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# Southeast Menhaden Fisheries



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## Unit 10

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### INTRODUCTION

Menhaden are a herring-like fish found in coastal and estuarine waters of the U.S. Atlantic and Gulf of Mexico. They form large schools at the surface, which are located by aircraft and harvested by purse seines to produce fishmeal, fish oil, and fish solubles<sup>1</sup> (a reduction fishery). An active bait-fish fishery along the Atlantic coast, primarily located in Virginia and New Jersey, harvests about 15–20% of the amount landed by the industrial fishery. These fisheries are managed by individual coastal states, with interstate coordination handled through the Atlantic States Marine Fisheries Commission (ASMFC) and the Gulf States Marine

Fisheries Commission (GSMFC). Menhaden are prey for many fishes, marine mammals, and sea birds, and form an important component of coastal ecosystems.

In the Atlantic area, the menhaden resource is near fully utilized, with a maximum sustainable yield of 264,000 metric tons (t) per year and a recent average annual yield (2004–06) for the reduction and bait fisheries of 196,000 t (Table 10-1). In the Gulf of Mexico, the menhaden resource is near fully utilized, with a maximum sustainable yield of 645,000 t and a recent average yield for the reduction fishery of 456,000 t.

### SPECIES AND STATUS

#### Atlantic Menhaden

Atlantic menhaden range from West Palm Beach, Florida, north to Nova Scotia, Canada. As coastal waters warm in April and May, large surface

Photo above:  
Menhaden boats heading out  
for a day of fishing in Moss  
Point, Mississippi.

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<sup>1</sup>Fish solubles are the heavier components of the liquid that is pressed from cooked fish while making fishmeal; the lighter portion of the liquid is fish oil. The solubles are boiled down to a thick solution that is sold as fish emulsion and used in pet food as flavoring, in animal feed as added protein, and in fertilizer.

**Table 10-1**  
Productivity in metric tons (t) and status of southeast menhaden fishery resources.

Species/Stock	Recent average yield (RAY) <sup>1</sup>	Current yield (CY) <sup>1</sup>	Sustainable yield (MSY) <sup>2</sup>	Stock level relative to $B_{MSY}$ <sup>3</sup>	Harvest rate	Stock status
Atlantic menhaden	196,000	196,000	264,000	Above	Not overfishing	Not overfished
Gulf menhaden <sup>4</sup>	456,000	456,000	645,000	Unknown		
Total	652,000	652,000	909,000			

<sup>1</sup>2004–06 average; includes reduction fishery landings only for gulf menhaden, and both reduction and bait landings for Atlantic menhaden.

<sup>2</sup>MSY is based on the yield per recruit at  $F$ -threshold times median recruitment.

<sup>3</sup>Stock level criteria are based on terminal population fecundity relative to target fecundity.

<sup>4</sup>Harvest rate and stock status are not available for this stock. Benchmarks for gulf menhaden have been developed similar to Atlantic menhaden (Vaughan et al., 2007); these benchmarks have been recommended but not yet adopted by the GSMFC. Status relative to the proposed benchmarks is not overfishing and not overfished.

schools form along the coasts of Florida, Georgia, and the Carolinas. The schools move slowly northward, stratifying by age and size during summer, with the older and larger fish generally moving farther north. The southward migration begins in early fall with surface schools disappearing in late December or early January off the Carolinas. Atlantic menhaden may live up to 10 years, but most fish caught are age 3 or younger.

Menhaden reduction landings rose during the 1940's and early 1950's, peaking at 712,100 t in 1956 (Figure 10-1). Landings remained high

during the late 1950's and early 1960's, dropped precipitously during the mid 1960's and remained low, bottoming out at 161,600 t in 1969. Through the 1970's and 1980's, landings improved, but not to the levels of the late 1950's. Landings peaked again in 1983 at 418,600 t. Landings during 1990–98 averaged about 311,000 t annually. Beginning in 1998 the industry underwent considerable consolidation until only two factories (one in Reedville, VA, and one in Beaufort, NC) and 12 vessels were active on the Atlantic coast in 2000. Correspondingly, reduction landings in 2002 and 2003 declined to 174,000 t and 166,100 t, respectively. After the 2004 fishing season, the factory in Beaufort closed; since 2005 the factory in Reedville, VA, with 10 vessels, has been the only reduction facility active on the Atlantic coast. Reduction landings in 2007 amounted to 174,500 t. The commercial ex-vessel revenue of Atlantic menhaden for 2004–06 averaged \$27.3 million per year.

