

Instant Ocean®

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Advancing the Hobby of the Marine Aquarist

Encounters of the Volitans Kind!

By Robert Di Marco, international lecturer and clownfish breeder

In January 2005, while I was giving a talk on clownfish rearing at the monthly Brooklyn Aquarium Society meeting, my wife, Louise, and I received an invitation from two unexpected audience members. Joe Yaiullo, curator/co-founder, and Todd Gardner, aquarist, of Atlantis Marine World had driven from Long Island to hear the talk. They cordially invited us to tour their wonderful public aquarium.

Todd had mentioned to me during previous get-togethers, that in the fall he and the staff at Atlantis Marine World collect numerous tropical fish that are pulled up the Atlantic coast by the currents of the Gulf Stream and end up along the harbors and bays. During our tour, nevertheless, we were more than surprised to see many tropicals, such as various species of damselfish, filefishes, triggerfishes, butterflies, trumpet fishes, as well as blue, gray and French angels. All had been collected in the Long Island, New York area and were on public display at the aquarium!

More fascinating still, another display at the Aquarium contained several lionfish that also had been collected from around pilings at the local marina. These lionfish were in various stages of maturity, and some were so young that their full coloration had not yet developed. There was no doubt at that time that the *Pterois volitans* not only are surviving the colder waters off the northeast coast, but they are also reproducing!



Adult volitans lionfish living in the Bahamas



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In May 2004, despite having seen the numerous lionfish at Atlantis Marine World, I was glued to my chair in utter amazement at one of the presentations at the combined conferences of Marine Ornamentals/World Aquaculture in Honolulu. Todd Gardner gave a spellbinding talk and showed photos that provided clear proof that the Atlantic Ocean now contains colonies of the Indo-Pacific lionfish *Pterois volitans*!

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SPECIAL EVENTS

- **Marine Ornamentals Conference**
February 9-12, 2008
Lake Buena Vista, Florida
Learn more at:
www.hawaiiacquaculture.org/marineornamentals08.html
- **Marine Aquarium Expo**
April 5-6, 2008
Orange County, California
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Todd presented the results of various reports⁽¹⁾, tracking the chronology from the first discovery to increased sightings and concluding with the astonishing fact that lionfish may actually be surviving the cold waters along the coast of northeastern United States. Little did I know then that I, a clownfish breeder from Montreal, would two years later become witness to this spectacular development!

July 30, 2006, was the first day of our vacation in Nassau, The Bahamas. I couldn't wait to don my snorkeling gear and jump into the warm waters of the Gulf Stream and enjoy my favorite vacation pastime, admiring the jewels of the sea in their natural habitat.

Lionfish Sightings in the Western Atlantic Ocean, 2000–2004 ⁽³⁾	
2000	First recorded Atlantic sighting of lionfish (a pair), off the coast of North Carolina.
2001	Collected information proves sightings in the same region have increased almost ten times.
2002	Encounters double again. Now area of sightings stretches from southeastern coast of Florida to Long Island, New York.
2004	Lionfish sightings all along Eastern Seaboard become even more abundant.
2004	Remarkable reports of lionfish off the Mexican Yucatan Peninsula, Bermuda and St. Kitts.

After about an hour of snorkeling—peering in and out between the coral rubble, crevices, and limestone boulders—I was making my way back to our beach area, when out of the corner of my eye I noticed the unusual swaying motion of a reddish-brown and white weed-like “plant.” Curiously, instead of flowing with the current as did the adjacent floating algae, the object actually swam back and forth against the current with its appendages flowing. Then it hit me: I am snorkeling in the Bahamas in four feet of water, barely 60 feet from the resort beach, and I am staring at a live Pacific *Pterois volitans*, leisurely swimming in a crevice, looking for its next meal!

I could not believe my eyes. I swam as

fast as I could, calling out to my wife, “Louise! The camera! The camera!” Louise came running. “What is it? French angel? Queen angel? Shark? Stingray?!” I was finally able to catch my breath and blurt out, “LIONFISH!” Louise reacted with total disbelief, “Are you sure?!”

Although Louise is a fish nut “widow,” she has absorbed by osmosis much fish lore. She immediately related to Todd’s presentation two years earlier. She continued expressing her amazement: “You’re positive you saw a lionfish?” She handed me the underwater camera and ran for her snorkeling gear. We took a number of pictures as well as videos in total euphoria of having witnessed this amazing species of fish in the Caribbean! The photos accompanying this article bear witness to what we saw on that day.

