Tilefish − *Lopholatilus chamaeleonticeps*

Overall Vulnerability Rank = High

Biological Sensitivity = High
Climate Exposure = High
Data Quality = 75% of scores ≥ 2

	Lopholatilus chamaeleonticeps	Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)
Sensitivity attributes	Stock Status	2.2	2.8	
	Other Stressors	2.1	2.6	
	Population Growth Rate	3.8	2.6	
	Spawning Cycle	2.1	2.8	
	Complexity in Reproduction	2.3	0.8	
	Early Life History Requirements	2.0	0.8	
	Sensitivity to Ocean Acidification	1.4	1.8	
	Prey Specialization	1.2	3.0	
	Habitat Specialization	2.9	3.0	
	Sensitivity to Temperature	2.1	2.6	
	Adult Mobility	3.1	2.4	
	Dispersal & Early Life History	2.0	1.4	
	Sensitivity Score	High		
Exposure variables	Sea Surface Temperature	3.9	3.0	
	Variability in Sea Surface Temperature	1.0	3.0	
	Salinity	2.2	3.0	
	Variability Salinity	1.2	3.0	
	Air Temperature	1.0	3.0	
	Variability Air Temperature	1.0	3.0	
	Precipitation	1.0	3.0	
	Variability in Precipitation	1.0	3.0	
	Ocean Acidification	4.0	2.0	
	Variability in Ocean Acidification	1.0	2.2	
	Currents	2.1	1.0	
	Sea Level Rise	1.1	1.5	
	Exposure Score	High		
	Overall Vulnerability Rank	High		

Low
Moderate
High
Very High

Tilefish (*Lopholatilus chamaeleonticeps*)

Overall Climate Vulnerability Rank: **High** (100% certainty from bootstrap analysis).

Climate Exposure: **High**. Two exposure factors contributed to this score: Ocean Surface Temperature (3.9) and Ocean Acidification (4.0). All life stages of Tilefish use marine habitats.

Biological Sensitivity: **High.** Two factors scored above 3.0: Population Growth Rate (3.8) and Adult Mobility (3.1). Tilefish are slow growing and long-lived (Lombardi-Carlson and Andrew 2015). In addition, Tilefish use burrows for shelter and are relatively site specific (Able et al. 1982).

Distributional Vulnerability Rank: **Low** (100% certainty from bootstrap analysis). Tilefish is site specific and inhabit specialized habitats. They do have planktonic larvae, but this stage is very rare in regional ichthyoplankton sampling suggesting limited dispersal (Steimle et al., 1999).

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Tilefish on the Northeast U.S. Shelf is estimated to be neutral, but with a moderate degree of uncertainty (66-90% certainty in expert scores). Tilefish is a warm-water fish and warming in the Northeast U.S. may result in more available habitat. However, Tilefish has high habitat specificity and the effect of warming on habitat availability in uncertain. In addition, the effect of climate on productivity is unclear.

Data Quality: 75% of the data quality scores were 2 or greater indicate that data quality is moderate.

Climate Effects on Abundance and Distribution: A Tilefish die-off in 1882 was attributed to enhanced southward transport of cold water in the Labrador Current, coincident with a minimum in the North Atlantic Oscillation (NAO) index during the early 1880s (Marsh et al., 1999). Fisher et al. (2014) hypothesized that NAO affected commercial landings throughout most of the 20th century by altering slope water temperatures and likely the Tilefish's reproductive success; warmer water increases productivity of Tilefish, while colder water decreases productivity. However, Fisher et al. (2014) proposed that the environment-landings relationship broke down as exploitation increased.

Life History Synopsis**:** Tilefish is a large, long-lived, demersal, warm-water species of fish that occurs from Nova Scotia to Suriname, but not in the Caribbean Sea, and is primarily found from the southern edge of Georges Bank to Key West, Florida, and throughout the Gulf of Mexico (Steimle, 1999). Tilefish reach maturity at 5-11 years, with males slower to mature than females (Able, 2002). Spawning occurs from March to November with a peak in May to September (Steimle, 1999). Little is known about spawning behavior, but Tilefish are highly fecund, may be pair spawners, and are likely fractional or serial spawners (Steimle, 1999; Able, 2002). Eggs are buoyant and hatch after at least 40 hours based on captive eggs held at warmer temperatures than experienced in the wild (Steimle, 1999). Larvae are planktonic from July to September in warm waters over the outer continental shelf (Steimle, 1999). Larvae are probably zooplanktivorous (Steimle, 1999). Settlement patterns are unknown, but juveniles have been found in vertical shaft burrows in semi-lithified clay and in anthropogenic structures like lobster traps and ship wrecks (Steimle, 1999). Juveniles may not be able to excavate their own burrows initially, so may use the burrows of other animals to start their own (Steimle, 1999). Juveniles consume benthic organisms such as crabs, Conger Eels, Hagfish, bivalve molluscs, polychaetes, holothurians, sea anemones, and echinoderms, but occasionally consume pelagic prey such as salps, squid, and small fish (Steimle, 1999). Adults and juveniles have been found from depths of 80-540 m, but mostly occur in a narrow band of the outer continental shelf and upper slope (100-200 m) where water temperatures stay

fairly stable (8-17°C) known as the warm belt (Steimle, 1999). Small migrations or hibernation during low temperature events are possible, but a mass mortality event in 1882 is attributed to a flood of cold water into the area (Steimle, 1999; Able, 2002). Tilefish require structure such as boulders, the scour depressions beneath them, or more commonly, vertical or horizontal burrows in semi-lithified clay that they likely inhabit and continue to excavate throughout their adult life, never migrating far (Steimle, 1999). Tilefish stay close to their burrows at night, but forage on a variety of benthic prey during the day including: shrimps, crabs, molluscs, polychaetes, sea cucumbers, brittlestars, urchins, anemones, tunicates, and occasionally fishes (Able, 2002). Molluscs and echinoderms dominate the diet of smaller fish, but their diet shifts to galatheids, spider crabs, and ophiuroids in larger fish (Able, 2002). Tilefish burrows are also subcolonized by decapod crustaceans, and for all inhabitants, are likely a way to avoid predators (Steimle, 1999; Able, 2002). Monkfish (Goosefish), Spiny Dogfish, Conger Eels, and larger Tilefish prey on juveniles while sharks are suspected to prey on adults (Steimle, 1999). The Mid Atlantic Fishery Management Council manages Tilefish through the Golden Tilefish Fishery management plan. The Mid-Atlantic stock is considered rebuilt and is not overfished or undergoing overfishing, based on the most recent assessment (NEFSC, 2014). The southeast United States and Gulf of Mexico stocks are also not overfished nor undergoing overfishing (SEDAR, 2011a, b).

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