

Pollock – *Pollachius virens*

Overall Vulnerability Rank = Moderate ■

Biological Sensitivity = Moderate ■

Climate Exposure = High ■

Data Quality = 88% of scores ≥ 2

<i>Pollachius virens</i>		Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)	<div><div>Low</div><div>Moderate</div><div>High</div><div>Very High</div></div>
Sensitivity attributes	Stock Status	1.1	2.8	<div><div></div><div></div><div></div><div></div></div>	
	Other Stressors	1.4	2.2	<div><div></div><div></div><div></div><div></div></div>	
	Population Growth Rate	3.0	2.2	<div><div></div><div></div><div></div><div></div></div>	
	Spawning Cycle	2.2	3.0	<div><div></div><div></div><div></div><div></div></div>	
	Complexity in Reproduction	1.6	2.5	<div><div></div><div></div><div></div><div></div></div>	
	Early Life History Requirements	2.6	1.2	<div><div></div><div></div><div></div><div></div></div>	
	Sensitivity to Ocean Acidification	1.6	2.0	<div><div></div><div></div><div></div><div></div></div>	
	Prey Specialization	1.5	3.0	<div><div></div><div></div><div></div><div></div></div>	
	Habitat Specialization	1.3	3.0	<div><div></div><div></div><div></div><div></div></div>	
	Sensitivity to Temperature	1.9	2.4	<div><div></div><div></div><div></div><div></div></div>	
	Adult Mobility	1.7	2.5	<div><div></div><div></div><div></div><div></div></div>	
	Dispersal & Early Life History	1.1	3.0	<div><div></div><div></div><div></div><div></div></div>	
	Sensitivity Score		Moderate		
	Exposure variables	Sea Surface Temperature	3.9	3.0	<div><div></div><div></div><div></div><div></div></div>
Variability in Sea Surface Temperature		1.0	3.0	<div><div></div><div></div><div></div><div></div></div>	
Salinity		1.2	3.0	<div><div></div><div></div><div></div><div></div></div>	
Variability Salinity		1.2	3.0	<div><div></div><div></div><div></div><div></div></div>	
Air Temperature		1.0	3.0	<div><div></div><div></div><div></div><div></div></div>	
Variability Air Temperature		1.0	3.0	<div><div></div><div></div><div></div><div></div></div>	
Precipitation		1.0	3.0	<div><div></div><div></div><div></div><div></div></div>	
Variability in Precipitation		1.0	3.0	<div><div></div><div></div><div></div><div></div></div>	
Ocean Acidification		4.0	2.0	<div><div></div><div></div><div></div><div></div></div>	
Variability in Ocean Acidification		1.0	2.2	<div><div></div><div></div><div></div><div></div></div>	
Currents		2.1	1.0	<div><div></div><div></div><div></div><div></div></div>	
Sea Level Rise		1.1	1.5	<div><div></div><div></div><div></div><div></div></div>	
Exposure Score		High			
Overall Vulnerability Rank		Moderate			

Pollock (*Pollachius virens*)

Overall Climate Vulnerability Rank: **Moderate** (72% 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 Pollock use marine habitats.

Biological Sensitivity: **Moderate**. Two sensitivity attributes scored above 2.5: Population Growth Rate (3.0) and Early Life History Requirements (2.6). Pollock are relatively late maturing (4-6 years) and long-lived (25 years) (NEFSC, 2012). Pollock are winter spawners and have a long egg and larval period. Juveniles use inshore habitats before moving offshore and joining adult populations (Cargnelli et al., 1999).

Distributional Vulnerability Rank: **High** (98% certainty from bootstrap analysis). Pollock are pelagic and highly mobile. Early life stages are dispersive.

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Pollock on the Northeast U.S. Shelf is very likely to be negative (>95% certainty in expert scores). Pollock is a cold-temperate species and warming could limit habitat; shifts into deeper water have been observed. There is also evidence for a congener that productivity will decrease as temperatures warm.

Data Quality: 88% of the data quality scores were 2 or greater indicate that data quality is moderate.

