



The effect of the Florida Current on the dispersal of larval fish



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Introduction

Western boundary currents such as the Gulf Stream have a significant impact on the distribution and abundance of larval fish. The Florida Current flows northward past the Florida Keys to the eastern shore of Florida. Transport of water along the 27°N latitude between South Florida and the Bahamas has been measured quarterly since 2002. Though valuable, these oceanographic data would be enhanced through biological sampling that would provide information on the ecologically and commercially valuable fishes present (e.g. Istiophoridae and Scombridae). The addition of such data would provide valuable knowledge on the distribution and seasonal variation of such species in this area. Biological sampling in the way of ichthyoplankton net tows, coupled with the oceanographic data series, will give information on the dynamic between larval fish and the physical processes of the Florida Current.

Objectives

1. Assess the abundance and composition of larval fish occurring in the Florida Current
2. Determine the distribution of ecologically and commercially important species in South Florida waters
3. Evaluate temporal variation of the larval composition and abundance in South Florida



Fig 1. Larval fish collected from various neuston samples. From left, Serranidae, Scombridae, Lutjanidae, Istiophoridae, Scaridae. Scale indicates 1 mm.

Methods

Cruises took place on the R/V F.G. Walton Smith in September 2009 (WS 0916) and November 2009 (WS 0921). Neuston nets were deployed at nine stations across the 27°N latitudinal gradient. The net used had a mesh of 500 µm, and a flowmeter was only used during WS 0921 in order to estimate the volume of water filtered. The net was deployed using a davit and a manual winch, and the tow was performed off the starboard side of the ship (Fig 2). Each tow was performed at night, and lasted for ten minutes. The resulting sample was rinsed and then preserved in 97% EtOH. The volume and mass of each sample was found, and they were then sorted for larval fish, cephalopods, and lobster, using dissecting microscopes. Once sorted, fish were identified to the lowest possible taxonomic level.



Fig 2. R/V F.G. Walton Smith (L); Neuston net tow with rig (R).

Preliminary Results

- Sep. 2009 – 488 fish collected, 37 families identified; Carangidae 28%, Scombridae 17%, Sphyraenidae 13%, Myctophidae 5%
- Nov. 2009 – 353 fish collected, 53 families identified; Mullidae 16%, Carangidae 13%, Myctophidae 8%, Gerreidae 6%
- Istiophoridae (n=13) and Lutjanidae (n=7) present in September, but absent in November
- Mullidae (n=55) present in November, but absent in September
- Carangidae, Scombridae, and Sphyraenidae present in high numbers in September, but comparatively smaller numbers in November
- Myctophidae and Bothidae present in similar amounts for both cruises

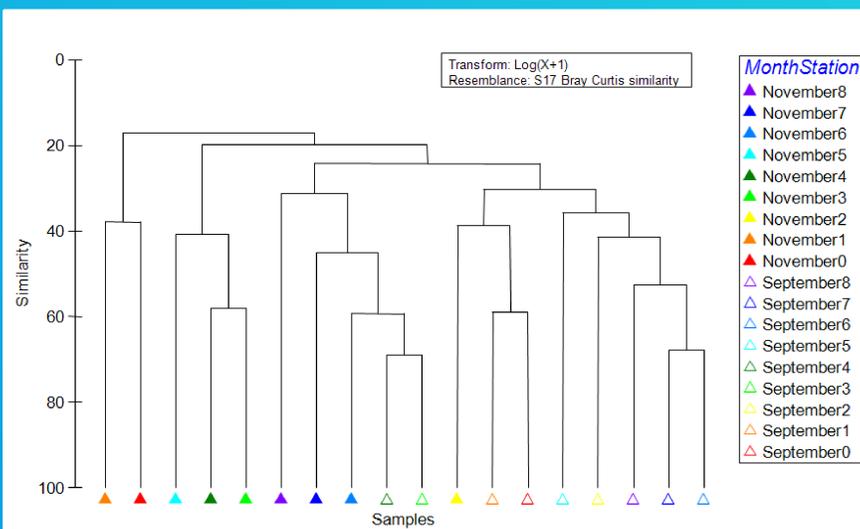


Fig 3. Cluster analysis, created with Primer-6, shows grouping of stations based on similarity. Stations group strongly according to cruise and distance from shore.

