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**OBSERVATIONS OF EXTREMELY SHALLOW-WATER HABITAT
USE BY OCEAN TRIGGERFISH, *CANTHIDERMIS SUFFLAMEN*,
AT SAN SALVADOR ISLAND, THE BAHAMAS**

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ABSTRACT

Ocean triggerfish (*Canthidermis sufflamen*) have previously been reported as occupying deep water. We report observations of ocean triggerfish regularly using very shallow, near-shore habitats at San Salvador Island, the Bahamas, a new habitat for the species.

INTRODUCTION

The ocean triggerfish, *Canthidermis sufflamen* (Mitchill, 1815), is usually described as occurring in pelagic habitats, offshore reefs, and near drop-offs to deep water (Hoesé & Moore, 1977; Aiken, 1983; Robins *et al.*, 1986; Humann & DeLoach, 1989) with a minimum typical depth of 5 m (Gasparini & Floeter, 2001; Feitoza *et al.*, 2003). A few sources suggest ocean triggerfish occur, at least rarely, inshore (Böhlke & Chaplin, 1968; Randall, 1996; Gasparini & Floeter, 2001; Froese & Pauly, 2009) and Randall (1967) collected one specimen in a water depth of ~3 m. Here, we report the regular occurrence of ocean triggerfish in very shallow water adjacent to shore at San Salvador Island, The Bahamas.

METHODS AND RESULTS

San Salvador is a small island (~11 km x 19 km) atop a small, isolated platform at the edge of the continental shelf (Shaklee, 2008) (Figure 1). The shallow-water shelf (≤ 15 m) surrounding the island is narrow, with a sharp shelf-break to deep water usually < 1 km from shore and in some places < 0.25 km (Diehl *et al.*, 1988).

We observed ocean triggerfish in shallow-water habitats during 6 trips to San Salvador during the month of January, 2001–2011. The observations were made during visits to coastal and near-shore habitats in conjunction with a class we teach based at the Gerace Research Centre, College of The Bahamas. Starting in 2005, we systematically recorded all sightings of ocean triggerfish in shallow-water habitats and recorded the events with still photographs or video, when possible.

Between January, 2001, and January, 2011, we observed ocean triggerfish in shallow, nearshore habitats a total of 18 times at 6 locations (Table 1). All of our sightings during this period were in either Graham's Harbor, at the north end of San Salvador, or Snow Bay, on the south-east edge (Figure 1). From land, we observed ocean triggerfish swimming close to shore in very shallow (≤ 1.5 m) water on 12 separate occasions (Table 1). In several cases, the water depth was less than the height of the fish so that the top of its dorsal fin stuck out of the water (Figure 2). We observed triggerfish over both seagrass and rocky benthic habitats, and we often saw triggerfish in pairs. In 2009 and 2011, we also saw ocean triggerfish near shallow (< 2 m depth) patch reefs close to shore in Graham's Harbor (Table 1). On one occasion, while snorkeling at Dump Reef at night, we observed two triggerfish wedged into holes in the reef, apparently resting or sleeping. Since January, 2011, we have additionally seen ourselves or received reports of triggerfish adjacent to shore near Lindsey Reef, North Point, Snow Bay near Pigeon Creek, and East Beach (Figure 1).

