



First Record of Walton's Mudskipper *Periophthalmus waltoni* Koumans 1941 from Narmada Estuarine Region of Gujarat, India

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Abstract The present study confirmed the occurrences of Walton's mudskipper *Periophthalmus waltoni* Koumans 1941 under the family Gobiidae as the first kind of record from the estuarine region of river Narmada of Gujarat, India. A total of 21 specimens were collected with the size ranging from 124 to 145 mm and from 10.7 to 26.2 g, respectively, from Jageshwar fishing sites during the monsoon period (July–September 2019). Walton's mudskipper was reported to be found in countries like Iran, Iraq, Oman and Pakistan, but its availability in Indian waters is questionable. The present findings confirmed the

occurrences of the species in the Narmada estuary, Gujarat, India drainage to the Arabian Sea.

Keywords *Periophthalmus waltoni* · A new record · Narmada estuary · Gujarat

Periophthalmus waltoni Koumans 1941 is commonly known as Walton's mudskipper of the order Perciformes under the family Gobiidae locally known as *Levta* in Gujarat region. The species is distributed in the north-western Indian Ocean: the Persian Gulf and Gulf of Oman east to Pakistan. It is tropical demersal species inhabited marine, freshwater as well as brackish water [1]. It is an amphibious gobiid found in mudflats, tidal mangroves, sandy muddy shores of coastal inlets and estuaries of Iran, Iraq and Oman [2, 3]. In general, the mudskippers are reported to be found in the tropical and subtropical regions [4, 5]. Mudskippers comprise 25 air-breathing species of four genera, namely *Periophthalmodon*, *Periophthalmus*, *Boleophthalmus* and *Scartelaos*, under the subfamily Oxudercinae [6, 7].

According to Murdy [6], 34 species of mudskippers were reported worldwide, and out of them, nine species are available in India and seven of them being reported from Gujarat water bodies [8, 9]. Recently, Bhakta et al. could report three mudskipper species from the Narmada estuary, namely *Boleophthalmus dussumieri*, *Periophthalmodon schlosseri* and *Pseudapocryptes elongatus*, with their respective fishing methods [10]. But no reports are available on the occurrences of Walton's mudskipper in the river Narmada and its presence of Indian waters is questionable. The present findings established the occurrences of *P. waltoni* on the Narmada estuary, Gujarat, India, and

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confirm its range existence in the estuarine waters of the west coast of India.

The species was collected from the Jageshwar (21°40'19.63" N, 72°34'40.12" E) fishing area during the low tides by handpicking through stick traps from the mudskipper holes as well as by fallen gill nets (10–20 mm mesh size) during monsoon period (July–September 2019). The species was identified with the taxonomic keys provided in FishBase [11] as well as by Murdy [6]. The length and weight of each individual were taken at the field itself, then preserved in formalin (5%) and brought to the laboratory. The morphometric features of all specimens were recorded by a digital caliper to the nearest 0.01 mm. The meristic characters of each individual were counted, and the samples were kept in the Institute Fish Museum preserved with formalin (10%). Morphometric and meristic features of all specimens are provided in Table 1.

The species was identified with the taxonomic keys of FishBase with dorsal spine of 13, dorsal soft rays 14, anal spine 1 and anal soft rays 11 [11]. Dorsal fin is not connected by membranes, and pelvic fins are united by moderate to strong frenum forming a round disk and 13.88 ± 1.07 mm in total length (TL) with $12.75 \pm 0.70\%$ of standard length (SL). Scales on the entire body are small

and cycloid, on average 114–117 scales in the longitudinal series. Head length 29.59 ± 0.94 of SL with remnants of white spots all over. Eyes are small and 5.00 ± 0.0 mm in diameter. First dorsal fin with 13 spines and dark brown with a black margin anteriorly over the fin. Length of second dorsal fin base $24.72 \pm 1.54\%$ of SL with 14 soft rays and a black stripe, second stripe 2/3rd at the distal end. Anal fin with 1 spine and 11 soft rays; pre-anal length 66.44 ± 3.58 in TL and anal-fin base $18.93 \pm 0.90\%$ of SL; pectoral fin 18.24 ± 1.34 mm of TL (Table 1).

The color of the live specimen is light brownish with streaks on the flank. Mouth along with jaw portion with a dark blotch. Pelvic, pectoral and caudal fin dark brown: D1 slightly dark with a black margin anteriorly; D2 with four streaks; dark brown, black, white with light brown: a small second black stripe of 2/3rd at the distal end.

The maximum recorded length of the species was reported to be 123 mm SL [6] and 176 mm TL [12]. It is a carnivorous fish and opportunistic, feeding mainly on small animals such as insects, worms, crustaceans and fishes [13]. The salinity of the collection sites was 6.08 ppt, and the species has also been reported from such estuarine environment of Khor Al-Zubair estuary (Iraq) [14].

