



**Northern Shrimp
*Pandalus borealis***

Interesting Facts:

- * Shrimp begin life as males and metamorphose into females in the 3rd year.
- * Most shrimp do not live past 5 years of age.
- * Northern shrimp are a source of alkaline phosphatase, an enzyme used in molecular biology.
- * The species' carapace is a source of chitosan, a versatile chemical used in a variety of applications, including treatment of bleeding wounds, filtering wine, or improving the soil in organic farming.

Age/Length at Maturity:

- * 2.5 years for males
- * 3.5 years for females

Amendment 1 Biological Reference Points:

- * F target & threshold = 0.22 and 0.6, respectively
- * Biomass threshold & limit = 19.8 million lbs and 13.2 million lbs, respectively.

Stock Status: Not overfished but experiencing overfishing

Species Profile: Northern Shrimp Draft Amendment Seeks to Provide Greater Management Flexibility

Introduction

Northern shrimp, *Pandalus borealis*, support a small but important fishery in the Gulf of Maine with annual landings valued at an average of six million dollars a year. In the early 2000s, there was concern for the status of the stock and the ability of the resource to sustain high harvest levels. This resulted in severe harvest reductions in the 2001 through 2005 fishing seasons, which, in turn, contracted harvest and processing capacity and closed some markets for northern shrimp.

These harvest restrictions have allowed the resource to rebound with biomass at levels not seen since the late 1960s and early 1970s. Markets are now opening back up to take advantage of the high biomass of product available. However, harvest rates in both the 2010 and 2011 fishing seasons were far greater than anticipated, resulting in shortened seasons and an overharvest of the total allowable catch (TAC). Additionally, the number of participants in the northern shrimp fishery has increased because of limited entry programs in other Northeast fisheries. Draft Amendment 2, which is currently out for public comment, provides a suite of management options, such as catch controls and TAC allocations by space and time, to maximize the benefits of this valuable resource in a sustainable way.

Life History

Northern shrimp are located in the cold waters of the Northern Hemisphere. The species is found in Canadian waters and in the northern-most waters of the U.S. On the U.S. Atlantic coast, it primarily inhabits waters off of Maine, New Hampshire, and Massachusetts. Northern shrimp are hermaphroditic, maturing first as males at roughly 2 ½ years of age and then transforming to females at about 3 ½ years. Female shrimp may live up to five years old and attain a size of up to three to four inches in length. Differences in size at age by area and season can be ascribed to temperature effects, with more rapid growth rates at higher temperatures. Differences in size at age from year to year, and in size at sex transition, have been attributed to both environmental and stock density effects.

Spawning takes place in offshore waters during the late summer. By early fall, most adult females extrude their eggs onto the abdomen. Egg-bearing females move inshore in late autumn and winter, where the eggs hatch. Northern shrimp are an important link in marine food chains,



Photo: Cinamon Moffet, University of Maine

preying on both plankton and benthic invertebrates and, in turn, being consumed by many important fish species, such as cod, redfish, and silver and white hake.

Commercial Fishery

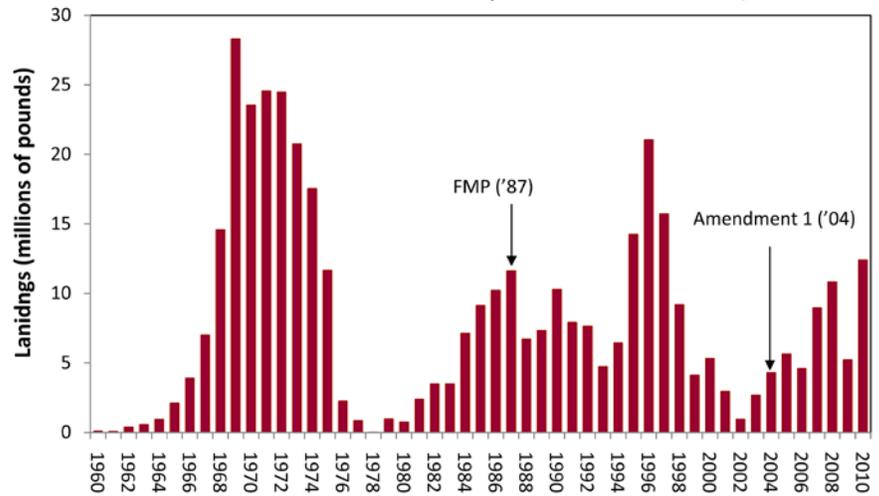
Northern shrimp provide a small but valuable fishery to the New England states, with an estimated ex-vessel value of \$6.4 million in 2010. The fishery is seasonal in nature, peaking in late winter when egg-bearing females move into inshore waters and ending in the spring under regulatory closure.