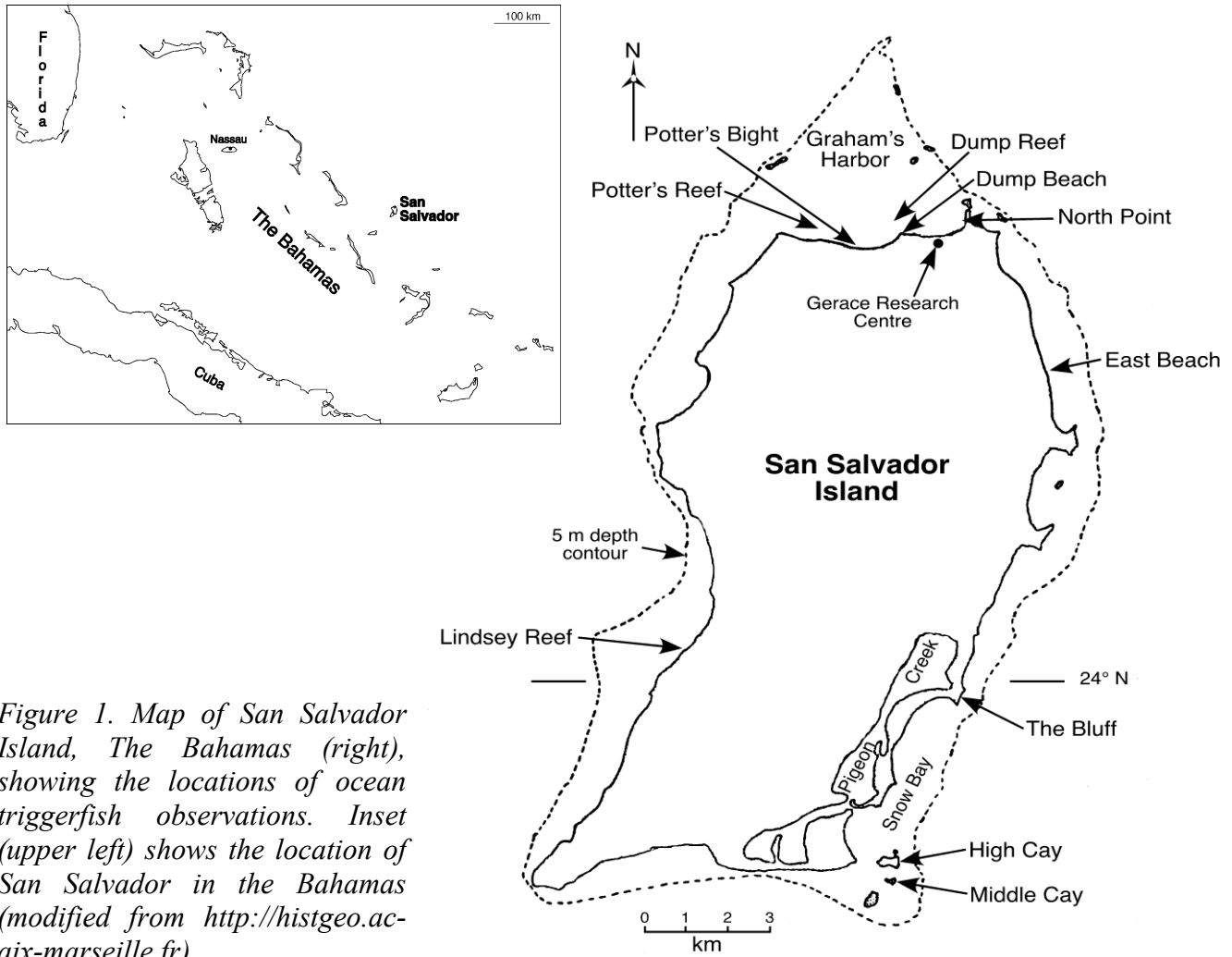


Figure 1. Map of San Salvador Island, The Bahamas (right), showing the locations of ocean triggerfish observations. Inset (upper left) shows the location of San Salvador in the Bahamas (modified from <http://histgeo.ac-aix-marseille.fr>)

Table 1. Locations and habitat characteristics of observations of ocean triggerfish (*Canthidermis sufflamen*) in nearshore habitats adjacent to San Salvador Island, The Bahamas, January, 2001 – January, 2011. All observations except those marked with an asterisk were made from shore. Locations are shown in Figure 1. Visits = the total number of times we (the authors) visited a location. Triggerfish sightings = the number of visits that at least one ocean triggerfish was observed. Sighting frequency = $100 \times (\text{triggerfish sightings}/\text{visits})$.

Location	Est. water depth (m)	Benthic habitat	Visits	Triggerfish sightings	Sighting frequency (%)
Dump Reef*	~ 2	patch reef	11	3	27%
Dump Beach	< 1	rocky	6	2	33%
Potter's Reef*	~ 2	patch reef	6	3	50%
Potters Bight	< 1	seagrass, sand	15	1	7%
The Bluff	< 1	rocky	7	4	57%
High & Middle Cays	≤ 1.5	rocky, seagrass	6	5	83%



Figure 2. A pair of ocean triggerfish (*Canthidermis sufflamen*) swimming over shallow seagrass just offshore from High Cay, San Salvador, The Bahamas, in January, 2005.