Discussion

Temporal and spatial variation between the two cruises can be observed, although a time series describing distribution of ichthyoplankton across the Gulf Stream has just begun. The larval fish composition was notably different between WS 0916 and WS 0921, as seasonal fluctuations in weather and temperature may determine the presence and abundance of different species. The presence of Istiophorids and Scombrids in September and absence in November suggests that these families may reach the end of their spawning seasons in the fall and begin again sometime after the winter (Richards and Luthy 2006; Richards 2006). Additional samples collected since this preliminary analysis (a third cruise took place 18-20 May 2010) may confirm further seasonal variation. The presence of deepwater Myctophids within the current during both cruises (Fig 4a) suggests possible upwelling or behavioral events, such as feeding, that bring these fish to the surface (Bakun 1996). The inshore distribution of Carangids (Fig 4b) may be attributed to the formation of eddies off the Florida Current that can entrain these larvae. As they grow, it is also possible that these fish may be looking to settle in the marine nurseries near the Florida coast (Bakun). As the recently obtained samples and future collections are sorted, a baseline of larval composition in the Florida Current will be established. Based on seasonal changes, these data will be useful as climate continues to change, and can be utilized by fish biologists and fisheries managers to assess population structure and spawning habits of ecologically and commercially valuable species. The next cruise is scheduled to take place in early September 2010.

References

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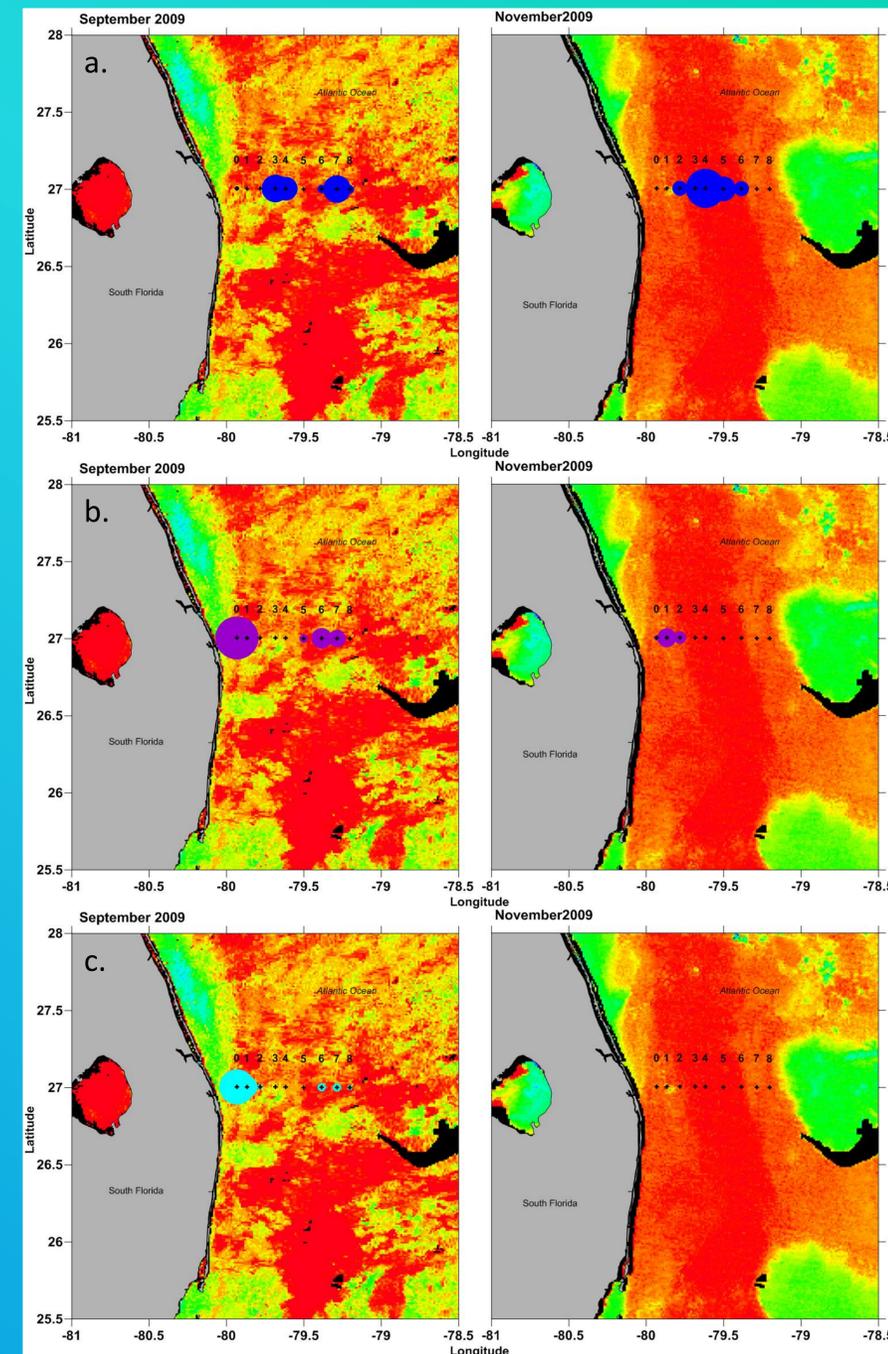


Fig 4. Abundance of families Myctophidae (4a), Carangidae (4b), and Scombridae (4c), during the September and November cruises, with respect to the southeast coast of Florida and the Florida Current. Distribution created with Surfer, and satellite imagery provided by ROFFS.

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