

First record of *Torquigener flavimaculosus* (Actinopterygii: Tetraodontiformes: Tetraodontidae) from Réunion Island

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Abstract

The first record of the yellow-spotted puffer, *Torquigener flavimaculosus* Hardy et Randall, 1983, on Reunion Island is confirmed by numerous video observations and by the capture of a specimen. This tetraodontid fish has been reported from the western Indian Ocean, the Red Sea, and the Mediterranean. In this report, we confirm its presence in Saint-Paul Bay in Réunion and this new observation completes the ichthyological inventory of Réunion Island.

Keywords

Baited Remote Underwater Video System, BRUVS, first observation, Indian Ocean, Mascarenes, pufferfish

Introduction

The most recent inventory of fish species from Réunion includes 984 marine and freshwater species belonging to 164 families (Fricke et al. 2009). This inventory conceals an unequal sampling effort between habitats because the majority of censuses were carried out on the coral reefs of the western side of the island (Pinault et al. 2013). Recent studies have provided a better understanding of the sandy and alluvial zones of the northern half of the island, the volcanic zone of Piton de la Fournaise, in the south-east, and the coastal habitats of an artificial reef or wrecks (Pinault 2013; Pinault et al. 2014). Throughout these studies, many new species were discovered and added to the island's faunistic inventory, and there are likely many more species yet to be observed.

As a part of the shark risk reduction, the missions carried out by the Shark Security Center, underwater cameras were deployed on the west and south-west coast of the island, primarily in sandy and detrital areas. The objective of these cameras was to record the frequentation of these sites by potentially dangerous sharks, as well as obtain a record of fish species living in these areas.

Material and methods

Réunion is a volcanic island in the Mascarene Archipelago, which includes Mauritius and Rodrigues. It is located at 21°06'S and 55°33'E, 690 km east of Madagascar. On the west and south-west coasts, highly urbanized and sheltered from the trade winds, fringing-type coral reefs

develop discontinuously over 25 km (Tessier et al. 2008). The southern and eastern regions, exposed to wind and swell, are sparsely inhabited. They are marked by the volcanic activity of Piton de la Fournaise and are characterized by recent flows and high coastal cliffs. Finally, in the northern region, also very urbanized, stretch pebble shores and alluvial black sand beaches.

As part of the monitoring and surveillance of shark populations in Réunion, Baited Remote Underwater Video Systems (BRUVS) were deployed all around the island. While sharks were the target species, an exhaustive list of all observed fish species was compiled.

Additionally, a single, freshly caught specimen of the genus *Torquigener* was brought to the research team for identification. This specimen was used to collect all morphometric information, measuring all characteristics outlined in Sabour et al. (2014) using calipers.

Results

Out of a total of 265 deployments of BRUVS, *Torquigener flavimaculosus* Hardy et Randall, 1983 was observed 22 times at depths ranging from 7 to 50 m (Fig. 1), but the majority of observations were made between 7 and 18 m on volcanic sand substrates. These fish often occurred in small groups ranging from 2 to 11 adult individuals.

Torquigener flavimaculosus is distinguished by the following set of characters which we used to formally identify the species (Fig. 2): the body is elongated. The

Table 1. Morphometric and meristic characters of *Torquigener flavimaculosus* collected from Saint-Paul Bay in Réunion compared with those of Mediterranean specimens reported by other authors.

