Atlantic Sea Scallop − *Placopecten magellanicus*

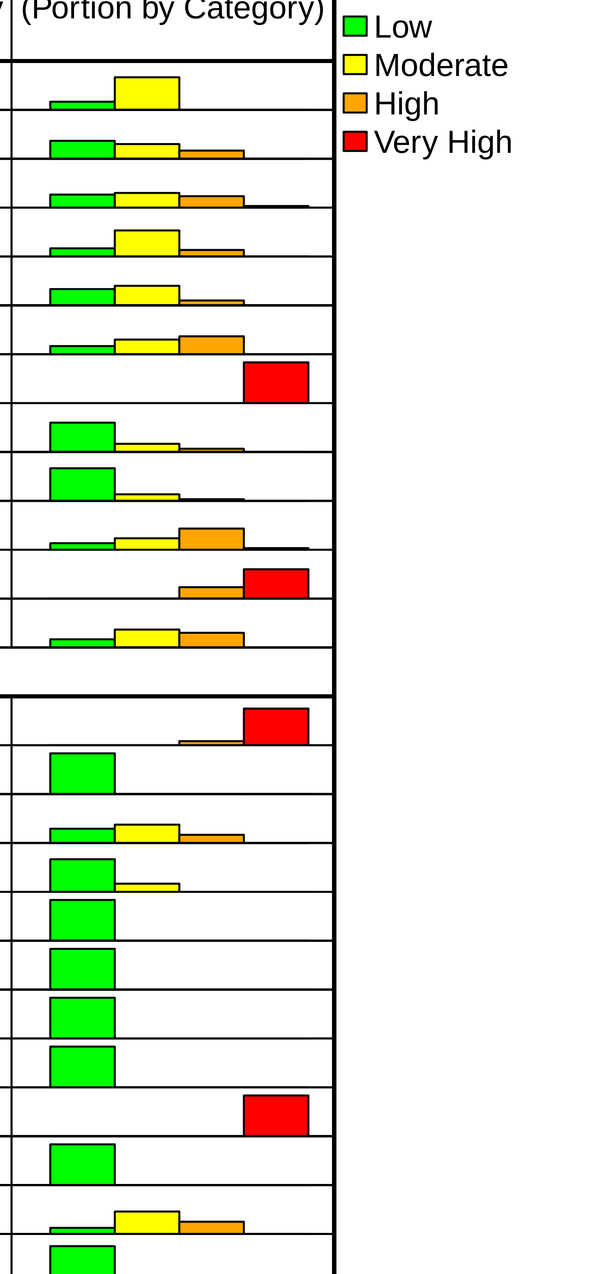
Overall Vulnerability Rank = High

Biological Sensitivity = High

Climate Exposure = High

Data Quality = 88% of scores ≥ 2

	Placopecten magellanicus	Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)
Sensitivity attributes	Stock Status	1.8	3.0	
	Other Stressors	1.8	1.7	
	Population Growth Rate	2.0	2.8	
	Spawning Cycle	2.0	3.0	
	Complexity in Reproduction	1.7	3.0	
	Early Life History Requirements	2.2	3.0	
	Sensitivity to Ocean Acidification	4.0	2.6	
	Prey Specialization	1.4	2.8	
	Habitat Specialization	1.2	3.0	
	Sensitivity to Temperature	2.4	2.8	
	Adult Mobility	3.7	3.0	
	Dispersal & Early Life History	2.2	2.8	
	Sensitivity Score	High		
Exposure variables	Sea Surface Temperature	3.9	3.0	
	Variability in Sea Surface Temperature	1.0	3.0	
	Salinity	1.8	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		



Atlantic Sea Scallop (*Placopecten magellanicus*)

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 Atlantic Sea Scallop use marine habitats.

Biological Sensitivity: **High**. Two sensitivity attributes scored above 3.0: Sensitivity to Ocean Acidification (4.0) and Adult Mobility (3.7). Atlantic Sea Scallops form calcium carbonate shell and adults are sessile, but capable of small-scale movements (meters).

