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# Southeast and Caribbean Invertebrate Fisheries

## INTRODUCTION

Important recreational and commercial marine invertebrates in the southeastern United States include shrimp, spiny lobster, stone crab, and conch. Some fisheries, as for coral, are almost non-existent. Others, like the penaeid shrimp fishery, are both extensive and extremely valuable. The southeast region's shrimp fisheries are one of the most valuable U.S. fisheries based on ex-vessel revenue. Some fisheries, such as those for spiny lobster and stone crab, have only moderate value on a national basis but are important locally or regionally. Because of the diversity in species, fisheries, geographic locations, yields, values, etc., each species group in the marine invertebrates unit must be examined separately for proper perspective.

Penaeid shrimp have been fished commercially since the late 1800's. The first fishery used long seines in shallow waters, until the otter trawl, introduced in 1915, extended shrimping to deeper waters. At first, most vessels towed one large trawl, sometimes 120 feet wide at the mouth. Soon, a two-trawl arrangement (each about 40–75 feet wide at the mouth) was found more effective. Some shrimpers are using a twin-trawl system which tows four trawls of about 40 feet wide at the mouth. The twin-trawl system is now very common gear on commercial offshore shrimpers.

Regulations in the Gulf of Mexico Shrimp Fishery Management Plan restricts shrimping by closing two shrimping grounds. There is a seasonal closure of fishing grounds off Texas for brown shrimp and a closure off Florida for pink shrimp. There are also size limits on white shrimp caught in Federal waters and landed in Louisiana. These

regulations strive to improve the monetary value of the shrimp fishery (Nance, 1998).

In the South Atlantic, white shrimp stocks are centered off the Georgia and South Carolina coasts. Brown shrimp are centered off the North and South Carolina coasts. The Atlantic fishery is much smaller than that of the Gulf and currently is managed under a Federal fishery management plan implemented in November 1993. This provides for compatible state and Federal closures if needed to protect overwintering shrimp stocks. A subsequent amendment added rock shrimp to the fishery management plan.

Spiny lobsters are managed under a joint fishery management plan, coordinated with regulations by the State of Florida. Current regulations specify a 3-inch minimum carapace length, a closed season from 1 April to 5 August, protection of egg-bearing females, closure of some nursery areas, recreational bag limits, and a controversial 2-day sport season.

Caribbean spiny lobsters are caught primarily by fish traps, lobster traps, and divers. The Caribbean Fishery Management Council's Spiny Lobster Fishery Management Plan includes the Federal waters of Puerto Rico and the U.S. Virgin Islands. The Federal plan is based on a 3.5-inch minimum carapace length and protection of young egg-bearing lobsters.

The conch fishery targets the queen conch but also takes other species. Most conch are taken by divers, and the resource can be easily depleted. Conch are currently protected in state and Federal waters off Florida. A fishery management plan is being developed for the Federal waters off Puerto Rico and the U.S. Virgin Islands by the Carib-

# Unit 11

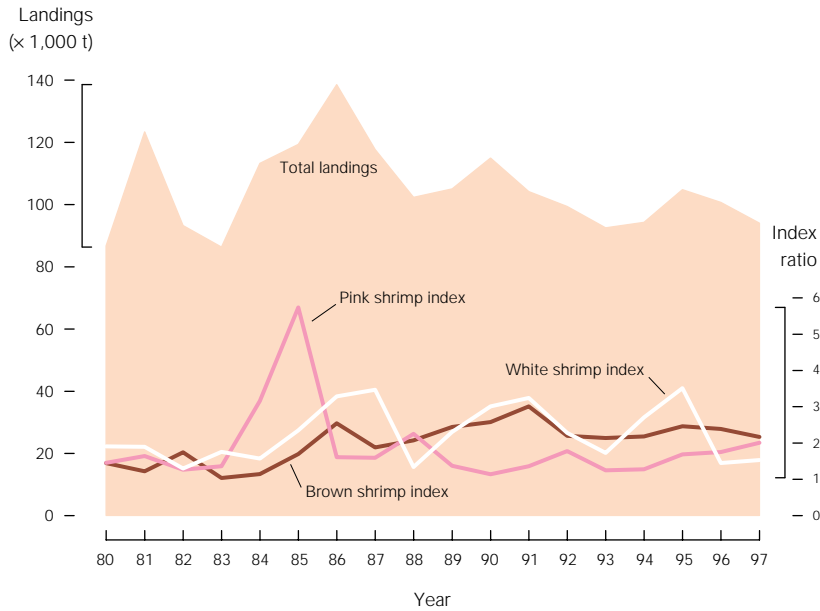
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**Figure 11-1**