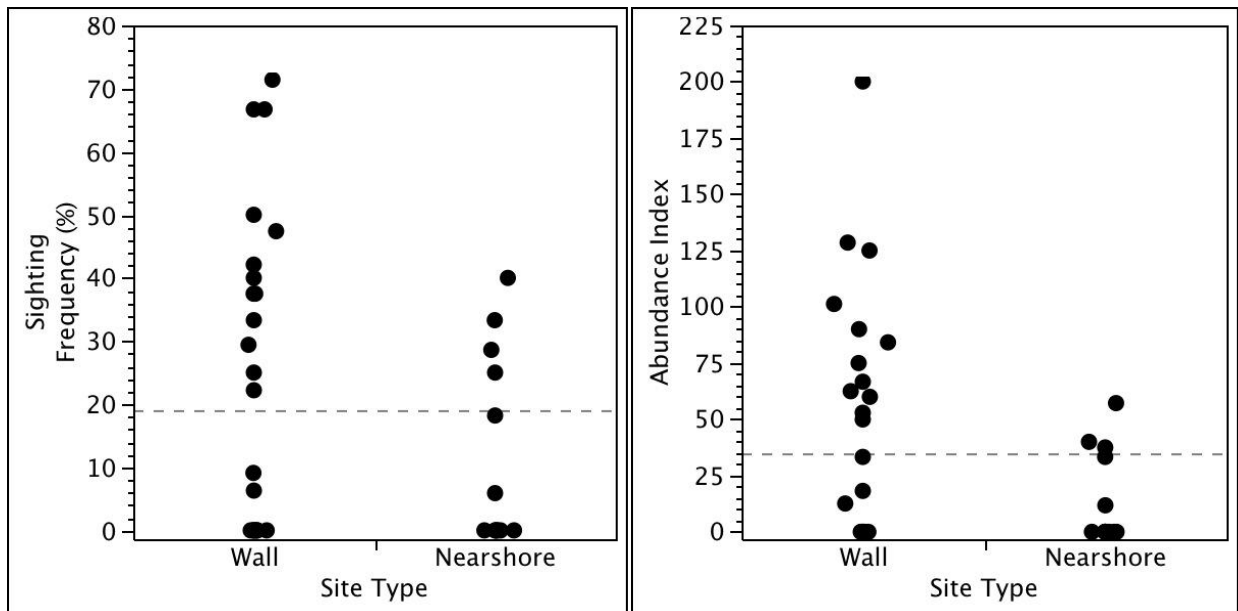


Figure 3. Sighting frequency (left) and relative abundance (right) of ocean triggerfish at deep-water (Wall, $n = 24$) and nearshore ($n = 16$) sites surrounding San Salvador, Bahamas. Data are from the REEF Volunteer Survey Database (REEF, 2011). The horizontal dashed line shows the overall mean for all sites. Wall sites are along the edge of the island's shallow platform where depth increases rapidly from about 15 m. Nearshore sites are on the platform at water depths ≤ 7 m. Sighting frequency = percent of surveys ocean triggerfish were seen at a site. Abundance index = sighting frequency \times density index. See text for a description of survey methods.

To broaden the spatial and temporal scope of observations, we acquired data from the REEF sport divers using the Roving Diver Technique: during a normal recreational dive, the volunteer records every species positively identified and, when possible, a density index score. The density index uses a logarithmic scale ranging from 1 (1 individual) to 4 (more than 100 individuals) (REEF, 2011).

In May, 2011, the REEF database for San Salvador consisted of 354 surveys at 52 sites going back to 1993 (REEF, 2011). Of the 52 sites, we could identify the location of 40 and categorize them as “wall” (n = 24) or “nearshore” (n = 16). Wall sites are primarily dive sites used by two commercial dive operations on San Salvador and are located along the edge of the shallow platform where water depth increases rapidly from ~15 m. Nearshore sites are all on the shallow-water shelf with depths less than 7 m.

For each of these 40 sites, we obtained two measures of ocean triggerfish distribution from the REEF database, sighting frequency and abundance index. Sighting frequency (SF) is the percent of surveys that a species is recorded at a particular site. The abundance index is calculated by multiplying SF by the average density index for the site, which gives a relative measure of species abundance that includes zero densities (absences) (REEF, 2011).

Ocean triggerfish abundance was consistently higher at wall sites compared to nearshore sites (Figure 3, right). While the maximum values for sighting frequency are higher for wall than nearshore sites, there is considerable overlap between the two site types (Figure 3, left). In particular, over ¼ of the nearshore sites had sighting frequencies >10%, indicating that ocean triggerfish occur regularly in shallow water around San Salvador.

