The Rise of Northern Gulf of Mexico Lionfish Derbies: How Do They Compare?

El Aumento de Derbies de Pez León en el Golfo de México Norte

L'ascension des Concours de Pêche de Rascasses Volantes : Quels Peuvent Être les Critères ?

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EXTENDED ABSTRACT

Although the first lionfish (*Pterois volitans*) was detected in the northern Gulf of Mexico (nGOM) in 2010, the first lionfish derby was not organized in the region until 2012. Since then, the number of derbies in the nGOM has increased in frequency and lionfish categories are now included in most fishing and diving events. The increase in lionfish derbies is likely due to dive industry engagement resulting from outreach, education and the increase of lionfish sightings throughout the region. From 2012 to 2014, 11,783 lionfish were collected during a total of 14 lionfish specific derbies from throughout the nGOM although the majority of the derbies were held east of the Mississippi river. Since 2014, more than 25,000 lionfish have been removed from a total of 27 lionfish specific derbies. At a minimum, collection date, location, and depth associated with capture were provided by each derby participant. Although, in many cases, more detailed information, including total length (TL), was recorded for each individual lionfish. Lionfish derbies are an efficient and accurate way to sample the population as there is incentive to harvest every lionfish observed (Akins et al. 2011), therefore reducing size-based bias commonly associated with 'trophy' fishing tournaments. TL is a relatively simple metric to record from lionfish harvested during derbies and can be used to model population age structure (Johnson and Swenarton 2016), as well as a means to compare populations among years and locations that provides important information for developing sound management plans.

The Gulf Coast Lionfish Coalition (Pensacola, FL) and Reef Monitoring, Inc. (St. Petersburg, FL) have organized annual lionfish derbies since May and September 2014, respectively. TL was recorded for every lionfish harvested during each derby. Before analysis, TL data was log transformed. Mean TL was compared by year within each location using an ANOVA and if significant, a Tukey Post Hoc test was used to determine homogeneous subsets. Additional derbies were hosted to allow for the comparison (T-Test) of two locations on the same temporal scale (Sept 2014 and May 2016). The annual derbies hosted in Pensacola yielded greater mean numbers of lionfish compared to St. Petersburg (Mean = 3,641 and 961, respectively). This is an expected result given that the waters offshore NW Florida are reported to have the highest lionfish densities in their invaded range (Dahl and Patterson 2014). In St. Petersburg, mean TL was different ($p < 0.001$) among years and two homogeneous subsets were determined; 2016 had smaller lionfish (255.34 ± 1.37 mm) than 2014 (269.4 ± 2.51 mm) and 2015 (275.8 ± 2.01 mm) (Figure 1A). In Pensacola, mean TL was different among years ($P<0.001$) and two homogenous subsets were determined; 2014 had smaller lionfish (233.1 ± 1.67 mm) compared to 2015 (244.3 ± 2.15 mm) and 2016 (241.7 ± 0.697 mm) (Figure 1B). Comparisons between locations resulted in a significant difference in mean TL ($p < 0.001$) between St. Petersburg and Pensacola in September 2014 and May 2016. In September 2014, St. Petersburg reported a greater mean TL (269.43 ± 2.51 mm) compared to Pensacola (244.81 ± 2.13 mm) ($p < 0.001$ although in May 2016, the mean TL in St Petersburg (218.42 ± 2.53 mm) was significantly less ($p < 0.05$) than Pensacola (241.69±0.70mm) (Figure 2).

Given the relatively recent invasion of lionfish into the nGOM, we would expect the mean TL to still be increasing with year. This is the case in Pensacola, as data from the most recent derby held in 2016 resulted in the largest mean TL. Derbies held in St Petersburg resulted in a smaller mean TL being reported during the most recent derby, which may be explained by the recent increase in commercial activity in waters offshore St Petersburg, FL. The increased commercial activity results in divers harvesting or selecting the larger, marketable lionfish thus reducing the mean TL during derbies being held in the same area. The difference in mean TL between locations was not expected as the invasion progressed into the region at the same time. Perhaps the difference in mean TL was a result of density dependent growth (Dahl and Patterson 2014), although this would only explain the differences seen in September 2014. The difference may also be explained by the difference in peak spawning activity between the two locations as peak spawning activity occurs earlier in the year offshore St. Petersburg compared to Pensacola (Fogg et al., *In press*).

