Northern Shrimp

Pandalus borealis

Federal Listing	N/A State
Listing	SGCN
Global Rank	Unknown
State Rank	SNA
Regional Status	

Photo by NHFG

Justification (Reason for Concern in NH)

In New England, the northern shrimp fishery provides valuable income to harvesters during the winter months and who may be limited out of other fisheries. Northern shrimp are an important component in marine food webs as they feed on plankton and benthic invertebrates and are preyed upon by commercially important species such as white and silver hake, Atlantic cod, and Acadian redfish. Northern shrimp are a short-lived species so they are vulnerable to changes in their environment. The increase in coastal development leads to increased pollutant run-off into the ocean which can damage crucial habitats of northern shrimp. Changes in ocean temperature due to global climate change or the North Atlantic Oscillation could have an effect on larval/juvenile development and/or adult migratory behavior.

Distribution

Northern shrimp are found in cold boreal waters of the North Atlantic, North Pacific, and Arctic Oceans. The Gulf of Maine has the most southern population in the range.

Habitat

Northern shrimp inhabit deep, cold water basins in the Atlantic Ocean and prefer depths of 90-180 meters consisting of soft substrates such as sand, clay or mud. They are protandric hermaphrodites that utilize different habitats depending on their life stage. As larvae and juveniles they inhabit inshore waters typically within ten miles of the coast. After a year, juveniles move offshore to continue their development into the male life stage. Females inhabit offshore waters during the spring and summer months and migrate inshore in the late fall-early winter to lay their eggs.

NH Wildlife Action Plan Habitats

- Marine

Distribution Map

Current Species and Habitat Condition in New Hampshire

Northern shrimp inhabit coastal waters off of New Hampshire in the Gulf of Maine. Results of the 2013 stock assessment report indicated that the Northern shrimp stock is overfished and overfishing is occurring in the Gulf of Maine. Northern shrimp abundance has been declining since 2006.

Population Management Status

The Northern shrimp commercial fishery was restricted between 2010 and 2012 due to declining stock populations. In 2013, only 49% of the total allowable catch was harvested. In response to the declining population the Northern Shrimp Section of ASMFC established a moratorium for the 2014 fishing season to protect the remaining spawning population and reduce pressure on the collapsed stock. The moratorium was expanded to the 2015 fishing season.

Regulatory Protection (for explanations, see Appendix I)

- Harvest permit - season/take regulations

Quality of Habitat

Northern shrimp are located in the cold waters of the Gulf of Maine. Spawning occurs in offshore waters during the late summer. During the winter, egg-bearing females move inshore, where the eggs hatch.

Habitat Protection Status

The Northern Shrimp Section established a moratorium for the 2014 and 2015 fishing season to protect the remaining spawning population and reduce pressure on the collapsed stock.

Habitat Management Status

The Northern Shrimp Section established a moratorium for the 2014 and 2015 fishing season to protect the remaining spawning population in the Gulf of Maine.

Threats to this Species or Habitat in NH

Threat rankings were calculated by groups of taxonomic or habitat experts using a multistep process (details in Chapter 4). Each threat was ranked for these factors: Spatial Extent, Severity, Immediacy, Certainty, and Reversibility (ability to address the threat). These combined scores produced one overall threat score. Only threats that received a "medium" or "high" score have accompanying text in this profile. Threats that have a low spatial extent, are unlikely to occur in the next ten years, or there is uncertainty in the data will be ranked lower due to these factors.

Species and habitat impacts from increasing sea surface temperatures (Threat Rank: High)

New Hampshire is located within the southern limit of the Northern shrimp distribution. Ocean temperatures have an important influence on northern shrimp in the Gulf of Maine (Apollonio et al. 1986; Richards et al. 1996; Richards et al. 2012).

Recruitment of Northern shrimp has been low during years when winter water temperatures were high. Colder temperatures are associated with higher recruitment of shrimp (Richards et al. 2012). Lower water temperatures can possibly stimulate population growth (Apollonio et al. 1986).

Habitat and species impacts from resource depletion resulting from commercial harvest (Threat Rank: High)

Fishing and harvesting causes direct mortality to the species. Commercial harvest may add additional stress on the Northern shrimp population that is being negatively impacted by warming water temperatures.

The harvest of Northern shrimp is managed by the ASMFC as outlined in the Interstate Fishery Management Plan. Commercial harvest can occur in the state of New Hampshire and is therefore managed through licenses and harvest regulations.