The day after my extraordinary encounter with the volitans, we went shopping in downtown Nassau. I was pleasantly surprised to find a store on Main Street that had a saltwater aquarium, which made a very interesting showpiece. In discussion with the shop owner, he indicated that he and his employee Patrick took care of the tank. We were later joined in the conversation by Patrick, who was most excited to tell me that he was astounded to have caught a lionfish in his net in Nassau Harbor! Evidently, he was highly intrigued to learn the source of the lionfish.

This ever-increasing substantiation of more lionfish in the Atlantic Ocean raises a wave of questions and emotions. First among them, just where did these Pacific fish come from and what are the consequences?

Let’s look at several hypotheses about the possible source:

The first is that the larvae could have been carried in the ballast water of ocean vessels. If the cause is ballast water, why then are we not seeing other varieties of tropical fish from the Pacific, and vice versa?

The second is accidental release. A paper published in 1995 records that an accidental release of a number of lionfish occurred in Biscayne Bay, Florida, in 1992. But if this is the source, why did the first sightings occur off North Carolina and not in Floridian waters,

and why eight years later? Could release or escape have occurred later, following a hurricane? Did the lionfish somehow escape from a public aquarium or a fish hatchery?⁽²⁾



After missing a juvenile, Robert nets an adult lionfish to photograph.

The third possible explanation is intentional release. Did the species find itself in the Atlantic because of introduction by curious or bored aquarists? By diving companies wishing to embellish dive sites? By ornamental commercial fish collectors wishing to secure a new collecting area?

For me, the hypothesis of escape from an aquarium has the most credibility. Any partial flow of ocean water through a hatchery or public aquarium could result in fertilized eggs and larvae entering Gulf Stream waters, which are teeming with micro algae, rotifers, and varieties of copepods. (When I have nothing to do poolside, I often take samples of ocean water and look at them through a hand-held microscope. I am surprised to see the multitude of microscopic organisms living in a single drop, readily available to larval fish.)

After the 2006 Nassau trip, I procrastinated completing this article for a year and, yes, took another vacation in the Bahamas! I was anxious to don snorkeling gear once again and, armed with my camera, see if I could locate another lionfish. We were in the water for barely five minutes when we sighted our first lionfish! We snapped many pictures and moved on. No more than 50 feet away, strategically positioned under a small ledge, was another lionfish. I caught this one—very easily, as it did not swim away when I moved the net in front of it—and took some great pictures inside the vinyl net and on the reef after

releasing the fish. The next day, another beach, another snorkeling outing, and two more lionfish sighted!

I was happy to have seen and photographed six lionfish in three different areas, but I was in for another shock. After handing the camera to Louise, I went to collect a few sea biscuits and the beautiful skeletons of sea urchins. As I looked down near the base of the same sea wall, about 20 feet away from the pair of lionfish we had seen earlier, a baby lionfish appeared. It was barely two inches long, and the typical red *volitans* pigmentation was extremely pale—characteristic of the lighter coloration of many juvenile fish.

I marveled at this golf ball-shaped little fish with its appendages swaying in the current, and then I did a silly thing! If I could simply catch it in my shell-collecting net, I imagined, we could take some great close-ups, as we had done with the large lionfish. I could not have been more wrong. I barely moved my net toward the little fish, and it disappeared with lightning speed into one of the many holes drilled by rock-boring urchins. I had expected the calm, leisurely swimming manner of the larger specimen, but this juvenile probably was still unsure of its venomous defenses.

Cooperative Hunting Behavior in Lionfish, Captive and in the Wild

During a vacation to Nassau, The Bahamas, in 2004, my wife and I visited Atlantis at Paradise Island, then the largest public aquarium in the world (before the Georgia Aquarium opened). One unique exhibit tank we saw housed as many as two dozen very large lionfish.

Having never seen lionfish in the wild, I believed from the literature that lionfish usually were found as solitary specimens or in pairs, but we were surprised to see that this large congregation of lionfish were living together harmoniously. What's more, we were told that the lionfish in the exhibit actually cooperate in hunting down the live food introduced into the tank; they corner the specimen as a team, and then each lionfish gets its meal in succession.

Since then, one author relates witnessing this same behavior in the wild, in the Pacific, where about a dozen lionfish were hunting as a pack.



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Several key questions remain unanswered: What ultimate impact will the lionfish “contamination” have on the Atlantic ecosystem? Are there any measures being taken or considered to limit or eradicate the species? How great is the danger that the highly venomous red lionfish poses to human health? And, of course, how large is the Atlantic lionfish population, and how fast is it growing?

