

Windowpane – *Scophthalmus aquosus*

Overall Vulnerability Rank = Low ■

Biological Sensitivity = Low ■

Climate Exposure = High ■

Data Quality = 79% of scores ≥ 2

<i>Scophthalmus aquosus</i>		Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)		
Sensitivity attributes	Stock Status	2.6	2.8		<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="width: 10px; height: 10px; background-color: green; margin-bottom: 5px;"></div> Low <div style="width: 10px; height: 10px; background-color: yellow; margin-bottom: 5px;"></div> Moderate <div style="width: 10px; height: 10px; background-color: orange; margin-bottom: 5px;"></div> High <div style="width: 10px; height: 10px; background-color: red; margin-bottom: 5px;"></div> Very High </div>	
	Other Stressors	2.4	2.6			
	Population Growth Rate	1.7	2.6			
	Spawning Cycle	1.3	2.8			
	Complexity in Reproduction	2.0	2.4			
	Early Life History Requirements	2.0	1.0			
	Sensitivity to Ocean Acidification	1.4	1.8			
	Prey Specialization	1.9	3.0			
	Habitat Specialization	1.4	3.0			
	Sensitivity to Temperature	1.6	3.0			
	Adult Mobility	1.8	2.4			
	Dispersal & Early Life History	2.5	1.8			
	Sensitivity Score		Low			
	Exposure variables	Sea Surface Temperature	3.9	3.0		
Variability in Sea Surface Temperature		1.0	3.0			
Salinity		2.1	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				

Windowpane (*Scophthalmus aquosus*)

Overall Climate Vulnerability Rank: **Low** (62% 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 Windowpane use marine habitats.

Biological Sensitivity: **Low**. Only one sensitivity attribute scored above 2.5: Stock Status (2.6). One stock in the region is overfished and overfishing is occurring, while the other stock is rebuilt (NEFSC, 2012).

Distributional Vulnerability Rank: **High** (93% certainty from bootstrap analysis). Windowpane are habitat generalists, make seasonal migrations, and have dispersive early life history stages.

Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Windowpane is likely to be neutral (90-95% certainty in expert scores). Windowpane inhabits temperate waters and may benefit from warming on the Northeast U.S. Shelf. However, the abundance of Windowpane in some estuaries has decreased.

Data Quality: 79% of the data quality scores were 2 or greater indicate that data quality is moderate.

Climate Effects on Abundance and Distribution: Working in New York/New Jersey Harbor, Wilbur et al. (2015) found that Windowpane age-1 abundances were significantly reduced after several cold winters. This results suggests that Windowpane productivity may remain the same or increase with warming. Nye et al. (2009) found that Windowpane distribution has shifted northward in recent years. In Narragansett Bay and Long Island Sound, the abundance of Windowpane has decreased some (Collie et al., 2008; Howell and Auster, 2012). Thus current understanding is equivocal as to the effect of climate on Windowpane.

Life History Synopsis: Windowpane flounder is a shallow-water, estuarine and marine, fast-growing flatfish species found in the western Atlantic from the Gulf of St. Lawrence to Florida (Chang et al., 1999). Windowpane reach sexual maturity after 3-4 years (Chang et al., 1999). Spawning occurs from February to November, beginning in the south and expanding north (Chang et al., 1999; Klein-MacPhee, 2002). Peak spawning occurs in cool or mid-range temperature water in spring and fall (Chang et al., 1999). Eggs are pelagic and hatch in about a week (Chang et al., 1999). Larvae are pelagic and eat copepods and other zooplankton (Chang et al., 1999). Many planktivorous fish species eat egg and larval Windowpane, including conspecifics (Chang et al., 1999). Larvae settle at 10-20 mm total length in estuaries (spring-spawned larvae) and on the shelf (spring- and fall-spawned larvae; Chang et al., 1999). Juvenile Windowpane occur on the shelf year round (Chang et al., 1999). Juveniles and adults migrate seasonally from shallow or inshore water in spring - fall, to offshore or deeper water in winter, but are generally found on sand or mud substrates in mid-temperature water of <100 m depth (Chang et al., 1999). Adult Windowpane also make long distance migrations along shore; but their range is limited by high and low temperature waters (Chang et al., 1999; Klein-MacPhee, 2002). Juvenile and adult fish feed on small crustaceans (mostly mysids and decapods), polychaetes, and several small fish including smaller individuals of the species (Chang et al., 1999; Klein-MacPhee, 2002). Several species of piscivorous fish, sharks, and skates consume Windowpane, but the main predators are Spiny Dogfish and Atlantic Cod (Chang et al., 1999; Klein-MacPhee, 2002). The species is managed by the New England Fishery Management Council's Northeast Multispecies Fishery Management Plan as two stocks: Gulf of Maine-Georges Bank and southern New England-middle Atlantic (NEFSC, 2012). Based on recent assessment

using data through the 2010, the northern stock was overfished and overfishing was occurring (NEFSC, 2012). In the southern stock overfishing is not occurring and was rebuilt based on the 2012 stock assessment (NEFSC, 2012).

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