

Winter Skate – *Leucoraja ocellata*

Overall Vulnerability Rank = Low ■

Biological Sensitivity = Low ■

Climate Exposure = High ■

Data Quality = 83% of scores ≥ 2

<i>Leucoraja ocellata</i>		Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)	
Sensitivity attributes	Stock Status	1.9	2.6		
	Other Stressors	1.6	1.8		
	Population Growth Rate	3.4	2.4		
	Spawning Cycle	1.2	2.8		
	Complexity in Reproduction	1.4	2.2		
	Early Life History Requirements	1.0	3.0		
	Sensitivity to Ocean Acidification	1.7	2.2		
	Prey Specialization	1.1	3.0		
	Habitat Specialization	1.2	2.8		
	Sensitivity to Temperature	2.0	2.8		
	Adult Mobility	2.0	1.8		
	Dispersal & Early Life History	1.9	3.0		
	Sensitivity Score		Low		
	Exposure variables	Sea Surface Temperature	3.9	3.0	
Variability in Sea Surface Temperature		1.0	3.0		
Salinity		1.6	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			

Winter Skate (*Leucoraja ocellata*)

Overall Climate Vulnerability Rank: **Low** (100% certainty from bootstrap analysis).

Climate Exposure: **High**. Two exposure factors contributed to this score: Ocean Surface Temperature (3.0) and Ocean Acidification (4.0). Winter 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** (88% certainty from bootstrap analysis). Winter 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 Winter Skate is estimated to be negative, but this estimate has a high degree of uncertainty (<66% certainty in expert scores). Winter 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: 83% 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 Winter Skate. Di Santo (2015) found that increased warming and acidification reduce body condition of newly-hatched Little Skate – a congener. These reductions in size could result in reduced juvenile survival and thus recruitment. Nye et al. (2009) found a shift southward accompanied by a shift into deeper water. Frisk et al. (2008) also identified a distribution shift, suggesting population connectivity between Georges Bank and the Scotian Shelf. The cause of this distribution shift remains unexplained.

Life History Synopsis: Winter Skate is a benthic marine species ranging from the south coast of Newfoundland and southern Gulf of St. Lawrence to Cape Hatteras, North Carolina (Packer et al., 2003). Winter Skate are sexually mature by 70-109 cm or approximately 7-11 years old and mate using internal fertilization (Packer et al., 2003; Hogan et al., 2013). Winter Skate may spawn year round, but the peak egg production occurs in summer and fall (Packer et al., 2003; Hogan et al., 2013). Eggs are encapsulated singly in an egg case with stiff pointed horns at the corners and young skates emerge from these encapsulated eggs fully developed (Packer et al., 2003). Juvenile and adult skate have similar distribution and habitat patterns. Winter Skate are found in a wide range of temperatures, salinities, and depths, but are mainly inshore (<100 m) and in estuaries in fall – spring and on Georges Bank in summer, but are absent from the Gulf of Maine in winter (Packer et al., 2003). Winter Skate are most abundant on sand, gravel, and sometimes mud substrate where they are buried during the day and emerge into the water column at night (Packer et al., 2003). Juvenile and adult skate prey on a variety of benthic infauna, including: polychaetes, amphipods, isopods, crabs, and small fish (Packer et al., 2003). The importance of fish and polychaetes to the diet increases with size while the consumption of amphipods and crustaceans decreases (Packer et al., 2003). Sharks, other skates, gray seals, and gulls are the dominant predators of winter skate (Packer et al., 2003; Swain et al., 2013). Winter Skate are managed as part of a skate complex with six other species under the New England Fishery Management

Council's Skate Fishery Management Plan. Based on the most recent assessment, Winter Skate are not overfished, but overfishing is occurring (NESFC, 2007).

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