Character	Presently reported study	Golani 1987	Corsini-Foka et al. 2006	Zenetos et al. 2008
Morphometric				
Number of specimens	1	2	3	1
Total length [mm]	105.0	97.0–98.0	55.0–134.6	133.0
Standard length [mm]	82.0	76.0–77.0	43.1–110.8	110.0
Standard length [%TL]	78.1	78.4–78.6	78.4–82.3	82.7
Head length [mm]	25.0	26.2–27.3	17.1–38.4	25.0
Head length [%SL]	30.5	34.5–35.5	31.1–35.0	22.7
Eye diameter [mm]	8.5	7.2–8.0	4.3–9.6	10.0
Eye diameter [%HL]	34.0	27.5–29.3	25.0–25.1	40.0
Preorbital length [mm]	9.0	—	7.2–11.6	11.0
Preorbital length [%HL]	36.0	—	42.1–43.2	4.0
Postorbital length [mm]	17.0	—	6.4–15.0	21.0
Postorbital length [%HL]	68.0	—	37.4–39.1	84.0
Interorbital space length [mm]	12.0	10.9–11.6	6.5–15.6	—
Interorbital space length [%HL]	48.0	41.6–42.5	38.0–40.6	—
Predorsal fin length [mm]	57.0	54.2–55.4	29.1–76.7	76.0
Predorsal fin length [%SL]	69.5	71.3–71.6	69.0–67.5	69.1
Prepectoral fin length [mm]	27.0	29.7–30.1	18.7–40.9	35.0
Prepectoral fin length [%SL]	32.9	39.1	36.9–43.4	31.8
Preanal fin length [mm]	57	57.6–58.0	31.5–79	83.0
Preanal fin length [%SL]	69.5	75.3–75.8	71.3–73.1	75.5
Caudal peduncle depth [mm]	6.1	5.9	3–8.3	15.0
Caudal peduncle depth [%SL]	7.4	7.8	7–7.5	13.6
Pectoral fin length [mm]	14.0	—	—	25.0
Pectoral fin length [%SL]	17.1	—	—	22.7
Meristics				
Dorsal ray count	9	9	9	—
Pectoral ray count	14	15	14	—
Anal ray count	7	7–8	7	—
Caudal ray count	10	10	10	—

TL = total length, HL = head length; SL = standard length.

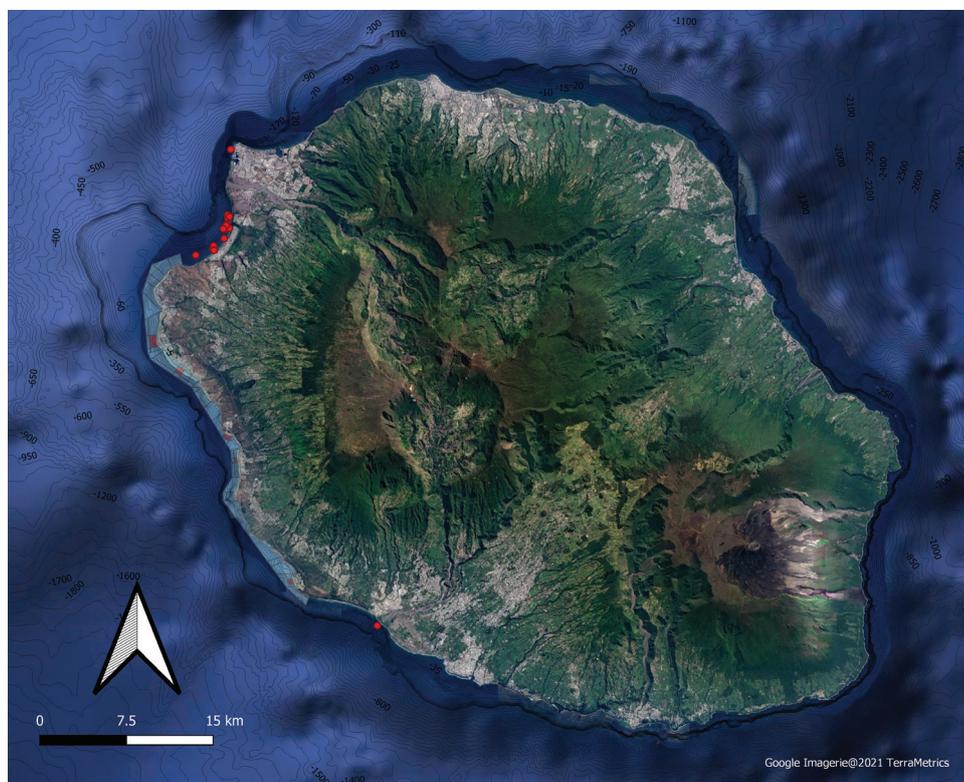


Figure 1. Spots in Saint-Paul Bay, Réunion Island where *Torquigener flavimaculosus* was observed by Baited Remote Underwater Video System (BRUVS) Source: Google Maps.

