

Atlantic Croaker

Micropogonias undulatus

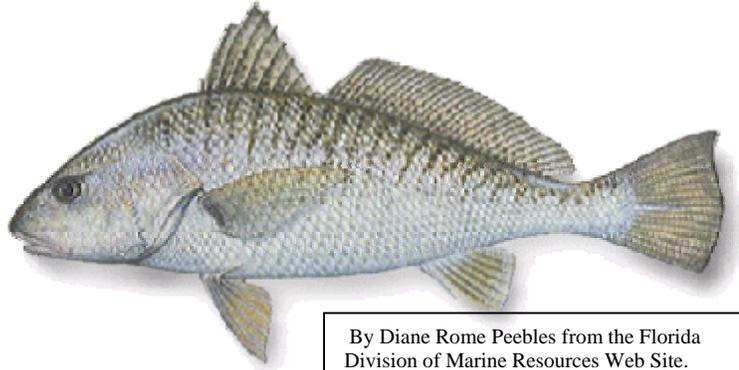
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DESCRIPTION

Taxonomy and Basic Description

The Atlantic croaker is the only representative of the genus in the western North Atlantic. This species gets its name from the deep croaking sounds created by muscular action on the air bladder.

It is one of 23 members of the family Sciaenidae found along the Atlantic and Gulf of Mexico coasts (Mercer 1987). The species has a typical fusiform shape, although it is somewhat vertically compressed. The fish is silvery overall with a faint pinkish-bronze cast. The back and upper sides are grayish, with brassy or brown spots forming wavy lines on the side (Manooch 1988). The gill cover has three to five prominent spines and there are three to five small chin barbels. It has a slightly convex caudal fin.



By Diane Rome Peebles from the Florida Division of Marine Resources Web Site.

Atlantic croaker south of Cape Hatteras reach maturity after one year at lengths of 140 to 180 mm (5.5 to 7 inches) and are thought to not survive longer than one or two years (Diaz and Onuf 1985). North of Cape Hatteras, the fish matures a year later at lengths greater than 200 mm (8 inches) and individuals may live several years. The Atlantic croaker reaches a maximum length of 500 mm (20 inches) (Hildebrand and Schroeder 1927). Catches of large Atlantic croaker appear to be relatively common on Chesapeake Bay, but large individuals of Atlantic croaker are rare in South Carolina. Bearden (1964) speculated that small croaker from South Carolina may migrate north, but limited tagging studies could not corroborate that assertion.

Although shrimp trawlers often catch Atlantic croaker, the species is probably not captured in quantities large enough to threaten the sustainability of the stocks. Diamond et al. (2000) concluded that late juvenile mortality resulting from bycatch was not the most important factor affecting Atlantic croaker populations. Evidence suggests that the oceanic larval stage is more critical to the success of the stock with small changes in mortality causing great changes in recruitment rates (Norcross 1983; Diamond et al. 2000). However, these studies also note that bycatch mortality has the potential to have large negative impacts on population growth rates, but bycatch reduction devices (BRDs) reduce this potential and can even result in population growth. Additionally, bycatch mortality has diminished substantially in recent years because of the decline in shrimp trawling effort. Poor economic conditions in the fishery have resulted in fewer license sales and much less fishing by licensed trawlers (pers. obs.).

Status

The Atlantic croaker is not a federally or state listed species. The Atlantic States Marine Fisheries Commission is investigating a management plan, but management recommendations

for the southeastern U.S. Atlantic states do not appear to be under consideration. The croaker is a significant and ubiquitous component of the inshore benthic fish community. As such, this species is probably a valuable indicator species of the relative health on estuarine benthic finfish and the associated habitat.

POPULATION DISTRIBUTION AND SIZE

The Atlantic croaker is a very common species in the waters of South Carolina. It occurs in coastal waters from Cape Cod, Massachusetts to Campeche Bank Mexico, and possibly from southern Brazil to Argentina (Mercer 1987). The species spawns in offshore waters on the continental shelf during fall. Adults in spawning condition have been found in depths of 7 to 131 m (23 to 430 feet) north of Cape Hatteras, and from 5 to 50 km (3 to 31 miles) offshore of South Carolina in depths of 40 to 91 m (131 to 298 feet) (Bearden 1964).

