Dusky Shark − *Carcharhinus obscurus*

Overall Vulnerability Rank = High

Biological Sensitivity = High
Climate Exposure = High
Data Quality = 88% of scores ≥ 2

Carcharhinus obscurus		Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)
Sensitivity attributes	Stock Status	3.9	2.4	
	Other Stressors	1.8	2.2	
	Population Growth Rate	4.0	3.0	
	Spawning Cycle	2.2	2.2	
	Complexity in Reproduction	1.5	1.2	
	Early Life History Requirements	1.0	2.6	
	Sensitivity to Ocean Acidification	1.0	2.6	
	Prey Specialization	1.1	2.8	
	Habitat Specialization	1.1	3.0	
	Sensitivity to Temperature	1.1	3.0	
	Adult Mobility	1.0	3.0	
	Dispersal & Early Life History	1.2	3.0	
	Sensitivity Score	High		
Exposure variables	Sea Surface Temperature	3.9	3.0	
	Variability in Sea Surface Temperature	1.0	3.0	
	Salinity	2.8	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		

Low
Moderate
High
Very High

Dusky Shark (*Carcharhinus obscurus*)

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). Dusky Shark are pelagic and complete their life cycle in marine habitats.

Biological Sensitivity: **High**. Two attributes scored above 3.0: Population Growth Rate (4.0) and Stock Status (3.9). Dusky Shark have low population growth rates (Cortés 1998). Dusky Shark is listed as vulnerable by the IUCN owing to low population abundance (http://www.iucnredlist.org/details/3852/0). Dusky Shark is identified as a Species of Concern in the Western Atlantic by the U.S. (http://www.nmfs.noaa.gov/pr/pdfs/species/duskyshark_detailed.pdf).

Distributional Vulnerability Rank: **Very High** (99% certainty from bootstrap analysis). Dusky Shark are habitat generalists and highly mobile. In addition, Dusky Shark are a placental, viviparous species and do not have a larval stage.

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Dusky Shark is very likely to be neutral (>95% certainty in expert scores). Dusky Shark is a highly mobile temperate shark. There is very little information available that suggests negative or positive effects of climate change.

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

Climate Effects on Abundance and Distribution: There is very little information on the effect of climate change on Dusky Shark. Chin et al. (2010) conducted a vulnerability assessment of sharks and rays on Australia's Great Barrier Reef (GBR) identifying similar factors for use in their vulnerability assessment, and ranked the level of exposure and sensitivity to these factors using current knowledge and expert opinion based on a 3 point scale (low, moderate, and high). Dusky shark exposure rankings were highly influenced by water temperature but sensitivity to this factor was ranked low for GBR sharks. Although the population growth rate was taken into account in the GBR study, little is known about the population status of sharks in this area (Chin et al. 2010, McAuley et al., 2012). GBR Dusky Sharks were assessed a low vulnerability ranking with respect to climate change.

Life History Synopsis**:** Dusky Shark is a large, coastal, migratory, warm-temperate shark species found from southern New England to the Caribbean and the Gulf of Mexico to southern Brazil (SEDAR, 2011). Males of the species reach 50% maturity at 231 cm fork length (FL) (17.4 years); females are slightly larger (234 cm FL) and 17.6 years at 50% maturity (Natanson et al.; 1995, Natanson et al., 2013). Dusky Sharks are viviparous with an 18-month gestation period and around 7 pups per litter (Castro 2009; Romine et al. 2009). Young Dusky Sharks are large at birth, 90-100 cm total length, and occur in warm-temperate, nearshore areas with sand or rocky bottoms (Branstetter, 2002; McCandless et al., 2007). Rarely, juveniles may enter estuarine habitats, but generally avoid areas of low salinity (McCandless et al., 2007). Adult Dusky Sharks seasonally migrate great distances between New England and the Gulf of Mexico (Branstetter, 2002; Kohler et al. 1998). The diet of Dusky Sharks includes several species of teleosts, elasmobranchs, crustaceans, and squid (Branstetter, 2002). The Atlantic States Marine Fisheries Commission manages Dusky Sharks through an interstate fishery management plan and NMFS manages them as part of the Consolidated Atlantic Highly Migratory Species Fishery Management Plan (ASMFC 2008; NMFS 2006). Based on the last northwest Atlantic stock assessment, Dusky Sharks are

considered to be overfished and experiencing overfishing (SEDAR, 2011) and landing of the species is prohibited (ASMFC, 2008; NMFS, 2006).

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