The commercial fishery began in earnest in the late 1950s/early 1960s and experienced an incredible expansion in landings, peaking in 1969 at 28.3 million pounds (Figure 1). Over the next eight years, landings dropped precipitously to a low of less than 85,000 pounds in 1977. The fishery was closed in 1978 due to a stock collapse and slowly reopened in 1979 at very low levels of harvest. The early 1980s showed a modest increase in landings and over the next ten years landings ranged from 4.7 to 11.6 million pounds. Landings increased to 20 million pounds in 1996 and then declined to low levels throughout the early 2000s. Concern about the status of the stock and the ability of the resource to sustain high harvest levels, led to severe harvest reductions in the 2001 to 2005 fishing seasons, with landings ranging from just under a million pounds (2002) to 5.6 million pounds (2005). Landings increased once again to 10.8 million pounds in 2008. Preliminary landings for 2010 are 12.4 million pounds, more than double the landings observed in 2009.

Given the recent growth in the fishery, early season closures occurred in the 2010 and 2011 fishing seasons because landing rates were far greater than anticipated. Furthermore, untimely reporting resulted in short notice of the season closures and an overharvest of the TAC by 14% in 2010 and 48% in 2011.

Currently, the shrimp fleet is com-

Figure 1. Northern Shrimp Landings
Source: ASMFC Northern Shrimp Technical Committee, 2010



prising of lobster vessels in the 30-46' range that re-rig for shrimping, small to mid-sized stern trawlers in the 40-56' range, and larger trawlers primarily in the 56-79' range. The shrimp trap fishery has grown in recent years accounting for 15% of Maine's landings during 2001 to 2009. However, otter trawl remains the primary gear employed and is typically chain or roller rigged, depending on area and bottom fished. There has been a trend in recent years towards the use of heavier, larger roller and/or rockhopper gear. These innovations, in concert with substantial improvements in electronic equipment, have allowed for much more accurate positioning and towing in formerly unfishable grounds, thus greatly

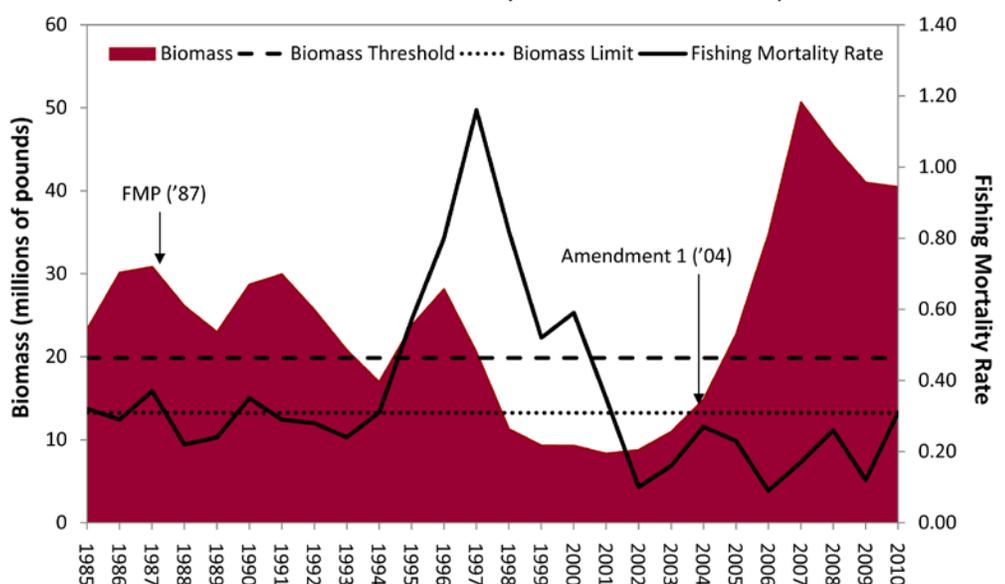
increasing the fishing power of the Gulf of Maine fleet.

Stock Status

Updated in 2010, the northern shrimp stock assessment indicates that the stock is not overfished, but is experiencing overfishing (Figure 2). Exploitable biomass declined from approximately 27.7 million pounds in 1996 to a time series low of nine million pounds in 2001. In 2007, biomass rose to a high of 50.7 million pounds and subsequently declined to 40.5 million pounds in 2010.