Shrimp landings in the U.S. Gulf of Mexico and species ratio, 1980–97, in metric tons (t). Index values are the current level of reproductive-age shrimp divided by the overfishing level; e.g. a value of 2 means that the current number of reproductive-age shrimp is 2× above the overfishing level.

bean Fishery Management Council.

Corals are managed as two groups, hard and soft. Because they are generally slow growing and provide critical habitat for many fishes, hard corals are protected except for very small collections taken by permit for research and educational purposes. Regulations are based on the fact that the value of coral as natural habitat is far more important than their commercial use.

Soft corals include gorgonians and sea fans. Some gorgonians are taken (about 50,000 colonies annually) for the aquarium and pharmaceutical trade. Growth potential for most species is considered limited. Sea fans are completely protected except for research and educational use by permit.

Stone crabs are caught mainly off southern Florida, though some are landed farther north along Florida's west coast. The Gulf of Mexico Stone Crab Fishery Management Plan, approved in September 1979, generally extended Florida's regulations into the U.S. Exclusive Economic Zone. These regulations are based on a minimum claw size of 2.75 inches, biodegradable trap panels, protection of egg-bearing females, and closed seasons. Minimum size regulations assure that crabs have reproduced at least once before being caught.

## SPECIES AND STATUS

### Shrimp Species

Brown, white, and pink shrimp account for 90% of the total Gulf of Mexico shrimp catch. In 1997 alone, these three important species produced 84,967 t valued at over \$437 million in ex-vessel revenue (Figure 11-1). They are found in all U.S. Gulf waters inside 120 m depths. Most of the offshore brown shrimp catch is taken at 20–40 m depths, white shrimp are caught in 10 m or less, and pink shrimp in 20–30 m. Brown shrimp are most abundant off the Texas-Louisiana coast, and the greatest concentration of pink shrimp is off southwestern Florida. In the South Atlantic, white shrimp landings are about 21% of their Gulf counterparts, while brown and pink shrimp are around 6% of the Gulf yield. Current, recent, and long-term potential yields for these species are given in Table 11-1.

Gulf brown and white shrimp catches increased significantly from the late 1950's to around 1990, with the most recent years showing a slight decrease from these maximum values. Pink shrimp catches were stable until about 1985; then they declined and were at an all time low in 1990. In recent years the catches have started to increase and are slightly above average levels. The numbers of young shrimp for each species entering the fisheries have generally reflected the level of catch. All commercial shrimps are harvested at maximum levels. The fishery is believed to have more boats and gear than needed (i.e. reducing fishing effort would not significantly reduce the shrimp catch) (Nance, 1993a and 1997). Reducing the bycatch of the shrimp industry, however, would help protect finfish resources.