Walton's mudskipper is reported to be present in four countries as native species, namely Iran, Iraq, Oman and Pakistan, though its presence in India was on questionable [11]. The species reported to occur on the east coast of India, which needs to be confirmed, and according to Shukla et al. and Kanejiya et al., it is found in the northern Gulf of Khambhat, Gujarat [8, 9]. A total of 85 finfish species have been reported to harbor from Narmada estuary, and out of them, three species are of mudskipper [15]. It seems the species is found the first time from the estuarine stretch, which might have migrated from the Arabian Sea. A good quantity of specimens has been collected during the sampling period which indicates further investigation is necessary to study whether is there any already established stock existing in the nearby environment. The occurrence of *P. waltoni* confirmed the four mudskipper species diversity in the Narmada estuarine stretch. The

Table 1 Morphometric measurements of *Periophthalmus waltoni* collected from Narmada estuary, Gujarat

Characters	Value (mean \pm SD)	Range
Total length (mm)	132.36 \pm 6.14	124–145
Standard length (mm)	108.8 \pm 5.17	102–121
Body depth (mm)	18.08 \pm 1.35	16–22
Head length (mm)	32.2 \pm 1.92	29–37
Orbit diameter (mm)	5.00 \pm 0.00	5–5
Inter-orbital width (mm)	5.56 \pm 0.50	5–6
Caudal peduncle depth (mm)	10.08 \pm 1.23	9–15
Caudal peduncle length (mm)	19.48 \pm 1.81	17–23
Pre-dorsal length (mm)	38.76 \pm 2.61	36–48
Pre-pelvic length (mm)	31.76 \pm 2.16	29–37
Pre-anal length (mm)	66.44 \pm 3.58	58–73
Base of first dorsal fin (mm)	25.68 \pm 3.03	21–31
Base of second dorsal fin (mm)	26.87 \pm 1.96	23–31
Base of anal fin (mm)	20.6 \pm 1.39	18–23
Pectoral fin length (mm)	18.24 \pm 1.34	16–21
Pelvic fin length (mm)	13.88 \pm 1.07	12–17
Caudal fin length (mm)	23.36 \pm 1.76	21–28
% of SL		
D ₂ base	24.72 \pm 1.54	22.41–28.43
Anal base	18.93 \pm 0.90	16.67–20.19
Pelvic fin	12.75 \pm 0.70	11.54–14.53
Head length	29.59 \pm 0.94	27.52–31.09



Fig. 1 Walton's mudskipper *Periophthalmus waltoni* Koumans 1941 collected from the estuarine stretch of river Narmada, Gujarat

present report confirmed the presence and distribution of the species in the Narmada estuary on the west coast of India drainage to the Arabian Sea (Fig. 1).

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References

1. Eschmeyer WN, Fong JD (ed) (2019) Catalog of fishes: genera, species, references. <http://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp>. Accessed 10 Sep 2019. (edited by Bill Eschmeyer).
2. Abdoli A (2000) The inland water fishes of Iran. Iranian Museum of Nature and Wildlife, Tehran, 378 p
3. Ghanbarifardi M, Malek M (2007) Permanent intertidal fish from the Persian Gulf and Gulf of Oman, Iran. Iran J Anim Biosyst 3:1–14
4. Bajpai S, Kapur V (2004) Oldest known gobiids from Vastan Lignite Mine (early Eocene), Surat District, Gujarat. Curr Sci 87(4):433–435
5. Bhatt NY, Patel SJ, Patel DA, Patel HP (2009) Burrowing activities of goby fish in the recent intertidal mud flats along the Navinal coast, Kachchh, Western India. J Geol Soc India 74(4):515
6. Murdy EO (1989) *A taxonomic revision and cladistic analysis of the oxudercine gobies* (Gobiidae: Oxudercinae), Australian Museum
7. Aguilar NM (2000) Comparative physiology of air-breathing gobies. Ph.D. dissertation, University of California, San Diego, USA
8. Shukla ML, Trivedi JN, Soni GM, Patel BK, Vachhrajani KD (2014) Mudskipper (Gobiidae: Oxudercinae) fauna of Northern Gulf of Khambhat with two new record of the species from Gujarat, India. Eur J Zool Res 3(3):67–74
9. Kanejiya J, Solanki D, Beleem I, Gohil B (2017) Mudskipper fishing in the coast of Bhavnagar, Gulf of Khambhat, Gujarat, India. J Fish 5(1):461–464
10. Bhakta D, Meetei WA, Vaisakh G, Kamble S, Das SK, Das BK (2018) Finfish diversity of Narmada estuary in Gujarat of India. Pro Zool Soc 72(3):257–262
11. Froese R, Pauly D (eds) (2019) FishBase. World Wide Web Electronic Publication. <http://www.fishbase.org/>. Accessed 09 2019
12. Abdoli L, Kamrani E, Abdoli A, Kiabi B (2009) Length weight relationships for three species of mudskippers (Gobiidae: Oxudercinae) in the coastal areas of the Persian Gulf, Iran. J Appl Ichthyol 25:236–237
13. Clayton DA, Snowden R (2000) Surface activity in the mudskipper, *Periophthalmus waltoni* Koumans 1941 in relation to prey activity and environmental factors. Trop Zool 13(2):239–249
14. Mhaisen FT, Al-Maliki NS (1996) Parasites diseases and food of the dark-blotched mudskipper *Periophthalmus waltoni* (Perciformes: Gobiidae) in the Khor Al-Zubair estuary (Iraq). Zool Mid East 13(1):85–88
15. Bhakta D, Meetei WA, Vaishak G, Kamble S, Chanu TN, Das SK (2018) Mudskipper fishery and indigenous fishing devices in Narmada Estuary, Gujarat. J Indian Soc Coastal Agric Res 36(2):74–78

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