I/UCRC Executive Summary	**Date**: November 5, 2019

Title: Characterization of the length-at-age composition of the Atlantic Chub Mackerel fishery in the mid-Atlantic for 2019

PI: Robert Leaf

Center/Site: Science Center for Marine Fisheries (SCeMFiS)

Statement of Problem: The following project is an extension of work to characterize the age and length composition of the mid Atlantic chub mackerel fishery. The project has components: 1.) characterize the length composition of Atlantic Chub Mackerel (ACM) in the commercial fishery for the 2019 season and 2.) assess trophic "importance" of ACM using published data. The first component involves collaborative work with SeaFreeze Ltd. and Lund's Fisheries. The second component of the work relies heavily on integrating NOAA NEFSC and published data.

The goal of this work will be to continue to understand inter and intra annual variation in length composition (and integrating the data with those collected from previous ACM work supported by SCEMFIS), to maintain a continuous time-series of fishery-dependent length-composition. As a second objective, We will use published data and an analytical tool "network analysis" to describe the prevalence of Atlantic Chub Mackerel (*Scomber colias*) and other prey items (invertebrates and fishes) in the diets of a suite of highly migratory species (Tunas, Billfish, Wahoo, and Dolphinfish) in the mid-Atlantic region with emphasis on HMS. We will focus our efforts on understanding the diets of HMS in the Mid-Atlantic Region. Although ACM is presumed to be a critical forage fish, there is an absence of *S. colias* reported in the diets of HMS fishes from the US South Atlantic.

Deliverables: Milestones for objective 1 include coordinate with SeaFreeze Ltd. and Lund's Fisheries, travel to NJ to determine length, weight, and collect otoliths, perform network analysis and report to MAFMC and IAB.

The deliverables for objective 2 of the project is to publish, in a peer-reviewed journal, and make a report to MAFMC's SSC the results of the network analysis. I will model the paper on previously published work: Oshima and Leaf 2018, Leaf and Oshima, 2019, and Leaf (2017), and Navia et al. (2019, Leaf is co-author).

Status relative to deliverables:

Objective 1: I have coordinated with Lund's Fisheries (J. Kaelin and J. Reichle) to collect Chub Mackerel for sampling. They assured me that they will put fish aside for us when they are collected.

We have made progress on objective 2. Specifically we have synthesized the results of published studies (Dragovich 1966; Manooch et al. 1983; Chase 2002; Satoh et al. 2004; Vaske Júnior et al. 2004; Potier et al. 2004; Rawlins et al. 2007; Butler et al. 2010; Rudershausen et al. 2010; Pinheiro et al. 2010; Vaske et al. 2011; Goñi et al. 2011; Logan et al. 2011; Vaske-Jr et al. 2012; Williams et al. 2015). In each paper, prey of HMS species are identified to the lowest possible taxa and various diet metrics including frequency of occurrence, index of relative importance, percent volume are used. These metrics, for each predator, can be transformed and scaled to create a synthetic index of prey "importance". The 16 published studies contain 2,896 unique predator-prey interactions. The information of presence/absence derived from DNA barcoding will be incorporated into the network as will the stomach content analysis information derived in this study. A feature of network analysis is that simulation analysis can be performed to understand the contagious effects of perturbation of network nodes. For example, in the network analysis of the Gulf of Mexico food web, the impacts of reducing the abundance of the forage fish Gulf Menhaden was investigated such that the impacts of directly connected and unconnected nodes (predators) could be evaluated (Oshima and Leaf 2018). One of the major sources of stomach contents data, yet to be summarized, is the publicly available NOAA NEFSC data base.

Summary of results relative to deliverables:

Objective 1. No results to report.

Objective 2. The table below is a summary of the n = 16 published studies focused on evaluating stomach contents of highly migratory species in the Atlantic (US and Europe).

Region		Number of Identified Prey Taxa	Number of Identified Prey Species
Bay of Biscay	Bluefin Tuna	99	39
Mid-Atlantic	Wahoo	75	15
	Blue Marlin	68	35
	Yellowfin Tuna	98	28
New England	Bluefin Tuna	96	84
North and Tropical Atlantic	Wahoo	21	0
	Dolphinfish	23	0
	Atlantic Sailfish	43	0
	Blue Marlin	22	0
	White Marlin	5	0
	Longbill Spearfish	27	0
	Albacore Tuna	25	0
	Yellowfin Tuna	27	0
	Bigeye Tuna	36	0
	Swordfish	23	0
North Carolina, USA	Bluefin Tuna	96	70
Northwest Atlantic	Skipjack Tuna	8	4
	Bigeye Tuna	44	26
Tropical Atlantic	White Marlin	40	30
	Blue Marlin	37	28
	Yellowfin Tuna	40	31
South Atlantic	Greater Amberjack	108	36
Southeast US	King Mackerel	18	3
	Spanish Mackerel	18	6

Challenges to project completion and recommendations addressing the same:

Objective 1. Awaiting coordination with J. Kaelin and J. Reichle to collect Chub Mackerel for sampling.

Objective 2. No challenges to report.

Both deliverables will be completed by the project close date, April 30, 2020.