The importance of lionfish derbies should not be understated. Trotta (2016) conducted surveys at numerous derbies held throughout Florida and the Bahamas from September 2013 until June 2014 to determine the economic impact of lionfish derbies to the areas they are hosted. One derby hosted by the Gulf Coast Lionfish Coalition as well as one hosted by Reef Monitoring, in May 2014, were surveyed during their study. These two derbies yielded the fewest number of

participants but resulted in more lionfish compared to the other derbies surveyed in the Trotta (2016) study. While the number of lionfish removed during a derby event is important, the outreach and data collected may be of greater value. Outreach activities can result in an increase in derby attendance and even spur participation in subsequent events. It can also result in the increase in demand for lionfish as a food fish. This increase in commercial demand results in a more consistent and sustained harvest outside of a weekend derby, and may result in a greater impact to the lionfish population on a local scale.

The information reported in this study is important to determine how the lionfish population structure differs by location over time, using the same sampling procedures. Collaborations with local recreational divers are critical in evaluating the progression of the lionfish invasion and it

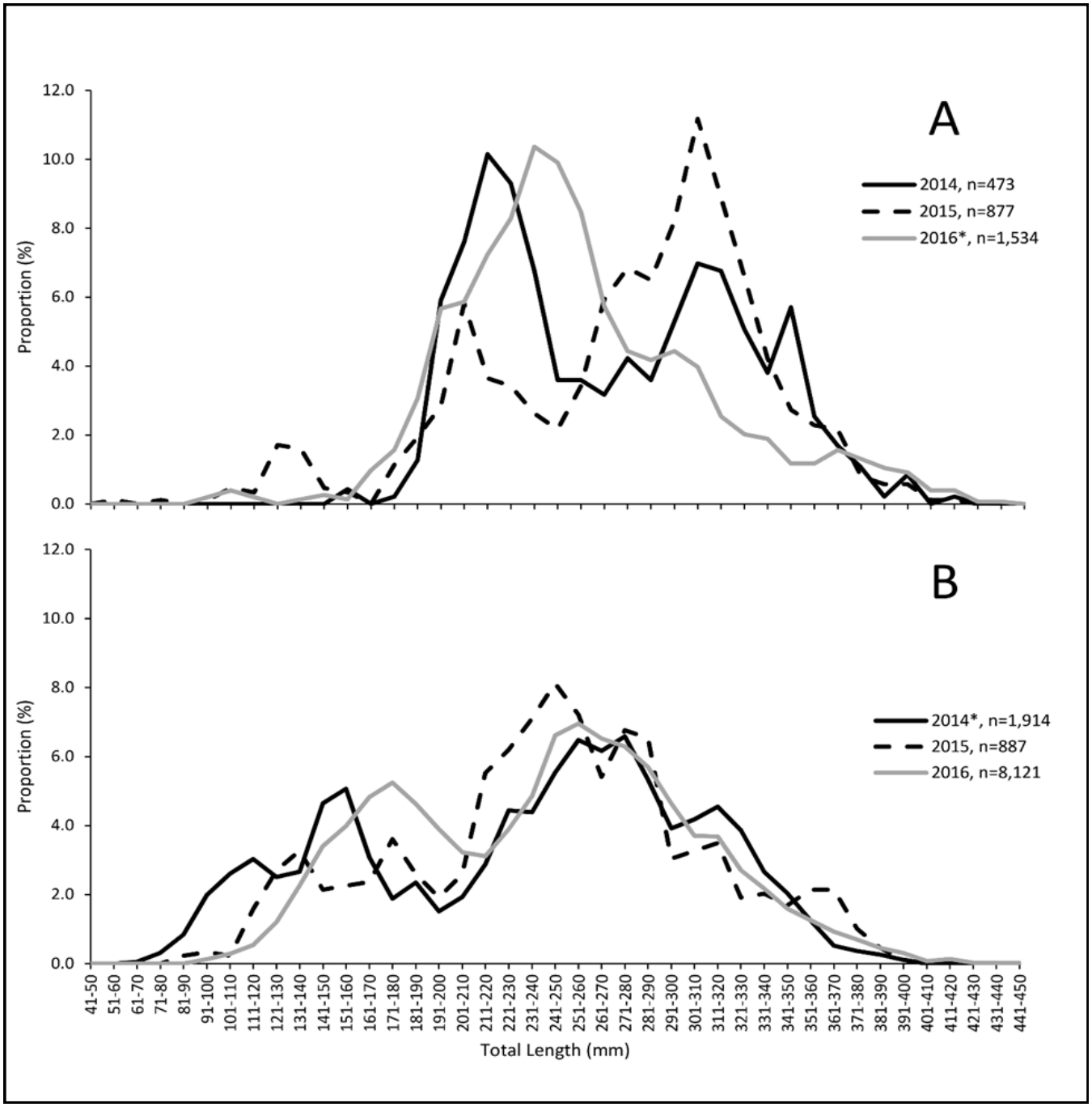

Figure 1. Proportion of length distribution of lionfish by year (2014 - 2016) in A) St. Pete, Florida and B) Pensacola, Florida. Mean total length was significantly different by year for both locations and homogeneous subsets were determined using a Tukey post-hoc test. Homogeneous subsets identified by the presence and absence of an asterisks in the figure legend.

