Domestic Shrimp Industries Past and Present

Objective(s)
This report will provide an overview of the domestic shrimp fisheries of the United States. It will cover the history of the industries, and briefly review important management decisions and policies. Primary focus falls on the largest domestic shrimp fishery in the Gulf of Mexico and South Atlantic regions, with secondary focus on cold water shrimp fisheries in the north Atlantic and north Pacific.

Summary of Findings

Introduction

Shrimp is the most popular seafood in the United States. As of 2005 we ate 4.1 pounds of shrimp per person annually (NOAA, 2005). Consumer demand has steadily increased since the 1980’s (see Appendix 1). The domestically supplied shrimp we eat comes from three regions, the Gulf of Mexico and adjacent Atlantic Ocean (known as the Gulf and South Atlantic Region), the Gulf of Maine, and off the southeast and south-central coast of Alaska. The Gulf and South Atlantic Region industry is the largest, 96% of the ex-vessel (the price the fishermen are paid up delivery of their fish to a processor) value of shrimp is caught in this region. The second largest is the New England Gulf of Maine fishery, which is followed by the relatively tiny Alaskan fishery.

Origins of the domestic industries

The roots of the first shrimp industry in the United States go all the way back to the colonial era, where subsistence shrimping for warm water shrimp (of the Panaeidae family) cropped up around present day Biloxi and New Orleans. The oldest account of commercial shrimp fishing is from 1883. This account describes a well established village of Malay fishermen who dried shrimp on raised platforms and supplied them to the New Orleans market. As processing and preservation techniques improved, the shrimp could eventually be sold
outside of the local area. In 1875 the Dubois brothers refined the process of shrimp canning, allowing for an even larger distribution area. 1889 is the first year for which complete estimates of catch statistics are available. The catch is estimated at 8.3 million pounds with an ex-vessel price of US$0.015/lb. White shrimp (Penaeus setiferus) is the targeted species (Condrey and Fuller, 1992)

At this time harvests are limited by environmental and industry factors (Condrey and Fuller, 1992). Shrimp are very sensitive to the physical characteristics of the ocean around them, including: currents, temperature, salinity, and habitat type. These factors remain the same today. Catch rates also depend on the harvesting technique used. At the turn of the century the two most common techniques were cast netting or haul seining. Cast netting involves a circular net, which could measure up to 14 ft in diameter, with a purse line and weights around the bottom. It is thrown over a visible patch of shrimp and then hauled in, either from shore or boat, but generally in water shallower than six feet. Haul seining, depending on the size of the seine net, could involve two men or one boat and a crew of up to twenty. The boat set one end of the net out in a semi-circle in a shallow bay or estuary while the rest of the crew held the other end of the net on shore. Then both sides of the net could be hauled in together (Iversen et. al., 1993). The boats used in both of these processes were generally rowboats fitted with sails (Condrey and Fuller 1992). World War One made it more difficult to put together the large crews need for these fishing practices.

The labor and technology restrictions inherent in the industry in the early 20th century were mitigated by the development of the trawl technique of fishing. Between 1912 and 1915 the otter trawl was modified from its original design, used to capture finfish, into an efficient shrimp harvesting technology. The otter trawl is a large cone shaped net with two lateral wings, with two wooden doors on either side. The water pressure against the boards holds the net open side to side, and the top and bottom of the net are equipped with floats and weights respectively. The wings guide the shrimp into the net where they are funneled into the cod-end jar (essentially a heavy duty mesh bag). The shrimp remain trapped there until the fisherman hauls the trawl aboard his vessel (Iversen et.al., 1993)

The advent and spread of trawl technology revolutionized the fishery. By 1920 fisherman had expanded into deeper water, up to 18 miles off shore. They reported, “an immense fishing ground where boundless supply of adult (white) shrimp always exist, with endless possibilities for the future of the shrimp industry” (Condrey and Fuller, 1992). Annual catch reports grew by a factor of 2.3 in one decade from 12.6 million pounds caught in 1908 to 29 million pounds caught in 1918. Volume of shrimp landings continued to increase; the 1928 catch of 79 million pounds more than doubled the 1918 harvest. Since the beginning of the industry the ex-vessel price grew to US$0.038/lb, a growth factor of 2.53 since 1889 (Condrey and Fuller, 1992). It is important to note that though trawling was a huge part of the shrimp industries rapid expansion, the fishery also now depended on the availability of crushed ice (which was used to pack the
shrimp in barrels while on board the ship), and on the expanding railway service to get it swiftly
to market (Iverson et al., 1993).