Distributional Vulnerability Rank: **Moderate** (83% certainty from bootstrap analysis).

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Atlantic Sea Scallop on the Northeast U.S. Shelf is very likely to be negative (>95% certainty in expert scores). Ocean acidification will likely negatively impact molluscs, including Atlantic Sea Scallop. Warming may also reduce habitat and increase vulnerability to predation which will reduce productivity and cause distributions to shift northwards and into deeper waters.

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

Climate Effects on Abundance and Distribution: Using a coupled biogeochemical, population, bioeconomic model, Cooley et al. (2015) indicated that yields may decrease in the Atlantic Sea Scallop fishery as adult growth slows under ocean acidification. There are no studies on the effects of ocean acidification on Atlantic Sea Scallops specifically, but work with other molluscs suggest negative effects (Ries et al., 2009; Talmage and Gobler, 2010). Predation of juvenile Atlantic Sea Scallops was higher at higher temperatures (Barbeau and Scheibling, 1994). Recruitment of Atlantic Sea Scallops in shallow water is likely decreased owing to higher temperatures and recruitment in offshore waters is likely decreased because of temperature related overlap with an important predator species *Astropecten americanus*. Increased temperatures may lead to lower recruitment and thus negatively affect population productivity.

Life History Synopsis**:** Atlantic Sea Scallop is a marine bivalve species that occurs from the Gulf of St. Lawrence to Cape Hatteras, North Carolina (Hart and Chute, 2004). Atlantic Sea Scallops are among the most fecund of all bivalves, but while most mature at 2 years, significant egg production does not occur until after 4 years of life (Hart and Chute, 2004). Atlantic Sea Scallops have separate sexes, with occasional instances of hermaphroditism. Spawning occurs between August and November, but there also is some spawning in the spring (Hart and Chute, 2004). Scallop eggs are dense and benthic (Hart and Chute, 2004). There are several stages of larval development. Eggs hatch into a trochophore stage, which is pelagic and only lasts a few days. Trochophore larvae then transform into the veliger stage, which is also pelagic and can last 1-2 months (Posgay, 1953). The pelagic larvae are generally at the mercy of currents, but can make small corrections to their distribution (Hart and Chute, 2004). These early pelagic stages are eaten by filter feeders and planktivores (Hart and Chute, 2004). At a shell height of about 0.25 mm, usually in late fall or early winter, larvae transform to pediveligers, then settle to the benthos, changing their diet, morphology, and locomotory ability (Hart and Chute, 2004). At this stage, young Atlantic Sea Scallops attach to bottom substrate such as shell fragments, gravel, buoys, or filamentous plants and animals (e.g., algae, hydroids) using byssal threads and are referred to as spat (Hart and Chute, 2004). Juvenile Atlantic Sea Scallops are free swimming, but only for short distances when disturbed (Hart and Chute, 2004). Adult Atlantic Sea Scallops prefer firm sand, gravel, shell, or rock habitat, in cool water, with high salinity, and require a current for feeding and waste removal (Hart and Chute, 2004). Throughout most of their lives, Atlantic Sea Scallops are suspension filter feeders on phytoplankton, microzooplankton, and detritus (Hart and Chute, 2004). There are many fish and invertebrate predators of Atlantic Sea Scallops, namely: Atlantic Cod, Atlantic Wolfish, Ocean Pout, sculpins, American Plaice, Winter Flounder, Yellowtail Flounder, cancer crabs, American Lobsters, and several sea star species (Hart and Chute, 2004). The New England Fishery Management Council's Sea Scallop Management Plan manages Atlantic Sea Scallops, one of the most valuable fisheries in the United States (Hart and Chute, 2004). Based on the most recent stock assessment, Atlantic Sea Scallops are neither overfished nor is overfishing occurring (NEFSC, 2007).

Literature Cited:

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