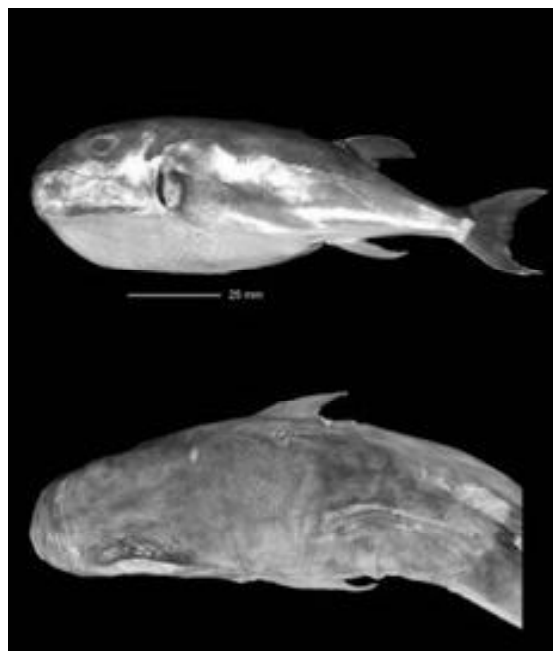


Fig. 1. Half-smooth golden puffer *Lagocephalus spadiceus* (Richardson, 1845) collected from Kerala coast of India; entire specimen (above) and dorsal view of head showing rhomboidal spinule patch (below).

Morphometric measurements of the specimen collected during the present study are given in Table 1.

The species identity of this specimen was further confirmed by molecular studies. Total DNA was extracted from muscle tissue and a portion of the mitochondrial DNA gene Cytochrome Oxidase subunit I (COI) was amplified and sequenced using standard procedures. Amplification was carried out using the universal primers FishF1 (52-TCA ACC AAC CAC AAA GAC ATT GGC AC-32) and FishR1 (52-TAG ACT TCT GGG TGG CCA AAG AAT CA-32). Phylogenetic analysis and sequence divergences were determined using Kimura 2-parameter distance model of MEGA (Version 6.0) Package (Tamura *et al.*, 2007). The sequence was aligned and compared to a homologous sequence of *L. spadiceus* from GenBank (www.ncbi.nlm.nih.gov/nucleotide) database to confirm the identification. Blasting the sequence in GenBank showed 99% similarity with similar sequences. This high genetic similarity (>99%) confirms that

this specimen is indeed *L. spadiceus*. Sequence length of CO1 derived was 599 base pairs and the number of Adenine, Cytosine, Guanine, Thymine were 164 (27.38%), 122 (20.37%), 191 (31.89%), 122 (20.37%) respectively. Sequence of cytochrome oxidase subunit 1 gene of *Lagocephalus spadiceus* is given below: The evolution of molecular taxonomy resolves the

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TCCGGCTGGGTCGAAGAAAAGTAGTATTTAAATTGCGG
TCTGTGAGAAGCATGGTGTATGCCCGCTGCAAGAACA
GGGAGGGAGAGAAGAAGAAGAACGGCAGTGA
TTAGGACGGCCACACAAACAGAGGGGTT
TGGTACTGGGAGATGGCGGGAGGTTTTATGTT
AATGATTGTGGTGATAAAGTTAATGGCCCC
GAGGATTGAGGAGACACCTGCAAGAT
GTAGGGAGAAGATGGTCAGATCAACGG
ATGCTCCGGCATGGGCGAGATTGCCCGCTAGCG
GAGGATATACGGTCCAGCCTGTTCCGGCCCCGGC
CTCGACACCAGAGGAGGCAAGGAGAAGTAAGAAGGA
AGGGGGGAGAAGTCAAAAAGCTCATGTTGTTT
ATTTCGAGGGAAGGCCATATCAGGCGCCC
CGATTATTAGGGGAATCAATCAGTTTCCGAA
GCCACCGATCATGATTGGCATTACTATAAA
GAAAATTATTACGAACGCGTGGGCCGTG
ACGATTACATTATAAATCTGGTCTGCTCC
CCCAGGAGAGCACCTGGTTGGCTCAGCTCTGCC
CGAATAAGGAGGCTCAGGGCCGTTCCCAC
TATTCCGGCTC
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identification problems of fishes. DNA barcoding is an efficient method for species-level identifications using an array of species specific molecular tags derived from the 5' region of the mitochondrial cytochrome oxidase 1 (CO1) gene (Dhanesh *et al.*, 2015). *L. spadiceus* is similar to *L. guentheri* and *L. gloveri* in general appearance. In this context, identification of fish species with similar appearance is challenging and DNA barcoding provides with new perspectives in ecology and systematics of fishes. It may be concluded from the present study that the morphometric characters along with DNA barcoding could be used for identifying *L. spadiceus*.

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Table 1. Morphometric and meristic characters of *Lagocephalus spadiceus* caught from Sakthikulangara, south west coast of India

Morphometric characters	Mean values in cm
Total Length (cm)	16.59
Standard Length	13.96
PreDorsal Length	9.40
PreAnal Length	9.62
PrePectoral Length	4.55
EyeOrbital Length	2.41
Eye Diameter	1.17
Caudal Fin Length	2.66
Caudal Peduncle Width	1.14
Fork Length	15.44
Head Length	4.61
Body Depth	3.97
Meristic characters	Nos
Dorsal Fin Rays	12.00
Anal Fin Rays	11.99
Pectoral Fin Rays	16.97
Caudal Fin Rays	15.00

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