Recruitment overfishing has not been evident in the Gulf of Mexico shrimp stocks (Klima et al., 1990; Nance, 1993b). The number of young brown shrimp produced per parent increased significantly until about 1991 and has remained near that level in recent years. White and pink shrimp have not shown any general trend, although pink shrimp stocks have rebounded from the low values experienced in the early 1990's. The brown shrimp increase appears related to marsh alterations. Coastal sinking and a sea-level rise in the

Species and area	Recent average yield (RAY) <sup>1</sup>	Current potential yield (CPY)	Long-term potential yield (LTPY)	Fishery utilization level	Stock level relative to LTPY
Brown shrimp, Gulf of Mexico	53,080	Unknown	57,653 <sup>2</sup>	Full	Near
Brown shrimp, Atlantic	2,645	Unknown	3,447 <sup>2</sup>	Full	Near
White shrimp, Gulf of Mexico	28,942	Unknown	29,980 <sup>2</sup>	Full	Near
White shrimp, Atlantic	6,045	Unknown	6,305 <sup>2</sup>	Full	Near
Pink shrimp, Gulf of Mexico	11,009	Unknown	7,469 <sup>2</sup>	Full	Near
Pink shrimp, Atlantic	730	Unknown	955 <sup>2</sup>	Full	Near
Royal Red Shrimp	250	Unknown	Unknown	Unknown	Unknown
Seabob Shrimp	3,947	Unknown	Unknown	Unknown	Unknown
Rock Shrimp	6,240	Unknown	Unknown	Unknown	Unknown
Spiny lobster, SE United States <sup>3</sup>	3,325	2,400	3,565	Over	Below
Spiny lobster, Caribbean	111	Unknown	Unknown	Unknown	Unknown
Stone crab <sup>4</sup>	2,961	1,121	976	Full	Near
Queen conchs <sup>5</sup>	91	55	Unknown	Over	Below
Coral <sup>6</sup>	0	0	Unknown	Unknown	Unknown
Total	119,376	116,575	120,953		

**Table 11-1**  
Productivity in metric tons and status of Southeast and Caribbean invertebrate fisheries.

<sup>1</sup>1995–97 average for shrimp; 1994–96 average for other species.

<sup>2</sup>Long-term potential of brown, white, and pink shrimp based upon last observed 10-year average annual yield (1988–97).

<sup>3</sup>Yields based upon commercial catches; recreational catch is unknown but may be significant.

<sup>4</sup>Yields are in tons of claws; declawed crabs regenerate new claws.

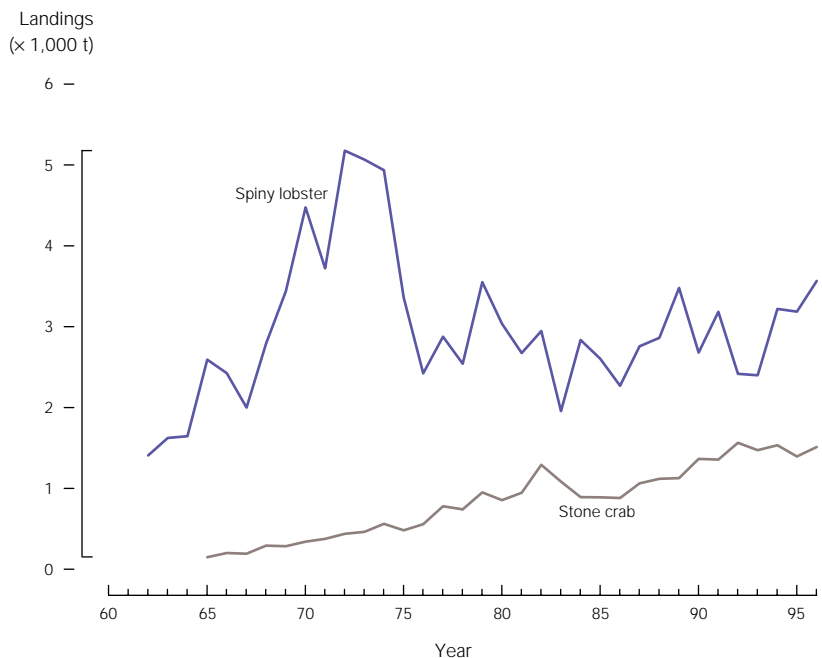
<sup>5</sup>Landings from Puerto Rico. Fishing prohibited in Florida.