To the last question—if my simplistic empirical calculation could be used for these sightings—the lionfish population is reproducing in the Caribbean and has doubled in the last twelve months. An in-depth analysis that documents the species’ true growth rate and the ecosystem effects of lionfish in the Atlantic would be a good project for someone’s graduate thesis.

When I contemplate my first sighting during our 2006 trip to the Bahamas, and the four- to five-inch lionfish that I witnessed—positioned in a natural channel between two limestone rocks that were teeming with mouth-size grunts and damsels—I believe the survival of the Atlantic lionfish is assured. Moreover, with the further evidence of

the tiny juvenile this year, it seems that finally, to paraphrase Ian Malcolm in the film *Jurassic Park*, *Nature is finding a way!*

References

- (1) Talk at Marine Ornamentals held in Honolulu from March 1 to March 4, 2004 by Todd Gardner, entitled “Invasion of the Indo-Pacific Lionfish (*Pterois volitans*) along the East Coast of North America,” and “Biological invasion of the Indo-Pacific lionfish *Pterois volitans* along the Atlantic coast of North America.” Paula E. Whitfield¹, Todd Gardner², Stephen P. Vives³, Matthew R. Gilligan⁴, Walter R. Courtenay Jr.⁵, G. Carleton Ray⁶, Jonathan A. Hare¹. as published in MEPS Vol. 235. Publication date: June 19, 2002, Print ISSN: 0171-8630; Online ISSN: 1616-1599, Copyright © 2002 Inter-Research.
 - 1 – NOAA Beaufort Laboratory, Beaufort, North Carolina
 - 2 – Biology Department, Hofstra University, Hempstead, New York
 - 3 – Department of Biology, Georgia Southern University, Statesboro, Georgia
 - 4 – Marine Science Programs, Savannah State University, Savannah, Georgia
 - 5 – Florida Caribbean Science Center, US Geological Survey, Gainesville, Florida
 - 6 – Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia
- (2) Personal communication with Todd Gardner and Charles Delbeck.
- (3) Tour boat Captain Bobby Edwards from Web site: “Lionfish in North Carolina” http://www.atlantischarters.net/timeline_2001.htm.

Part 2a: Science Behind Synthetic Sea Salts

From the Labs of Instant Ocean

Visit www.instantocean.com to read Part 1 of this continuing article, found in the Vol. 23, Fall 2007 issue.

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2. Instant Ocean

a. The early formulas.

Instant Ocean® synthetic sea salt was developed by Aquarium Systems, Inc. (ASI), which was founded in 1964 by William Kelley. Kelley had been director of the Cleveland Aquarium, a part of the Cleveland Museum of Natural History.

Instant Ocean synthetic sea salt today is the number one synthetic sea salt (SSS) in the world. It was first formulated by Robert R. Segedi and Kelley in the early 1960s (Segedi and Kelley 1964). Their formula was a modification of a formula that Kelley obtained from Dr. Dieter Backhaus of the Exotarium of the zoological gardens of Frankfurt am Main, Germany. This formula and the Instant Ocean modification of it were not exact replicates of natural seawater (NSW). Instead, NSW values were taken as guidelines rather than as an absolute target.

The first Instant Ocean formula was definitely not a consumer product. It consisted of four parts, with most of the salts in part one. Part two was calcium chloride, and parts three and four were mixtures of trace elements. Segedi and Kelley reported that they were able to maintain invertebrates indefinitely with this formula—something not previously possible.

Throughout the 1960s, Kelly and Segedi continued formulating Instant Ocean, and as early as 1965 they filed patent applications for the formula. Their first patent was granted June 22, 1971 (US Patent 3,585,967). It covered a two-part dry formula; part one contained the basic salts, and part two contained trace elements. A second patent (US Patent 3,623,455) was granted on November 30, 1971, and a third (US Patent 3,886,904) on June 3, 1975.

Over the years, a number of modifications to the Instant Ocean formula have been made. Some of the modifications were changes in the chemical compounds used to formulate Instant Ocean. Other modifications were in the final amounts of the various ions in the dissolved product. The formula for Instant Ocean is proprietary and a trade secret. Only a select few individuals with Instant Ocean know the formula, and they work under non-disclosure agreements to guard against the formula's being copied. For those reasons, only general references are made to the Instant Ocean formula in this paper.

PUBLICATION INFORMATION

SeaScope® was created to present short, informative articles of interest to marine aquarists. Topics may include water chemistry, nutrition, mariculture, system design, ecology, behavior, and fish health. Article contributions are welcomed. They should deal with pertinent topics and are subject to editorial reviews that in our opinion are necessary. Payments will be made at existing rates and will cover all author's rights to the material submitted.

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