This rapid expansion caught the attention of Milton Lindner, the chief federal
government scientist. He, the US Bureau of Fisheries, and the natural resources departments of
Georgia, Louisiana and Texas, put together the first focused federal shrimp investigation.
Concerns about overfishing prompted them to design a study to gain enough information about
current shrimp stocks and fishing practices to develop yield models. This shrimp census
inadvertently lead to even more industry expansion. In 1937 large scale shrimp fisherman from
Florida’s east coast learned from Lindner of the large schools of white shrimp off the Louisiana
coast. That same year, they moved in and Louisiana’s annual reported catch jumped 16 million
pounds, from 60 to 76 million pounds. Between 1938 and 1939 Lindner mapped shrimp
concentrations in the Gulf between the beach and the 100 fathom (600ft) line from the Mexican
border to Carrabelle, Florida. His findings were abundant white shrimp population, but no new
fishing grounds comparable to those off the central Louisiana coast (Condrey and Fuller, 1992).

During WWII research in the industry lapsed while shrimp landings continued to rise. No
management restrictions came from Lindner’s study, but now the entire white shrimp spawning
grounds were covered by the trawl fishery. The industry continued expanding and by 1950 the
annual catch for the Gulf was 143 million pounds in US waters and an additional 47 million
pounds caught by US fisherman in Mexican Gulf waters (Condrey and Fuller, 1992).

Right around this time the fishery saw its first collapse. White shrimp populations
plummeted in the late 40’s and early 50’s, likely due to a combination of overfishing and drought
(see Appendix 2). By 1957 total white shrimp harvests were less than 10% of pre- 1952 catches.
The effects of this collapse were offset by a simultaneous dramatic increase in brown (Penaeus
aztecus) shrimp populations. Harvest pressure shifted from the white shrimp to the brown shrimp
and pink shrimp (Penaeus duorarum) (Iverson et al., 1993).

Pink shrimp featured highly in the last large expansion of the fleet Gulf fishery. In 1948
high densities of pink shrimp were found in Florida’s Dry Tortugas region. In the first year the
catch was 17 million pounds, the highest recorded catch for that region. Between 1950 and 1976
the fishery for all species of shrimp continued to expand until “full use of the domestic fishing
grounds” was made, and the fleet expanded into Central and South America. In 1976 the annual
catch was 210 million lbs with a high price of US$1.31/lb (Condrey and Fuller, 1992).

The remaining domestic fisheries in the US target cold water shrimp of the family
Pandalidae, primarily the northern (formerly, and confusingly, the pink) shrimp, and serve a
different market than the warm water shrimp (Iverson et al., 1993).

The first recorded mention of harvestable stocks of Pandalidae shrimp was in New
England waters. Richard Rathbun noted their presence in 1883 but the Gulf of Maine shrimp
fishery did not formally begin until 1938. For the next decade landings were made by primarily Mainers fishing from January-April. Similarly to the Gulf and South Atlantic fishery, canning and quick freezing techniques resulted in industry expansion which peaked at a harvest of 528,000 pounds in 1945 (for comparison this is about 40% of shrimp pounds landed in the Gulf and South Atlantic region in 1889) (Clark et.al., 2000).

Landings declined with decreasing abundance to the point that there were no commercial landings from 1954 to 1957. The fishery began recovering in the late-1950’s, presumably due to improved environmental conditions. By the mid-1960s the market was expanding and fisherman from Massachusetts and New Hampshire had joined the fleet (Clark et.al., 2000).

In the mid-70’s the Massachusetts’s fleet around Gloucester began dragging further from shore in the summer. This targeted all age groups of shrimp, instead of only the females who migrated shoreward during the winter months to lay their eggs. The Gloucester fisher expanded rapidly until they accounted for 40% of landings in the gulf of Maine. This was disastrous for the shrimp stocks, and landings decreased from an average of 22 million lbs a year in the early seventies to just 800,000 lbs in 1977 (Clark et.al., 2000). (see Appendix 3).

This collapse prompted the Atlantic States Marine Fisheries Commission (which had been approved by Congress in 1950) to begin serious management of the problem. The Commission closed the fishery for two seasons and subsequently has restricted the fishery to the window of December to May (Clark et.al., 2000).

A few small fisheries exist in the north Pacific; historically the most productive are located in southern Alaska (Iverson, et.al., 1992). In 1915 a trawl fishery developed in Southeast Alaska which currently harvests about 1.75 million lbs a year and is capped at 41 permits. In 1958 a trawl fishery sprung up around Kodiak and the Alaska Peninsula. This fishery peaked at 115 million pounds annually between 1973 and 1977. This fishery collapsed in the late 1970’s and 1980’s. The collapse is associated with a climate regime shift, the effects of which were dramatically warmer waters and increases in groundfish populations. Since population decreases were noted in fished and unfished areas it is likely that fishing played a limited role in this collapse. Since then the fishery has dwindled to just 4 or fewer vessels in only the Kodiak area. A historic pot trap fishery also occurs in SE, which strengthened in the 1990’s and is now capped at 800,000 pounds a year (Alaska Division of Fish and Game).

