Occurrence of Finless sole, *Pardachirus marmoratus* (Lacepède, 1802) from the Iraqi marine waters

Soleidae is a family of flatfish widely distributed in oceans across the world, from tropical to temperate regions, comprising 32 genera and 185 species (Froese & Pauly 2024). Finless sole is distributed in the Western Indian Ocean, from the Red Sea and Persian/ Arabian Gulf to South Africa and Sri Lanka (Carpenter & Niem 2001).

In the Arabian Gulf, the Soleidae is represented by several species, including *Brachirus orientalis*, *Pardachirus marmoratus*, *Solea elongata*, *Solea stanalandi*, *Zebrias captivus* and *Zebrias synapturoides* (Carpenter et al. 1997). The Iraqi marine waters may differ from other areas of the Arabian Gulf and may support different fish species (Al-Mudaffar & Mahdi 2014). Regarding *Pardachirus marmoratus*, this species is known to occur in the Arabian Gulf, but its distribution within the Iraqi marine waters is not well documented, it is possible that the environmental factors mentioned above may influence the distribution and abundance of this species within the Gulf, including coastal waters in Iraq (Ali et al. 2018).

Like many other fish species, *Pardachirus marmoratus* has been impacted by overfishing, habitat destruction, and other human activities, it is currently classified as a species of "Least Concern" by IUCN, but its population is believed to be declining in some areas due to these threats (Munroe et al. 2020). Natarajan (1980) redescribed finless sole occurring in the Gulf of Mannar along the Indian coast. Jawad et al. (2017) reported cases of partial hyperpigmentation and malpigmentation in finless sole from the Arabian Sea coasts of Oman. The present paper reports the new distribution of *P. marmoratus* in Iraqi marine waters, constituting this species' northernmost extension in the Indian Ocean.

A total of 42 specimens of family Soleidae, including one finless sole, were collected during the period from March 2021 to May 2022 from the Iraqi marine waters, northwestern Arabian Gulf, 29° 46' 50" N 48° 39' 74" E (Fig. 1), using a trawl net. The Iraqi marine waters are located at the head of the Gulf from the north, and extend west to Khor Abdullah and the Kuwaiti borders, as its coastline is 60 km long, and is characterized by its trenches of varying depths of 10 - 26 m (Muttashar et al. 2024). The morphological characteristics included meristic characters which were counted employing a dissection microscope, and 14 morphometric characters were measured to the nearest mm by using a digital caliper and fish measuring board following Hubbs & Lagler (1958). All morphometric measurements were percentages of standard length. The specimens are deposited in the Marine Science Centre, University of Basrah, Iraq (MSCUB).

The total length of the specimen was 225 mm, standard length 190 mm (Fig. 2). Finless sole, *P. marmoratus* has an oval-shaped body, its depth 40.73% in standard length, that is laterally compressed 8.86%. Dorsal fin length was 98.42%, while anal fin length 90.53%. Dorsal and anal fins separated from caudal fin. The pectoral fins are absent. Dorsal fin rays 63, anal fin rays 49, and pelvic fin rays 5 (Table 1). The coloration of the specimen is pale brown with various dark brown markings in the form of rings and spots on the head, body, and fins. The lateral line has two brown dots containing yellow flecks.

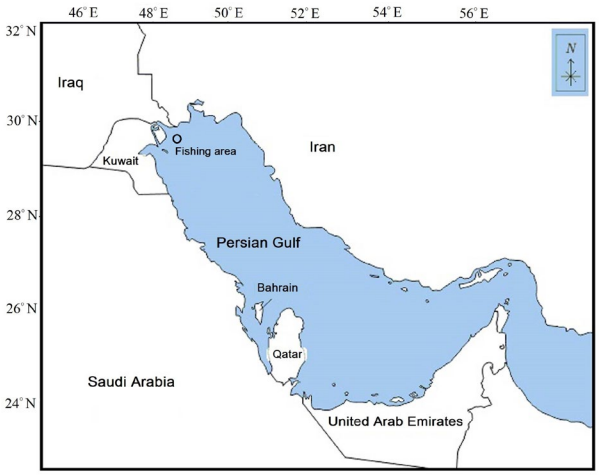

Figure 1. Map showing fishing area in Iraqi marine waters.

Figure 2. *Pardachirus marmoratus* from the Iraqi marine waters.

Finless sole, *P. marmoratus* is distributed across the Indo-West Pacific region, including in the Arabian Gulf and Iranian coastline (Yasemi et al. 2008). The new occurrence of *P. marmoratus* in Iraqi marine waters is significant from an ecological perspective, as it indicates the presence of a species that is adapted to a specific set of environmental conditions. Understanding the distribution and abundance of different species within a given ecosystem is essential for accurately assessing the health and resilience of that ecosystem (Negi & Mamgain 2013). The presence of Finless sole in Iraqi marine waters is likely due to a natural range extension as a result of changes in the marine factors such as winds, marine currents and larval flow and looking for food, or due to the human activity caused introduction of one or more phases of the life cycle of the species (Al-Faisal & Mutlak 2023).

The morphological characters are particularly important because they can provide clues about the evolutionary relationships among different fish species (Girard et al. 2020). *P. marmoratus* is distinguished from other soles in the region by the absence of pectoral fins, dorsal fin rays (63 vs. 58 in *Brachirus orientalis*, and 72 in *Solea elongata*) anal fin rays (49 vs. 50 in *B. orientalis*, and 60 in *S. elongata*), and the

coloration, these characteristics were consistent with Natarajan (1980) and Carpenter et al. (1997).

Table 1. Morphometric and meristic characteristics of *Pardachirus marmoratus* from the Iraqi marine waters.

Morphometric characters	
Total length (mm)	225
Standard length [SL] (mm)	190
Body depth % in SL	40.73
Body width % in SL	8.86
Head length % in SL	23.54
Head depth % in SL	26.09
Head width % in SL	8.86
Snout length % in SL	5.07
Eye diameter % in SL	2.50
Interorbital distance % in SL	1.63
Dorsal fin length % in SL	98.42
Anal fin length % in SL	90.53
Pelvic fin length % in SL	11.01
Caudal peduncle depth % in SL	11.14
Meristic characters	
Dorsal fin rays	63
Anal fin rays	49
Pelvic fin rays	5

The pectoral fins are well developed in the other Soles (*Brachirus orientalis* and *Solea elongate*), compared to their absence in *P. marmoratus*. Pectoral fins are typically used for stability and maneuvering in the water. However, in some flatfish species, including certain members of the family Soleidae, the pectoral fins are either greatly reduced in size or completely absent. This adaptation is thought to have evolved so that these fish could camouflage themselves better on the ocean floor. By reducing or eliminating their pectoral fins, flatfish can more easily bury themselves in the sand or blend in with their surroundings, making them less visible to predators or prey (Chen et al. 2017).

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