Climate Effects on Abundance and Distribution: Spawning activity and success is negatively impacted by higher temperatures in the congener *P. pollachius* (Suguet et al., 2005) suggesting that warming could decrease productivity of Pollock in the Northeast U.S. Shelf ecosystem. Although latitudinal movements in the distribution of Pollock have not been documented (Perry et al., 2005; Nye et al., 2009), Pollock have moved into deeper waters in recent years on both sides of the Atlantic (Dulvy et al., 2008; Nye et al., 2009).

Life History Synopsis: Pollock is a boreal, marine species found in the eastern and western Atlantic. In the western Atlantic, Pollock occur from western Greenland, Hudson Strait, and Labrador to Cape Hatteras, North Carolina, but are uncommon south of New Jersey (Able and Fahay, 2010). Pollock reach maturity between ages 3 and 6 (NEFSC, 2010). Spawning peaks from November to February as water temperature drops (peaking in 4.5-6°C water; Cargnelli et al., 1999). Most spawning occurs in the northern part of the range (Georges Bank, western Gulf of Maine, Massachusetts Bay, and Scotian Shelf) over hard, stony, or rocky bottom, but eggs and small larvae collected in the southern portion indicates limited spawning in areas near Delaware Bay and the Virginia Capes (Cargnelli et al., 1999; Able and Fahay, 2010). Some large adults form huge spawning aggregations in winter and spring (Klein-MacPhee, 2002; Able and Fahay, 2010). Eggs are pelagic and incubate for 1-2 weeks (Klein-MacPhee, 2002). Larvae are also pelagic on the continental shelf in 50-250 m cool water during February – May (Cargnelli et al., 1999; Able and Fahay, 2010). After 3-4 months, late larvae migrate inshore and by 25-30 mm have most of the adult characters (Cargnelli et al., 1999; Klein-MacPhee, 2002). Larvae consume phytoplankton and copepod nauplii when small then switch to copepods, amphipods, cumaceans, isopods, and larval fishes at later stages (Able and Fahay, 2010). Larvae transform to a pelagic juvenile stage at sizes >25 mm and move into estuaries during late winter or after approximately 6 months (Cargnelli et al., 1999; Able and Fahay, 2010). Juveniles remain in rocky coastal and estuarine areas for 1-2 years before moving offshore (Cargnelli et al., 1999; Able and Fahay, 2010). Juveniles feed near

vegetated areas and consume mostly euphausiids, but some amphipods, decapod larvae, isopods, copepods, polychaetes, and small fishes have also been observed in stomachs (Able and Fahay, 2010). Juvenile and adult Pollock distribution is highly influenced by temperature; avoiding habitat with temperature >15°C with seasonal migrations (Klein-MacPhee, 2002; Able and Fahay, 2010). Juveniles make several inshore-offshore migrations to avoid extreme temperature for up to two years before joining the adult populations and occur over sand, mud, rock, and vegetated bottom in a wide range of temperatures (Cargnelli et al., 1999). Juveniles join the adult population at approximately 20 cm during autumn and are found across the shelf in spring and autumn, but offshore and to the south (as far as the mid-Atlantic region) in the winter (Able and Fahay, 2010). Adults are found throughout the water column and make short inshore-offshore migrations to avoid temperature extremes and north-south migrations for spawning (Cargnelli et al., 1999; Klein-MacPhee, 2002). Pollock are deeper in the water column during spring and summer than during winter and adults move farther offshore than juveniles (Cargnelli et al., 1999). Spawning adults move into shallower waters during the spawning season and the northern populations may migrate south to the Gulf of Maine and Georges Bank to spawn (Klein-MacPhee, 2002). Adult Pollock consume pelagic crustaceans (particularly euphausiids), small fishes, and squid (Able and Fahay, 2010). Spiny Dogfish, Monkfish (Goosefish), American lobster, minke whale, gray seal, harbor seal, and larger Pollock are the primary predators of the species (Klein-MacPhee, 2002). The New England Fishery Management Council manages Pollock as part of the Northeast Multispecies Fishery Management Plan. Pollock are not overfished, and overfishing is not occurring (NEFSC, 2010).

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