

**Impact of Rapid Warming on Cod Stocks in the Gulf of Maine**

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Climate change is altering conditions in all marine ecosystems, but the pace of change is not uniform. Rapid changes in environmental conditions pose a challenge for resource management, especially when available tools or policies assume the environment is stationary. Over the last 34 years, the Gulf of Maine has warmed at four times the global average rate, and the rate has accelerated over the recent decade. This warming was associated with a northward shift in the Gulf Stream and with the Atlantic Multidecadal Oscillation and Pacific Decadal Oscillation. The unprecedented warming led to reduced recruitment, reduced growth, and reduced survival of Atlantic cod. The assessment model for this stock does not include temperature effects, leading to catch limits that were too high and to reference points that were unrealistic. Future recovery of this fishery now depends on both sound management and favorable temperatures. The experience in the Gulf of Maine highlights the need to incorporate environmental factors into resource management. It also highlights a need for scientific and policy guidance for managing species threatened by future warming.