DISCUSSION

Our observations and the REEF database both suggest that, at least at San Salvador, ocean triggerfish regularly come into very shallow water adjacent to shore, a type of habitat use not

volunteer diver survey database (www.reef.org). These fish surveys are conducted by volunteer previously reported in the literature for this species. We suspect that most of the ocean triggerfish we observed were foraging. When we were able to make extended observations, the fish typically swam along a section of shore repeatedly, sometimes poking at the substrate, behavior that suggests searching for prey. Although ocean triggerfish are usually listed as feeding mainly on large zooplankton (Aiken, 1983; Randall, 1996; Gasparini & Floeter, 2001; Froese & Pauly, 2009), this is largely based on Randall (1967), who collected most of his specimens from deep water. However, he reported that one specimen from shallower water (~3 m) had only echinoid remains in its gut (Randall, 1967). Citing Randall (1967) and one additional study from Cuba, FishBase (Froese & Pauly, 2009) reports zoobenthos as 30-60% of the ocean triggerfish's diet and lists cirrepedes (barnacles), crabs, gastropods, and sea anemones as specific food items. Other triggerfish are predators on benthic invertebrates (Hiatt & Strasburg, 1960; Reinthal *et al.*, 1984; Turingan & Wainwright, 1993; Vose & Nelson, 1994). Ocean triggerfish likely also have the feeding morphology to consume benthic invertebrates (Turingan & Wainwright, 1993; Vose & Nelson, 1994), which are abundant in the nearshore rocky and seagrass habitats around San Salvador. Thus, we conclude that *C. sufflamen*'s habitat use and diet are broader than previously reported.

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REFERENCES

- Aiken, K.A. 1983. The biology, ecology and bionomics of the triggerfishes, Balistidae. Pp. 191-205 in Munro, J.L., ed., *Caribbean Coral Reef Fishery Resources*. ICLARM, Manila, Philippines.
- Böhlke, J.E., and C.C.G. Chaplin. 1968. *Fishes of the Bahamas and Adjacent Tropical Waters*. University of Texas Press, Austin, TX, 771 pp.
- Diehl, F., D. Mellon, R. Garrett, and N. Elliott. 1988. *Field Guide to the Invertebrates of San Salvador Island, Bahamas*. Bahamian Field Station, Ltd., 105 pp.
- Feitoza, B.M., L.A. Rocha, O.J. Luiz-Júnior, S.R. Floeter, and J.L. Gasparini. 2003. Reef fishes of St. Paul's Rocks: new records and notes on biology and zoogeography. *Aqua Journal Ichthyology and Aquatic Biology* 7:61-82.
- Froese, R., and D. Pauly. 2009. FishBase. <http://www.fishbase.org>. Accessed on 5 March 2009.
- Gasparini, J.L., and S.R. Floeter. 2001. The shore fishes of Trindade Island, western South Atlantic. *Journal of Natural History* 35:1639-1656.
- Hiatt, R.W., and D.W. Strasburg. 1960. Ecological relationships of the fish fauna on coral reefs of the Marshall Islands. *Ecological Monographs* 30:65-127.
- Hoese, H.D., and R.H. Moore. 1977. *Fishes of the Gulf of Mexico, Texas, Louisiana, and Adjacent Waters*. Texas A & M University Press, College Station, TX, 327 pp.
- Humann, P., and N. DeLoach. 1989. *Reef Fish Identification: Florida, Caribbean, Bahamas*. New World Publications, Jacksonville, Fla., 272 pp.
- Randall, J.E. 1967. Food habits of reef fishes of the West Indies. *Studies in Tropical Oceanography* 5:665-874.
- Randall, J.E. 1996. *Caribbean Reef Fishes, 3rd edition*. T.F.H. Publishers, Neptune City, NJ, 368 pp.
- REEF. 2011. Reef Environmental Education Foundation Volunteer Survey Project Database. www.reef.org. Accessed on 5 May 2011.
- Reinthal, P.N., B. Kensley, and S.M. Lewis. 1984. Dietary shifts in the queen triggerfish, *Balistes vetula*, in the absence of its primary food item, *Diadema antillarum*. *Marine Ecology - Pubblicazioni Della Stazione Zoologica Di Napoli I* 5:191-195.
- Robins, C.R., G.C. Ray, J. Douglass, and R. Freund. 1986. *A Field Guide to the Atlantic Coast Fishes of North America*. Houghton Mifflin, Boston, MA, 354 pp.
- Shaklee, R.V. 2008. *In Columbus' Footsteps: Geography of San Salvador, The Bahamas*. Gerace Research Centre, San Salvador, The Bahamas, 94 pp.
- Turingan, R.G., and P.C. Wainwright. 1993. Morphological and functional bases of durophagy in the queen triggerfish, *Balistes vetula* (Pisces, Tetraodontiformes). *Journal of Morphology* 215:101-118.
- Vose, F.E., and W.G. Nelson. 1994. Gray triggerfish (*Balistes capricus* Gmelin) feeding from artificial and natural substrate in shallow Atlantic waters of Florida. *Bulletin of Marine Science* 55:1316-1323.