The decline in stock biomass in the 1960's resulted from poor recruitment during a period of initially high spawning stock. This decline drove fishing effort southward to Virginia and North Carolina, and more recently concentrated effort in Chesapeake Bay (Smith, 1999). During the 1990's, spawning stock biomass increased following good-to-excellent survival of recruits during the 1970's and 1980's. While spawning stock biomass recently peaked in 1997 at about 130,800 t, recruitment of age-1 fish has declined over the last decade to recent lows. Recruitment of age-0 Atlantic menhaden appears to have improved during odd years from 1999 to 2005, with the 2005 year-class contributing substantially to the reduction catch as age-1 and age-2



Joseph W. Smith, NMFS

Menhaden catch is concentrated or “hardened” in the bunt of the purse seine and pumped aboard the carrier vessel through a large hose.

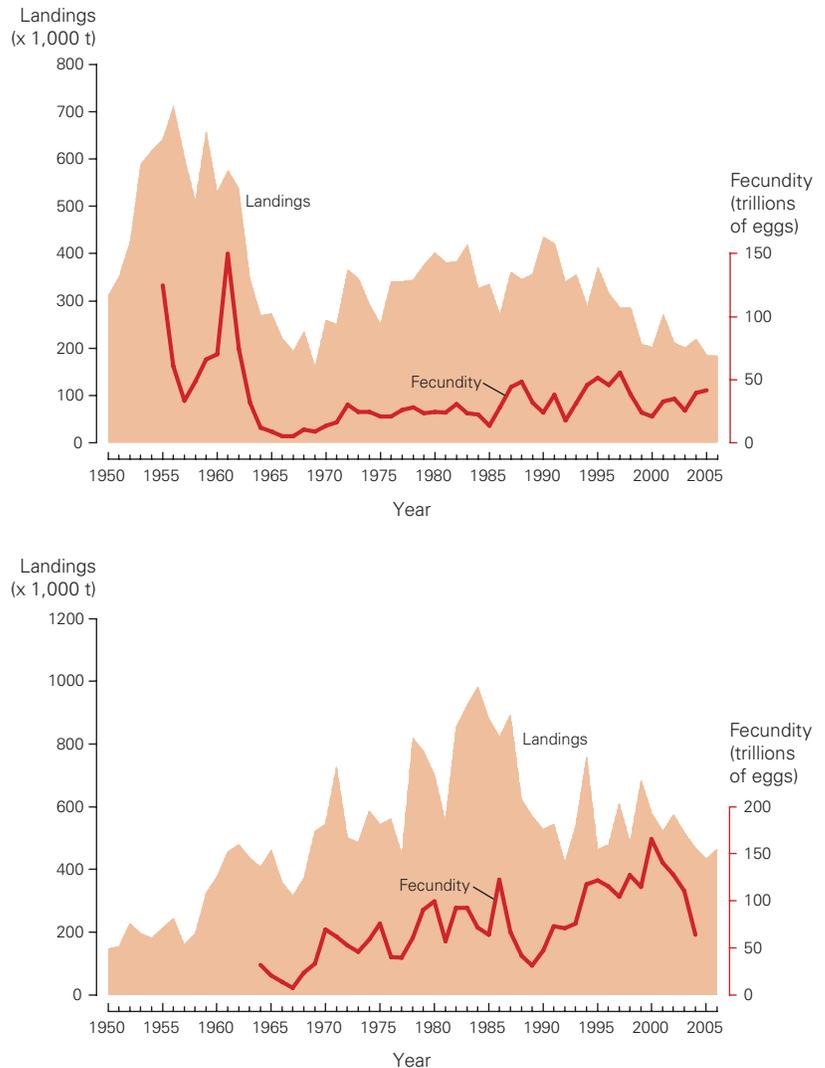
fish during 2006 and 2007, respectively. Moreover, adult Atlantic menhaden have been abundant in the coastal waters of southern New England during the summers of 2005–07, suggesting that the stock is expanding once again toward the northern half of its range.

Concern over recent poor recruitment (especially from Chesapeake Bay) and heightened interest in the ecological role of menhaden led to development of an Amendment to the Fishery Management Plan (FMP) for Atlantic Menhaden (ASMFC, 2001). The Amendment provided managers with two benchmark variables: fishing mortality ( $F$ ), and spawning stock biomass (SSB). Exceeding pre-specified levels of these benchmark variables determines the need for specific management actions. In 2003, the stock assessment for Atlantic menhaden underwent a peer review process, SouthEast Data Assessment and Review, or SEDAR (ASMFC, 2004). In early 2004, the Atlantic Menhaden Plan Development Team recommended changing the second management benchmark to address population fecundity; later that year the ASMFC adopted an Addendum to the FMP.