Studies of marine fishes have consistently shown that the Atlantic croaker is among the most common fishes in state waters. Bearden (1964) noted that Atlantic croaker was second only to star drum, *Stellifer lanceolatus*, in trawl samples collected in South Carolina from 1953 to 1962. Keiser (1977) found that Atlantic croaker was the third most abundant fish in samples taken off South Carolina on shrimp trawlers in 1974 and 1975, trailing spot (*Leiostomus xanthurus*) and Atlantic menhaden (*Brevoortia tyrannus*). Wenner and Sedberry (1989) examined fishes in the coastal waters off the Southeastern United States using trawls and found Atlantic croaker to be the second-most abundant species following spot. Whitaker et al. (1989) conducted experimental trawling in South Carolina's sounds in 1986 and 1987 and found Atlantic croaker present in 55 of 89 samples taken. Among the recreationally important species, Atlantic croaker was second in catch rates to southern kingfish (*Menticirrhus americanus*) and ahead of southern flounder (*Paralichthys lethostigma*), spot, summer flounder (*Paralichthys dentatus*) and other species. South Carolina Department of Natural Resources' (SCDNR's) SEAMAP program samples regularly-trawled stations in nearshore coastal waters, and found Atlantic croaker to be second only to spot in terms of abundance for the period 1989 to 2004 (24.0 percent to 12.6 percent). However, in 2004, Atlantic croaker fell to the eighth most abundant species. Trawling conducted in 2001 through 2002 in South Carolina's estuarine waters as part of the SCDNR's Estuarine and Coastal Assessment Program (SCECAP) found Atlantic croaker to be the fourth-most abundant species behind white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*) and spot (Van Dolah et al. 2004).

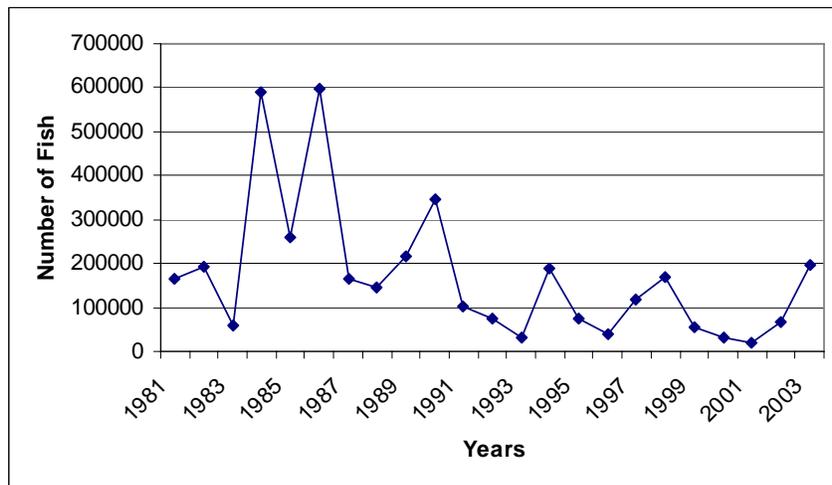
Joseph (1972) examined historical landings and catch-per-unit-effort data for Atlantic croaker stocks in the mid Atlantic states and Chesapeake Bay, and concluded that fluctuations in abundance over the previous 80 years were largely attributable to the natural environment, namely temperature. He noted that unusually cold winters could decimate larval and juvenile fish.

Hales and Reitz (1992) examined Native American middens and Spanish colonial sites in Florida for Atlantic croaker otoliths and found large fish (12 to 46 cm) that were present from 2000 BC to the mid-16th century. They concluded that there has been a severe reduction in size and age of Atlantic croaker in the southeast within historic times due to overfishing or habitat degradation. This reduction could be related to shrimp trawl bycatch.

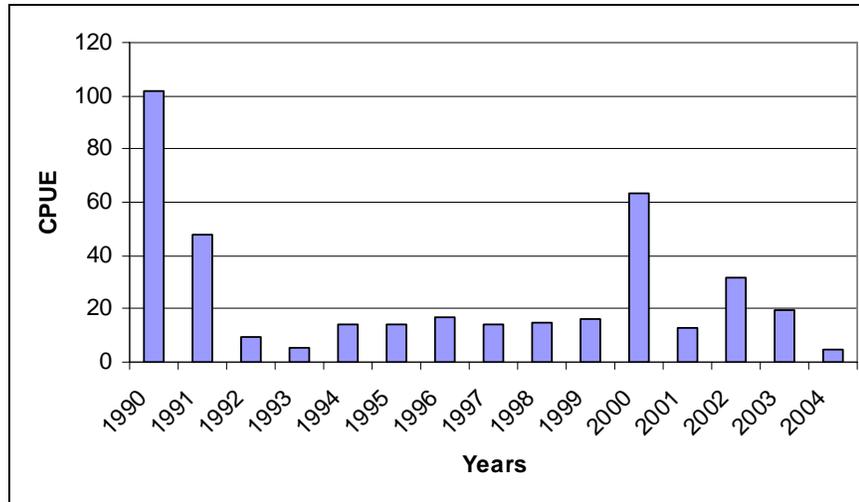
Also working with Chesapeake Bay stocks, Norcross (1983) concluded "...croaker are basically a density-independent stock; and juvenile recruitment is erratic and dependent upon specific environmental parameters. The effect of spawning stock size may only become apparent after accounting for the effects of density-independent variables." Environmental variables utilized in her model were January-February-March temperature and wind-induced larval transport. She also noted, however, that several weak year classes in succession increase the fishing pressure on each year class, and this further reduces spawning potential. She observed that directed fishing on fish less than two years old is only acceptable when year classes are strong.

