Little Skate – *Leucoraja erinacea*

Overall Vulnerability Rank = Low 🟩

Biological Sensitivity = Low 🟩
Climate Exposure = High 🟧
Data Quality = 88% of scores $\geq$ 2

Leucoraja erinacea	Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)
Sensitivity attributes			🟩 Low 🟨 Moderate 🟧 High 🟥 Very High
Stock Status	2.0	2.8	
Other Stressors	1.5	1.4	
Population Growth Rate	2.9	2.4	
Spawning Cycle	1.2	3.0	
Complexity in Reproduction	1.3	2.2	
Early Life History Requirements	1.1	3.0	
Sensitivity to Ocean Acidification	1.5	2.8	
Prey Specialization	1.2	3.0	
Habitat Specialization	1.2	3.0	
Sensitivity to Temperature	2.1	3.0	
Adult Mobility	2.3	2.2	
Dispersal & Early Life History	1.9	2.8	
Sensitivity Score	**Low**		
Exposure variables			
Sea Surface Temperature	3.9	3.0	
Variability in Sea Surface Temperature	1.0	3.0	
Salinity	2.0	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	**Low**		

Little Skate (*Leucoraja erinacea*)

Overall Climate Vulnerability Rank: **Low** (88% certainty from bootstrap analysis).

Climate Exposure: **High**. Two exposure factors contributed to this score: Ocean Surface Temperature (3.9) and Ocean Acidification (4.0). Little Skate are demersal and complete their life cycle in marine habitats.

Biological Sensitivity: **Low**. Only one attribute scored above 2.5: Population Growth Rate (3.4). In general, skates have a low population growth rate (higher sensitivity to climate change) (Frisk 2010).

Distributional Vulnerability Rank: **High** (76% certainty from bootstrap analysis). Little Skate are habitat generalists and moderately mobile as adults, making seasonal movements. In addition, skate egg cases are subject to movement by currents and juveniles may move on scales of 1-10 km.

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Little Skate is estimated to be negative, but this estimate has a high degree of uncertainty (<66% certainty in expert scores). Little Skate are a cold water species and reductions in productivity may occur because of warming and ocean acidification. However, distributions have shifted southwards in recent years, contrary to the expectation of a northward shift with warming.

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

Climate Effects on Abundance and Distribution: Di Santo (2015) found that increased warming and acidification reduce body condition of newly hatched Little Skate. These reductions in size could result in reduced juvenile survival and thus recruitment. Nye et al. (2009) found that Little Skate moved southwards while a majority of species moved northwards. In addition, Collie et al. (2008) found Little Skate increasing in Narragansett Bay. The causes for this distribution shift and change in abundance remain unclear, but Frisk et al. (2008) suggested a connection between skate populations on the Northeast U.S. Shelf and the Scotian Shelf. Such a connection could play a role in the southward movement of Little Skate (e.g., increasing population size).

Life History Synopsis**:** Little Skate is a coastal, benthic elasmobranch that occurs from southeastern Newfoundland to Cape Hatteras, North Carolina (McEachran, 2002). Little Skate reach sexual maturity at about 4 years and mating occurs through internal fertilization (Packer et al., 2003). Spawning occurs year round with peaks in spring and fall (Packer et al., 2003). An individual may spawn twice annually and produce approximately 30 eggs per year (Packer et al., 2003). Eggs are encapsulated in a greenish-brown case and laid in pairs on the sea floor (Packer et al., 2003). The egg case adheres to the bottom substrates with sticky filaments, but frequently wash up on beaches (Packer et al., 2003). Eggs incubate for 6-12 months; duration is partially determined by temperature (Packer et al., 2003). Sea urchins and whelks prey on skate eggs (Packer et al., 2003). Juveniles hatch looking just like adults (Packer et al., 2003). Juveniles and adults occur on sand, gravel, and mud substrates and range from estuaries to 300 m, but usually occur at depths <111 m (McEachran, 2002; Packer et al., 2003). The inshore portion of the population migrates seasonally inshore and offshore regulated by temperature, as well as small migrations to the north and south (Packer et al., 2003). Juveniles and adults are generally found farther inshore and in estuaries during spring and summer, and overwinter in deeper water (McEachran, 2002; Packer et al., 2003). Juveniles consume crustaceans, particularly amphipods and decapods (Packer et al., 2003). The reliance on amphipods decreases with size, and the consumption of fish and polychaetes

increases (Packer et al., 2003). Adult skates consume primarily decapod crustaceans, amphipods, polychaetes and to a lesser degree isopods, bivalves, and small fish (Packer et al., 2003). The dominant predators of juvenile and adult Little Skates are sharks, other skates, teleost fishes, gray seals, and Rock Crabs (Packer et al., 2003). Little Skate is managed as part of the skate complex by the New England Fishery Management Council and are neither overfished nor is overfishing occurring (NEFSC, 2007).

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