Management

Current management practices in the Gulf and South Atlantic Region are multifaceted. Individual states all have jurisdiction over their state waters. Federal waters are managed by a joint management council structure. The Gulf of Mexico Fisheries Management Council
manages the Gulf of Mexico region and the South Atlantic Fisheries Management Council manages the South Atlantic region. Management decisions are based on issues individual to the regions, though some overlap occurs. Management decisions are carried out through Fishery Management Plans (FMP) for shrimp in both regions. Changes to the FMP’s are made through an amendment process (NOAA, 2004).

The Gulf of Mexico FMP was put in place as a federal regulation on May 15, 1981. The plan was designed to increase yield in both volume and value, by avoiding the harvest of small shrimp. These small shrimp can grow larger and be caught later. Key management action incorporates:

1. “establishing a cooperative Tortugas Shrimp Sanctuary with the state of Florida to close a shrimp trawling area where small pink shrimp comprise the majority of the population most of the time.
2. a cooperative 45-day seasonal closure with the state of Texas to protect small brown shrimp emigrating from bay nursery areas; and
3. seasonal zoning of an area of Florida Bay for either shrimp or stone crab fishing to avoid gear conflict.”

Additionally the FMP also set up a reporting system for major players in the shrimp industry including vessels, dealers, and processors. (Gulf of Mexico Fishery Management Council, 2010).

Fifteen subsequent amendments to the FMP have further tailored the document to suit these goals:

4. “Optimize the yield from shrimp recruited to the fishery.
5. Encourage habitat protection measures to prevent undue loss of shrimp habitat.
6. Coordinate the development of shrimp management measures by the Gulf of Mexico Fishery Management Council (Council or GMFMC) with the shrimp management programs of the several states, where feasible.
8. Minimize the incidental capture of finfish by shrimpers, when appropriate.
9. Minimize conflict between shrimp and stone crab fishermen.
10. Minimize adverse effects of obstructions to shrimp trawling.
11. Provide for a statistical reporting system.”

(Gulf of Mexico Fishery Management Council, 2006).

The South Atlantic FMP was put in place in 1993. The objectives of the plan and its following amendments are:
1. “Eliminate fishing mortality on overwintering white shrimp following sever winter cold kills.

2. Reduce the bycatch of non-target finfish, invertebrates and threatened, protected and endangered species.

3. Encourage states with mariculture facilities to carefully monitor these operations and require safeguards to prevent exotic species from escaping and/or diseases from entering the environment.

4. Reduce or eliminate loss and/or alteration of the habitat on which shrimp depend or degradation of water quality that would reduce shrimp production.”

The management techniques used to accomplish these objectives include: closures after cold weather causes an 80% reduction in shrimp populations, and prohibit trawling with less than 4 inch mesh in a 25 mile buffer zone directly off shore in areas where shrimping is closed in federal waters (South Atlantic Fishery Management Council, 1993).

The management of the Gulf of Maine Industry is based on the creation of the Atlantic States Marine Fisheries Commission (ASMFC) which was approved by congress in 1950. The ASMFC Northern Shrimp Section, which includes representatives form Maine, New Hampshire and Massachusetts, is responsible for the fisheries management, based on information from the Northern Shrimp Technical Committee (Clark et. al., 2000). They developed their own FMP, the Northern Shrimp Fishery Management Plan which was approved in 1986. Broadly painted, the goals of the FMP are to “generate the greatest possible economic and social benefits from its [Northern Shrimp stocks] harvest over time (Atlantic States Marine Fisheries Commission, 1986.”

Alaskan shrimp stocks are managed by the Alaska Department of Fish and Game from zero to two hundred miles offshore (Alaska Department of Fish and Game, 2008).
Appendixes

1.

Chart from the National Oceanic and Atmospheric Administration’s National Marine Fisheries Service.

Shrimp consumption has appreciably increased since the 1980’s. Shrimp consumption has grown in all households between 1995 and 2002, but lower income households increased shrimp consumption by 45%, whereas middle and low income houses increased consumption by just 15%. Shrimp is no longer a luxury food purchased primarily by high income families. This increase in consumption is primarily due to the wide availability of imported shrimp (Consuming Industries Trade Action Coalition, 2004).
2. Annual shrimp landings correlated with the average rainfall of the previous three years in the state of Texas.

From the Food and Agriculture Organization’s Corporate Document Repository

Though this chart is for Texas specifically, similar trends in both rainfall and catch were felt through the whole Gulf and South Atlantic region.

The dramatic collapse in the late 1970’s is the dominant feature on this chart of total landings. The Gulf of Maine shrimp industry is inherently prone to fluctuation due to shrimp’s dependence on a wide variety of specific environmental factors.
Sources


National Oceanic and Atmospheric Administration. “Chapter Two: An Overview of the Commercial Shrimp Industry in the Gulf of Mexico and South Atlantic Region.” Draft