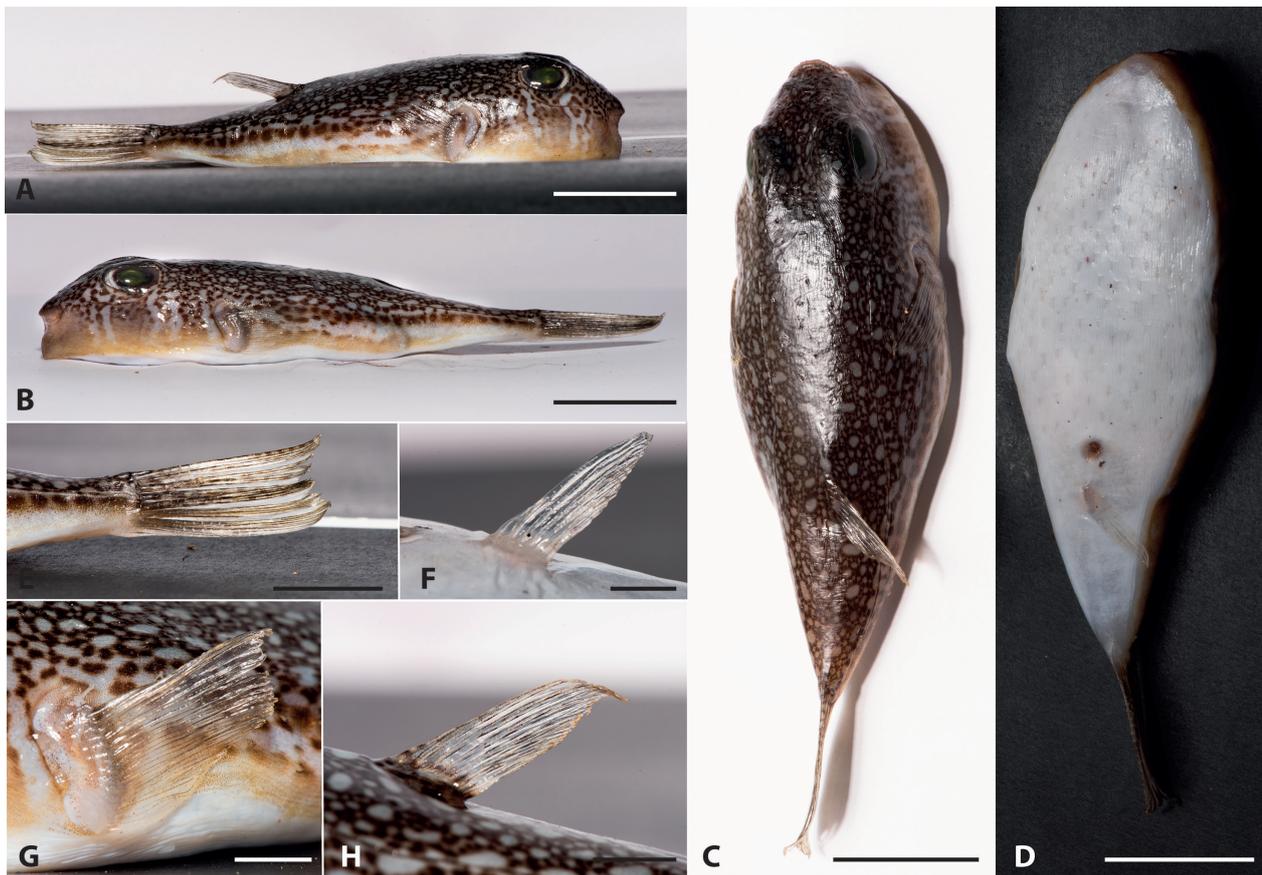


Figure 2. Photo of the *Torquigener flavimaculosus* specimen, collected off Réunion Island; **A** = right side, **B** = left side, **C** = dorsal view, **D** = ventral view, **E** = caudal fin, **F** = anal fin, **G** = pectoral fin, **H** = dorsal fin; scale bars: 2 cm (**A**, **B**, **C**, **D**); 1 cm (**E**); 0.5 cm (**F**, **G**, **H**).