In the northern shrimp fishery, landings are dominated by the availability and abundance of four and five year old north-

Figure 2. Northern Shrimp Total Stock Biomass & Fishing Mortality Rate
Source: ASMFC Northern Shrimp Technical Committee, 2010



ern shrimp. The emergence of a strong year class will tend to support productive fisheries four to five years down the road. The 2007 to 2009 year classes have shown above average strength when compared to past survey years, and should provide favorable conditions for the 2012 to 2014 fishing seasons.

Atlantic Coastal Management

In 1973, following the collapse of the stock in the early 1970s, Maine, New Hampshire, and Massachusetts formed the Commission's Northern Shrimp Section to initiate interstate management of the resource. This program represents the longest running interstate fisheries management program on the U.S. Atlantic coast. The Commission adopted the first Fishery Management Plan for Northern Shrimp in 1986. Under this plan, the fishery was managed through the establishment of fishing seasons, set each fall. This plan was replaced by Amendment 1 in 2004. Amendment 1 formally established biological reference points for the first time. These include a fishing mortality target and threshold of 0.22 and 0.6, respectively, and a biomass threshold and limit of 19.8 million pounds and 13.2 million pounds, respectively.

Since the adoption of Amendment 1, knowledge of the northern shrimp biology, population dynamics, and fishery has improved. Early season closures and an overharvest of the TAC in recent seasons have created challenges for both managers

and stakeholders. Given that these issues may jeopardize the future of the fishery and shrimp resource, Draft Amendment 2 is designed to address immediate concerns to implement timelier reporting and provide greater management flexibility to ensure that the TAC is not overharvested. Specific options include a timely and comprehensive reporting system, trip limits, trap limits, days out, area management, seasonal quotas, and harvest set asides. The Draft Amendment also proposes a clarification of fishing mortality reference points.

Upon completion of Amendment 2, the Section will initiate consideration of a limited entry program through the adaptive management addendum process detailed in Draft Amendment 2. The Public Information Document (PID) for this amendment initially notified the public of the Section's intent to consider development of a limited entry program. Based on public comment received on the PID and the Section's concern regarding continuing effort increases in this fishery,

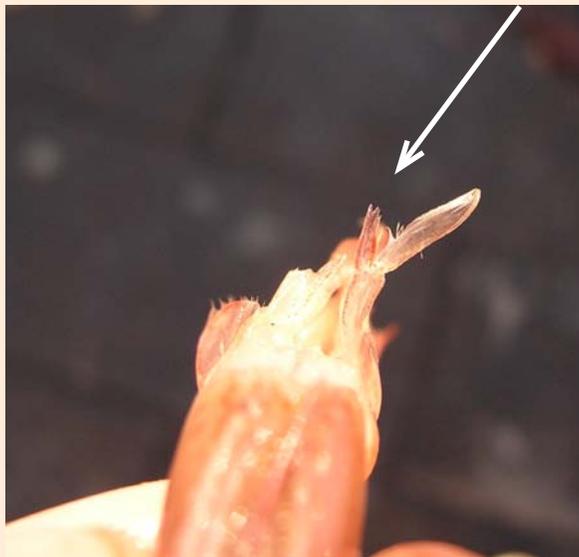
the Section established a control date of June 7, 2011. The intention of the control date is to notify potential new entrants to the fishery that there is a strong possibility they will be treated differently from participants in the fishery prior to the control date. As noted in the PID, the Section may use historic landings and/or participation criteria for current and past participants as the limited entry system is established.

New England states from Maine through Massachusetts will be conducting hearings on the Draft Amendment in mid-September. Copies of the Draft Amendment can be obtained via the Commission's website (www.asmfc.org) under Breaking News. Public comment will be accepted until 5:00 PM (EST) on October 3, 2011 and should be forwarded to Michael Waine, FMP Coordinator, 1050 N. Highland St., Suite 200 A-N, Arlington, VA 22201; 703.842.0741 (FAX) or at mwaine@asmfc.org (Subject line: Northern Shrimp Amendment 2).

Determining the Sex of Northern Shrimp

- The composition of landings by size and sex is important for understanding the stock structure in the assessment model.
- Tracking shrimp sex ratios can also help indicate strong dominant year classes.
- The sex of a shrimp is easily determined by examining the first pleopod. A male has a characteristic spit with a serrated or two point top edge (left) while a female has a single candle flame point (right).

Male: Two Points (serrated)



Female: Distinct Candle Flame

