White Hake − *Urophycis tenuis*

Overall Vulnerability Rank = Moderate

Biological Sensitivity = Moderate

Climate Exposure = High

Data Quality = 79% of scores ≥ 2

	Urophycis tenuis	Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)
Sensitivity attributes	Stock Status	2.6	2.8	
	Other Stressors	1.9	0.4	
	Population Growth Rate	2.6	2.7	
	Spawning Cycle	2.7	2.5	
	Complexity in Reproduction	1.5	1.4	
	Early Life History Requirements	2.1	1.4	
	Sensitivity to Ocean Acidification	1.2	2.4	
	Prey Specialization	1.2	3.0	
	Habitat Specialization	1.2	3.0	
	Sensitivity to Temperature	2.0	2.8	
	Adult Mobility	1.4	2.7	
	Dispersal & Early Life History	2.4	2.0	
	Sensitivity Score	Moderate		
Exposure variables	Sea Surface Temperature	3.9	3.0	
	Variability in Sea Surface Temperature	1.0	3.0	
	Salinity	1.1	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	1.2	1.5	
	Exposure Score	High		
Overall Vulnerability Rank		Moderate		

Low
Moderate
High
Very High

White Hake (*Urophycis tenuis*)

Overall Climate Vulnerability Rank: **Moderate** (90% 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 White Hake use marine habitats.

Biological Sensitivity: **Moderate**. Three sensitivity attributes scored above 2.5: Stock Status (2.6), Population Growth Rate (2.6), and Spawning Cycle (2.7). White Hake are not overfished nor is overfishing occurring, but the species is relatively rare in the Northeast U.S. Shelf. Growth of adults is relatively slow and spawning occurs in a relatively narrow time span (early spring) in deep water (Chang et al., 1999).

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

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on White Hake on the Northeast U.S. Shelf is likely to be negative (90-95% certainty in expert scores). White Hake is a cold-temperate species and warming could cause distribution shifts out of the region.

Data Quality: 79% of the data quality scores were 2 or greater indicate that data quality is moderate.

Climate Effects on Abundance and Distribution: There is a lack of information regarding the potential effects of climate on White Hake productivity. In terms of distribution, Nye et al. (2009) found that White Hake distribution has shifted northwards and into deeper waters over time.

Life History Synopsis**:** White Hake is an estuarine and marine, demersal species found from Newfoundland to North Carolina (Klein-MacPhee, 2002; NEFSC, 2013). The population is divided into two stocks: a Canadian stock primarily occurring in the Gulf of St. Lawrence and Scotian Shelf, and a United States stock primarily from the Gulf of Maine and Georges Bank (NEFMC, 2014). The northern stock moves inshore to spawn in August and September; the southern stock is believed to move offshore to the continental slope to spawn in early spring (April-May; Chang et al., 1999). However, timing and location of spawning is uncertain for the United States stock (Chang et al., 1999; NEFMC, 2014). Females are larger and longer-lived than males, but both are mature around 1.5 years (Chang et al., 1999). Egg and larval distributions are poorly understood for the United States stock (Chang et al., 1999; NEFMC, 2014). Eggs are pelagic, occurring across the shelf in a wide range of temperatures, and hatch within a week of spawning (Chang et al., 1999). Larvae are pelagic and probably occur in offshore waters along the continental slope off southern Georges Bank and the mid-Atlantic (Chang et al., 1999). Early juveniles are pelagic for approximately two months before settling to muddy and fine-grained, sandy bottom or eelgrass habitat on the shelf and in estuaries (Chang et al., 1999). Juveniles prefer warmer, less saline, more turbid waters and migrate inshore when waters are warm and offshore when cool (Chang et al., 1999). The diet of demersal juveniles includes polychaetes, shrimp, and other crustaceans (Chang et al., 1999). Atlantic puffin and Arctic tern are major predators of juvenile White Hake (Chang et al., 1999). Adult White Hake are demersal occurring from estuaries to the upper continental slope and deep basins on muddy and fine-grained, sandy bottom (Chang et al., 1999). Adults also move inshore during warmer months on Georges Bank and the Gulf of Maine (Chang et al., 1999). Fish, including young White Hake, squid, shrimp, and other crustaceans are the main prey of the species (Chang et al., 1999; Klein-MacPhee, 2002). Several species of fish including Sandbar Shark, larger White Hake, and Atlantic Cod as well as Atlantic puffin and arctic tern are major predators of hake

(Klein-MacPhee, 2002). The New England Fishery Management Council manages White Hake under the Northeast Multispecies Fisheries Management Plan (NEFMC, 2014). White Hake are neither overfished nor is overfishing occurring (NEFSC, 2013).

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