### Gulf of Mexico Menhaden

Gulf menhaden are found from Mexico's Yucatán Peninsula to Tampa Bay, Florida. They form large surface schools that appear in nearshore Gulf waters from April to November. Although no extensive coastwide migrations are known, some evidence suggests that older fish move toward the Mississippi River delta. Gulf menhaden may live to age 5, but most of those landed are ages 1 and 2. In 2007, active gulf menhaden reduction plants were located in Moss Point, Mississippi, and in Empire, Intracoastal City, and Cameron, Louisiana.

Historically, landings rose after World War II to a peak of 982,800 t in 1984 (Figure 10-1). Landings were generally high during the mid 1980's (greater than 800,000 t for 1982–87), but they declined steeply from 894,200 t to 421,400 t between 1987 and 1992. During this period (1987–92), the number of processing plants declined from 8 to 6 and the number of active vessels fell from 75 to 51. Landings in 1994 of 761,600 t were the greatest during the 1990's. Since 2000, only 4 processing



**Figure 10-1**

Landings in metric tons (t) and fecundity of menhaden, 1950–2006. Top, Atlantic (includes both reduction and bait fishery landings); bottom, Gulf of Mexico (includes only reduction landings).

plants operated on the Gulf, with about 40 vessels. Landings during 2004–06 averaged 456,000 t annually. Landings in 2007 amounted to 453,800 t. In 2005, Hurricanes Katrina and Rita did considerable damage to the four gulf menhaden reduction factories; two closed after the storms for the remainder of the fishing season, and faced major difficulties re-opening in 2006. The commercial ex-vessel revenue of Gulf menhaden for 2004–06 averaged \$39.7 million/year.

Because Gulf menhaden have a short life cycle and a high natural mortality, growth overfishing has not been a management concern. Management is coordinated through the GSMFC, and consists of an approximate 28-week fishing season (mid April through 1 November) and closure of inside waters

across the northern Gulf of Mexico. The Gulf Menhaden FMP was revised and adopted in 2002 (GSMFC, 2002). An updated stock assessment for Gulf menhaden (using data through 2004) has recently been completed (Vaughan et al., 2007). Suggested benchmarks for management of the fishery are similar to those for Atlantic menhaden (*F* and population fecundity).

## ISSUES

### Management Concerns

The primary concern for the Atlantic menhaden stock is a decline in recruitment noted since 1989 (1988 year-class) to low levels through 2003. This is considered in context with relatively high population fecundity during this period. Poor recruitment through the 1990's, with high spawning, suggests an underlying environmental problem (e.g. predation, water quality, etc.), rather than overfishing. Additionally, the need for multispecies management has been raised. In August 2006, ASMFC approved Addendum III of the Atlantic menhaden FMP, which capped annual removals of menhaden for reduction from Chesapeake Bay at 109,020 t for 5 years (2006–10) with provisions for catch overages and underages. Additionally, Addendum III encourages research on the status of menhaden within the Bay and assessment of localized depletion of the resource.

Gulf menhaden landings have declined greatly since the mid 1980's; however, estimates of static spawning potential ratio remain high (about 60%).

### Transboundary Stocks and Fishery Management Jurisdictions

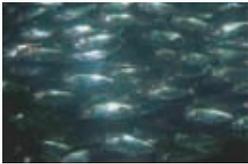
Because this resource migrates long distances, interstate coordination of fishery management is required for Atlantic menhaden along the U.S. Atlantic Coast and for Gulf menhaden along the northern Gulf of Mexico through the interstate marine fisheries commissions. During the late 1980's and early 1990's, fish landed at processing plants in New Brunswick and Nova Scotia, Canada, were caught off Maine by U.S. vessels and transported to Canada for processing.

### Bycatch and Multispecies Interactions

Two Saltonstall-Kennedy studies, funded in 1992 to investigate bycatch in the Atlantic and Gulf menhaden purse-seine fisheries, showed very low bycatch incidence (<0.1% of other species). However, the importance of menhaden as prey for other species has been an issue of much concern. The ASMFC recently created a Multispecies Technical Committee, and a subcommittee is currently updating the multispecies virtual population analysis (MSVPA) that passed Stock Assessment Review Committee (SARC) peer review in December 2005. This model focuses on the effect of three predators (striped bass, bluefish, and weakfish) on Atlantic menhaden. The eventual goal of this work is to manage forage and predator fish species at a multispecies level.

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Above: Menhaden swim through the water column with their mouths agape, filtering out plankton for food.