The latest stock assessment for the Atlantic States Marine Fisheries Commission (ASMFC), completed in 2004, was done only for the mid Atlantic region because there was inadequate data to assess the south Atlantic region (Florida to South Carolina) (Wallace 2004). The ASMFC Technical Committee found that the mid Atlantic is not overfished and overfishing is not occurring.

Recreational landings in South Carolina, as determined by a Marine Recreational Fisheries Statistics Survey (MRFSS) suggest considerable variability in catch, which probably is at least partially related to fluctuations in stock abundance. Since 1982, MRFSS data indicate a sinusoidal pattern with catches on the upswing in 2003. However, the long-term trend in recreational harvest appears to be downward (see table below).



Fishery-independent data collected routinely with trawls along the South Carolina beaches by the SEAMAP program of SCDNR indicate variability in abundance as suggested by catch per unit of effort (CPUE) data). There is a general downward trend in CPUE since 2000 with the 2004 catch being the lowest recorded, but CPUE has been above the longer-term average in three of the last five years (see table below). These data are inadequate at this time to suggest long-term population declines, but indicates the need to more closely examine population trends.



HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Atlantic croaker has a down-turned mouth, making it well suited for its bottom-feeding life style. Adults spawn offshore producing larvae that are carried into the coastal inlets by tidal currents. Larvae ride the “salt wedge” which moves along the bottom into estuaries (Bearden 1964). Atlantic croaker larvae have a day-night (diel) distribution in the water column that is opposite of that for most planktonic animals (Comyns and Lyczkowski-Shultz 2004). This “reverse diel vertical migration” means they are more common in deeper water during daylight compared to night. Optimal habitat for post-settlement juvenile Atlantic croakers is the low salinity zone in the upper portion of the estuary. Peterson et al. (1999) demonstrated in controlled laboratory experiments that Atlantic croaker grew considerably faster in salinities of 5 parts per thousand (ppt) than those growing in 20 ppt or a variable salinity (5 to 20 ppt). Young Atlantic croaker first recruit to the upper estuarine areas and gradually move seaward toward higher salinities as they become larger (Bearden 1964). Lower salinity estuaries typically had larger numbers of Atlantic croaker compared to higher salinity estuaries, indicating that survival and growth are enhanced by lower salinities and/or other factors that might be related to salinity (Bearden 1964). Miglarese et al. (1982), also working in South Carolina estuaries, found that salinity affects size distribution and Chao and Musick (1977) found that Atlantic croakers were most abundant in lower salinities in the York River, Virginia. However, others have suggested that depth and food preference may be related to size distribution (Migliarese et al. 1982).

Rogers et al. (1984) found that seasonal freshets of river flow were important to estuarine-dependent species including Atlantic croaker. They noted that it was striking that low salinity and freshwater areas serve as primary zones of recruitment and that peak recruitment and utilization periods occur during the period of maximum riverine influence, temporarily creating “a much larger proportion of the preferred habitat.” Ross (2003) concluded that oligohaline habitats (low salinity) provided better habitats for spot and Atlantic croaker because mortality rates are lower there. There are several alternative explanations of why mortality rates are lower in the lower salinity areas including: reduced predation, lower respiration rates (compared to high salinity) and higher growth rates.

Parker (1971) noted that the “large concentrations of croaker were always observed in shallow waters less than 1.2 m (4 feet) deep and in close proximity to a source of fresh or brackish water.” Parker also noted that these habitats were generally soft mud bottoms with large quantities of detritus. It was suggested these shallow areas provide abundant food and protection from predators. Bearden (1964) also found that young Atlantic croaker were most often found in small tidal creeks where bottoms are composed of soft mud and decomposing organic matter. He noted that larger Atlantic croaker were found on a great variety of bottom types, but were most abundant on “bottoms composed of mud and sand mixture, particularly near the mouths of tidal sounds and several miles offshore.” Miller et al. (2002), working in Delaware Bay, found that young Atlantic croaker used the entire range of marsh creek habitats. When found in deeper water of the bay, croaker were most abundant over the mud bottoms.

In summary, it appears that the lower-salinity upper reaches of estuaries are optimal habitat in South Carolina for young Atlantic croaker. Survival and growth rates appear to be higher in low salinity areas although the reason(s) is unknown. Atlantic croaker move seaward as they become larger, using the deeper channels to migrate. Mud bottom habitats throughout the estuary appear to be important to the species regardless of depth.