Species and habitat impacts from ocean acidification (Threat Rank: Medium)

Anthropogenic CO2 in the atmosphere reacts to form carbonic acid (H2CO3) in the ocean. Carbonic acid dissociates to form bicarbonate (HCO3) and hydrogen (H+) resulting in a decrease in seawater pH. The formation of additional hydrogen ions favors the increased formation of bicarbonate ions over carbonate ions (CO23-). Fewer carbonate ions hinders the formation of calcium carbonate (CaCO3) which is an important process for building and maintaining shells in shellfish.

One third of all anthropogenic sources of CO2 over the past 200 years have been stored in the ocean. This increase in CO2 is making the oceans more acidic. The effect of ocean acidification is suggested to inhibit the growth and survival of larval shellfish, having potentially negative effects on shellfish populations (Talmage and Gobler, 2010).

Habitat impacts from gear effects related to commercial harvest (Threat Rank: Medium)

Habitat impacts from introduced or invasive species (Threat Rank: Medium)

Introduced or invasive species are commonly transported and introduced in the marine environment through vessels, bilge water, and marine debris across the globe. Some exotic pets or aquarium fish released also have the potential to become established and compete with native species. Warming sea temperatures and large storm events play a role in introducing historically non-native species into new environments.

Black Gill Syndrome was also documented in the Gulf of Maine in 1966 (Apollonio and Dunton, 1969; Rinaldo and Yevich, 1974). Affected shrimp display melanized, or blackened gills, with inflammation, necrosis, and significant loss of gill filaments.

Habitat impacts from mercury deposition (Threat Rank: Medium)

Mercury is released into the environment as a result of human activity such as coal burning, mining, and industrial processes. Mercury ultimately makes its way into the marine environment through river and watershed inputs, as well as atmospheric deposition.

Mercury exposure showed a reduction of swimming activity and the onset of paralysis in Northern shrimp (St-Amand et al., 1999). The ecological significance of the alteration of larval swimming activity by mercury pollution will be an increase in mortality and its ripple effect through the community dynamics (St-Amand et al., 1999).

Habitat degradation from oil spills (Threat Rank: Medium)

Oil introduced into the marine environment can have lethal and sublethal effects on a variety of marine life across all life stages. Oil has the potential to come in contact with marine life through various industrial and shipping processes that inhabit our coastal waters. Oil spills pose the biggest threat with the potential to disperse large amounts of oil into the marine environment.

Shellfish exposed to oil have been shown to exhibit changes in respiration, reproductive development, feeding, growth rates, behavior, biochemistry, and mortality (Stekoll et al., 1980). Early stages of shellfish are more susceptible to effects of oil pollution than adults.

List of Lower Ranking Threats:

Habitat impacts from marine debris

Habitat degradation from nutrients from shore and ships

Habitat degradation from shore-based contamination

Habitat degradation from dredging and the dumping of spoils

Habitat impacts from increased wave action that causes bottom disturbance

Habitat impacts from increased storm events that send plumes including erosion, sedimentation, and salinity changes

Actions to benefit this Species or Habitat in NH

Reduced harvest of or moratorium on fishery

Primary Threat Addressed: Habitat and species impacts from resource depletion resulting from commercial harvest

Specific Threat (IUCN Threat Levels): Biological resource use / Fishing & harvesting aquatic resources / Biological resource use

Objective:
Implement rules to limit the harvest of Northern shrimp when stocks are low in order to allow the stock to rebuild.

General Strategy:
Implement rules to limit the harvest of Northern shrimp. The Atlantic State Marine Fisheries Commission manages northern shrimp in partnership with the states of Maine, Massachusetts and New Hampshire. When the Northern shrimp stock is low the states can implement rules to limit harvest.

Political Location: **Watershed Location:**

References, Data Sources and Authors

Data Sources
Information on northern shrimp habitat and population was obtained from ASMFC management plan,

scientific literature, and consultation with experts.

Data Quality
The Atlantic States Marine Fisheries Commission (ASMFC) manages northern shrimp in partnership with the states of Maine, Massachusetts, and New Hampshire. Members from each state form the Northern Shrimp section which follows a Fishery management plan for the species.
Trends in abundance of Gulf of Maine northern shrimp have been monitored since the late 1960's. Sea surface temperature has been measured daily since 1906 at Boothbay Harbor, Maine, near the center of the inshore nursery areas for northern shrimp.

2015 Authors:
Robert Eckert, NHFG

2005 Authors:
N/A

Literature

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