eye is surrounded by the dorsal lateral line. The lower margin of the eye is above the level of the corner of the mouth and above the top of the pectoral fin base. The mouth terminal is at the level of the upper end of the pectoral fin. The chin is distinct. The dorsal and anal fins are elongated and pointed. Small spinules are present on the belly, head, sides, and back in a spot that does not reach the dorsal fin. The lower border gill has a cartilaginous spur. The posterior margin of the gills covers small irregularly distributed spines. The dorsal body surface is brown with gray-whitish spots. A median lateral line of yellow-orange spots is distinguished, followed by a pale yellow area, separating the dorsal surface from the white ventral surface. Vertical yellow-brown stripes on the cheek are separated by irregular white stripes. The caudal fin shows brown spots. The dorsal fin is lightly spotted with white. The anal and pectoral fins are transparent. Table 1 summarizes the main morphometric and meristic data of the captured specimen. They are consistent with the description of this species provided by Hardy and Randall (1983) and Golani (1987) for this species which is referenced in the classification as being part of the Class of Actinopterygii, of the Order of Tetraodontiformes, of the Family of Tetraodontidae, of the Genus *Torquigener* Whitley, 1930 and of the species *Torquigener flavimaculosus*.

Discussion and conclusion

The yellowspotted puffer, *Torquigener flavimaculosus*, is found in the western Indian Ocean from the northern Red Sea to Kenya and in the Arabian Gulf and Seychelles (Froese and Pauly 2021). It has also been recorded in the Mediterranean Sea, as a Lessepsian migrant from the Red Sea, by Golani (1987) in Haifa Bay, Israel. Later, the species has also been recorded from Turkish coastal waters, the north-eastern Mediterranean Sea (Bilecenoglu 2003, 2005; Erguden and Gurlek 2010), and from Greek waters (Corsini-Foka et al. 2006; Zenetos et al. 2008).

By comparing the morphometric and meristic characters of our specimen with other Mediterranean individuals, we do not notice any striking differences in their proportions. The specimen was initially identified visually using body markings and coloration, these matching morphometric measurements help confirm the identification as *Torquigener flavimaculosus*. This is the first sighting of this species in Réunion, where it has been recorded on several occasions, close to the substrate, on a black sandy bottom, between 7 and 50 m of depth. This particular habitat is characterized by an endogenous fauna of mollusks, worms, and echinoderms, which represent abundant food for this invertivorous species (Froese and Pauly 2021). The associated ichthyological fauna

is relatively poor and only a few small pelagic such as *Selar crumenophthalmus* (Bloch, 1793) or *Decapterus macarellus* (Cuvier, 1833) occasionally congregate there (Turquet et al. 1998). The presently reported *T. flavimaculosus* represents a genus with 21 species (Froese and Pauly 2021), none of which have yet been recorded in Réunion. The validation of this species in the area adds to its distribution area and completes the ichthyological inventory of Réunion.

Very little is known about the reproduction of fishes of the genus *Torquigener*. At least one species is known to fabricate intricate nests to attract potential mates

(Kawase et al. 2013). Males were observed defending the nest after reproduction but left once the eggs have hatched (Kawase et al. 2013). It is unknown whether the hatchlings stay demersal or whether they become pelagic and part of zooplankton. According to Froese and Pauly (2021), another species, *Torquigener hypselogeneion* (Bleeker, 1852), is present in Seychelles; it would be interesting to know if this species is present in Réunion. Pelagic larval dispersal is known to occur between the Seychelles and Réunion Island, which could have been a way for the species to colonize the coastal waters of Réunion (Crochelet et al. 2016).

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