will be important to document when the mean TL stabilizes and if it decreases due to the increase of lionfish harvesting activities from derbies and commercial demand.

KEYWORDS: Invasive, Lionfish, *Pterois*, Derby, Gulf of Mexico

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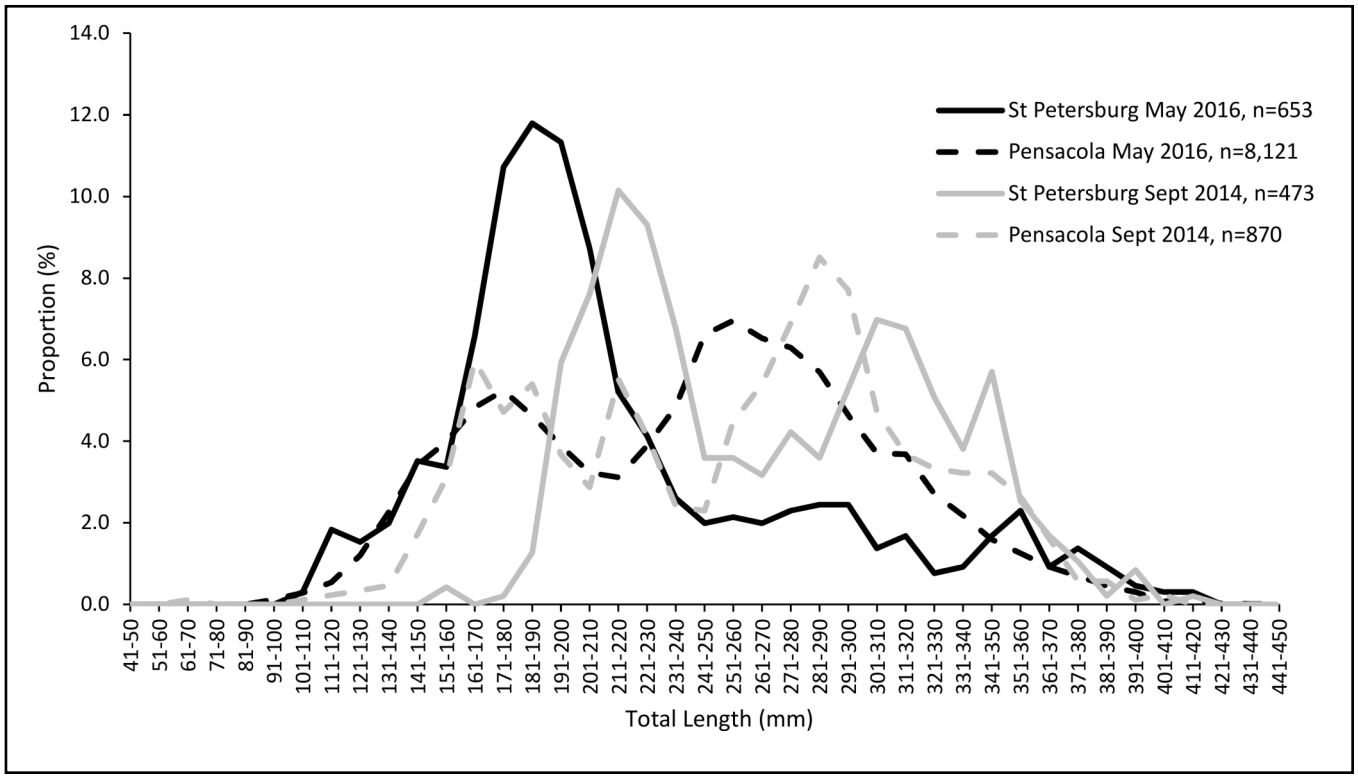

Figure 2. Proportion of invasive lionfish length distribution by year for two locations where lionfish derbies were held on the same day. Mean total length was significantly different by location for both years.