

Spiny Dogfish – *Squalus acanthias*

Overall Vulnerability Rank = Low ■

Biological Sensitivity = Low ■

Climate Exposure = High ■

Data Quality = 92% of scores ≥ 2

<i>Squalus acanthias</i>		Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)	
Sensitivity attributes	Stock Status	1.9	3.0		
	Other Stressors	1.2	2.4		
	Population Growth Rate	3.8	3.0		
	Spawning Cycle	2.0	2.4		
	Complexity in Reproduction	1.4	2.0		
	Early Life History Requirements	1.0	3.0		
	Sensitivity to Ocean Acidification	1.1	3.0		
	Prey Specialization	1.0	3.0		
	Habitat Specialization	1.1	3.0		
	Sensitivity to Temperature	1.4	2.8		
	Adult Mobility	1.0	3.0		
	Dispersal & Early Life History	1.0	3.0		
	Sensitivity Score		Low		
	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		1.2	1.5		
Exposure Score		High			
Overall Vulnerability Rank		Low			

Spiny Dogfish (*Squalus acanthias*)

Overall Climate Vulnerability Rank: **Low** (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). Spiny Dogfish are demersal / semi-pelagic and complete their life cycle in marine habitats.

Biological Sensitivity: **Low**. One attribute scored above 2.5: Population Growth Rate (2.8). Spiny Dogfish have low population growth rates (higher sensitivity to climate change) (Smith et al. 2008).

Distributional Vulnerability Rank: **Very High** (100% certainty from bootstrap analysis). Spiny Dogfish are habitat generalists and highly mobile as adults, making seasonal migrations. In addition, Spiny Dogfish are ovoviviparous and young are 20-33 cm at birth (Stehlik, 2007).

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Spiny Dogfish is very likely to be neutral (>95% certainty in expert scores). Spiny Dogfish inhabit cold-temperate waters and will likely not be affected by the magnitude of warming projected for the region. No changes in distribution have been observed over the past 30 years despite significant warming. Changes in productivity have not been documented.

Data Quality: 92% of the data quality scores were 2 or greater indicate that data quality is moderate.

Climate Effects on Abundance and Distribution: Little specific information exists on the effect of climate on Spiny Dogfish. In both the Northeast and Northwest Atlantic, no changes in distribution have been detected (Perry et al., 2005; Nye et al., 2009).

Life History Synopsis: Spiny Dogfish is a slow-growing, long-lived, elasmobranch species that occurs in temperate and boreal zones of the northern and southern hemisphere, and specifically from Greenland to northeastern Florida in the western Atlantic (Burgess, 2002). Spiny Dogfish females grow larger and older than males. Based on a recent study in the Gulf of Maine, 50% maturity for females is at 9.1 years of age and 76.9 cm stretch total length), while males reach 50% maturity at 7.5 years and 63.1 cm stretch total length (Bubley et al., 2013). Mating involves internal fertilization, as is the case with all elasmobranchs (sharks, skates, and rays), and occurs in offshore areas during fall and winter (Burgess, 2002; Stehlik, 2007). This ovoviviparous species bears 1-15 pups after an 18-22 month gestation period (Burgess, 2002; NEFSC, 2006). The next batch of eggs begins forming while the female is still pregnant, so she can become pregnant again shortly after giving birth (Burgess, 2002). Parturition occurs on offshore wintering grounds from November to January, but can stretch into summer (Stehlik, 2007). Newborns range in size from 20-33 cm, and the sex ratio of the litter is usually 1:1 (Stehlik, 2007). Adults and Juveniles are found from inshore to offshore shelf waters, in a variety of temperatures and substrates, and can tolerate brackish water, but prefer full salinity water (Burgess, 2002; Stehlik, 2007). Spiny Dogfish form schools based on size with large mature females more common inshore, schools of mixed gender juveniles more common offshore, and schools of medium-sized immature females and mature males more common in the middle (Burgess, 2002). Seasonal migrations governed by the movement of prey bring Spiny Dogfish to the Gulf of Maine and areas north during summer and fall, and to offshore areas of the Mid-Atlantic and Southeastern United States Shelf to overwinter (Burgess, 2002). Juveniles prey on ctenophores, squid, and euphausiids, and begin substituting bivalves, decapods, and shrimp for plankton as they mature (Stehlik, 2007). Adults prey mostly on small

schooling fish such as Atlantic Herring and Atlantic Mackerel, but also consume molluscs, crustaceans, jellyfish, and solitary fish such as flatfish and Haddock (Burgess, 2002). Predators include: larger sharks, including conspecifics, Atlantic Cod, hakes, Monkfish (Goosefish), Striped Bass, and possibly whales, seals, and dolphins (Burgess, 2002; Stehlik, 2007). In state waters, Spiny Dogfish are managed under the Atlantic States Marine Fisheries Commission's Interstate fishery management plan (ASMFC, 2008). The Mid-Atlantic and New England Fishery Management Councils jointly manage the species in federal waters. Based on the most recent assessment, Spiny Dogfish were not overfished nor was overfishing occurring (NEFSC, 2006). A Transboundary Resources Assessment Committee assessment (a joint stock assessment with Canada) was completed in 2010, but it was not accepted (TRAC, 2010).

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