CHALLENGES

Since colonial times, size and age structure of Atlantic croaker populations appears to have changed drastically in ways that are consistent with added heavy fishing pressure (Hales and Reitz 1992). Adequate freshwater flow into the coastal zone appears to be very important to the species. Inadequate freshwater flow into estuaries when juveniles are on the nursery grounds could negatively affect the species. Loss of shallow saltmarsh habitats through construction of seawalls in the upper reaches of tidal creeks could also be detrimental. Additionally, compromised water quality resulting from nutrients and chemicals associated with untreated storm water from coastal development could negatively affect the species, particularly the juveniles while in the nursery habitats.

Disease may be a new threat to Atlantic croaker stocks. During summer 2004, millions of fish reportedly washed ashore from Florida to New Jersey. Among these were at least hundreds of Atlantic croaker. It was speculated that a bacterial infection was the cause, perhaps related to unusually heavy rains (Daily Press, Hampton Roads, Virginia, 9 September 2004).

The potential impacts of chemical pollutants on Atlantic croaker and other fishes are just now coming to light. Endocrine disrupting chemicals (EDCs) such as organo-chlorines, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and alkylphenols are being investigated for impacts on fishes. Thomas (1990) found that female Atlantic croaker exposed to cadmium had elevated levels of reproductive hormones resulting in precocious ovarian growth; exposure to lead, benzene(a)pyrene and the PCB Aroclor 1254 each caused a decline in circulating steroid hormone levels and ovarian growth. McCarthy et al. (2003) demonstrated that environmentally realistic loadings of a PCB (Aroclor 1254) in eggs of Atlantic croaker through dietary exposure and maternal transfer can have significant effects on survival

and growth rates of larvae. In a separate study, Khan and Thomas (1996) showed that Aroclor 1254 significantly blocks testicular growth in Atlantic croaker.

Overfishing is a potential problem for Atlantic croaker stocks. At this time there are no conclusive stock assessment data to suggest the species is overfished in South Carolina. Because the species remains very common in coastal waters and it matures at a relatively small size, there appears to be adequate numbers of spawners to sustain the local stocks. Regardless, without the necessary information to fully assess the population trend for this species, over fishing is a possibility with increased fishing effort.

CONSERVATION ACCOMPLISHMENTS

Actions taken by the South Atlantic Fishery Management Council in Amendment 2 to Shrimp Management Plan (SAFMC 1996) and by the Atlantic States Marine Fisheries Commission in the Weakfish Management Plan (ASMFC 1994) have resulted in the mandatory use of bycatch reduction devices in shrimp trawl nets. Studies have shown that these devices are useful in reducing bycatch-related fishing mortality of fishes including Atlantic croaker. Additionally, the South Carolina General Assembly closed most of the area in the state's sounds and bays to shrimp trawling in 1986, thus reducing fishing mortality and providing greater survival of juveniles. Another legislative action by South Carolina eliminated small mesh gill nets in the state's estuaries and significantly reduced the length of recreational gill nets to 30.5 m (100 feet).

CONSERVATION RECOMMENDATIONS

- Research ways to improve catch data in order to determine population trends of Atlantic croaker.
- Examine the age structure of Atlantic croaker in South Carolina.
- Examine movement patterns of adult Atlantic croaker through tagging studies.
- Determine natural and fishing mortality rates of Atlantic croaker in South Carolina.
- Examine effects of pollutants on Atlantic croaker individuals and the stock as whole.
- Examine environmental factors that may affect abundance of Atlantic croaker.
- Examine ecological interactions between Atlantic croaker and other species, including red drum.
- Conduct a stock assessment for the south Atlantic population of Atlantic croaker.
- Research the impacts of disease on mortality of Atlantic croaker.
- Partner with appropriate agencies in North Carolina and Georgia to develop agreements to maintain adequate water flow into coastal estuaries.
- Work with the South Carolina Department of Health and Environmental Control's Office of Coastal Resource Management (OCRM) and the Army Corps of Engineers (ACOE) to minimize the loss of salt marsh habitat to construction projects in the coastal zone.
- Along with OCRM and other partners, work with municipal and county planners to work toward reducing the negative impacts of urban development to sensitive areas in coastal marshes.
- Improve and maintain water quality and reduce the input of contaminants by working with municipalities to improve and implement Best Management Practices (BMPs).

- Develop a regional fishery management plan for the Atlantic croaker to address conservation issues range-wide.

MEASURES OF SUCCESS

One measure of success would be to improve monitoring programs for Atlantic croaker such that a stock assessment and population trends can be developed. By conducting the above mentioned research, a regional management plan can be developed through partnerships with other state agencies. Although there appears to be much variability in catch per unit data from year to year, the ultimate measure of success will be to document stable population trends over long-term periods for the Atlantic croaker.

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