<sup>6</sup>Coral harvests prohibited except for a small take allowed for use in aquarium and pharmaceutical industries.

northwestern Gulf inundates intertidal marshes longer, allowing the shrimp to feed for longer periods within the marsh area. In the Gulf, both factors have also expanded estuarine areas, created more marsh edges, and provided more protection from predators. As a result, the nursery function of those marshes has been greatly magnified and brown shrimp production has expanded. However, continued subsidence will lead to marsh deterioration and an ultimate loss of supporting wetlands, and current high fishery yields may not be indefinitely sustainable. Parent stock indices for the three major Gulf species are shown in Figure 11-1.

### Spiny Lobster

Annual Florida spiny lobster landings were fairly stable during the 1980's, running about 2,700 metric tons (t) from the Gulf of Mexico (Figure 11-2), but yielding recent high landings in 1994 of 3,222 t, with ex-vessel revenue of about \$30 million. On Florida's Atlantic Coast, landings have averaged 230 t, valued at \$2 million. The fishery is considered overcapitalized with approximately 900,000 lobster traps fished during 1992.



**Figure 11-2**  
Landings of stone crab (claw weight) and spiny lobster, 1960–96, in metric tons (t).

In 1993, a trap reduction program was established, not to exceed 10% per year, which would maintain or maximize sustainable spiny lobster harvest from the fishery. Excessive effort in the fishery has

been estimated to occur when the number of traps fished exceeds 300,000/year. Spiny lobster fishermen use live undersized lobsters as attractants in their traps, but due to a high mortality rate for these "live bait" animals, about 30–50% of the potential yield is lost. The recreational fishery in Florida had over 120,000 participants purchasing recreational lobster stamps during the 1991 season. Recreational spiny lobster catches were estimated to comprise 41% of total landings during the first month and 22% of the total 1991–92 season landings.

Annual spiny lobster landings for Puerto Rico have averaged 126 t over the past 27 years, varying from 103 t in 1972 to a high of 223 t in 1979. No precise data are available on fishing effort, but the Puerto Rican stock produced landings of 72 t in 1992 and now appears to be overutilized. U.S. Virgin Islands landings for 1980–88 were fairly stable, averaging 19 t.

Spiny lobster larvae may drift at sea for 9 months, and thus identification of their source or parent stock is almost impossible. There is a practical management need to know far more about their origin and subsequent movement into the fishery.

### Stone Crab

Annual catches of stone crab (claw weight) varied from 1,200 to 1,400 t on the Gulf of Mexico and Atlantic coasts through the 1980's, with a record 3,065 t landed during 1994 (Figure 11-2). Recent annual ex-vessel revenue averaged \$18 million. The number of stone crab traps fished seasonally increased from 295,000 in 1979–80 to 567,00 in 1984–85 to a record 745,000 during 1992–93. While total landings have increased modestly in recent years, it is clear that these landings are the result of increased fishing effort (number of traps fished), especially during the early months of the stone crab season.

## ISSUES

### Habitat Concerns

Estuarine and marsh loss remove critical habitat for young shrimp. Additional studies are needed

to further assess the impacts of human-induced changes in habitat availability, environmental conditions, predator abundance, and pollution in the nursery areas. Florida spiny lobsters depend on reef habitat and shallow-water algal flats for feeding and reproduction. These habitat requirements may conflict with expanding coastal developments. The productivity of stone crabs in Florida Bay is related to water quality and flow through the Everglades. Specific water requirements need to be identified and maintained through comprehensive Everglades water management. A unified program to integrate and study the effects of environmental alterations, fishing technology, regulations, and economic factors on shrimp, lobster, and crab production and restoration is needed, particularly in the reef habitats of South Florida. Steps need to be taken to mitigate or restore lost estuarine habitats.

### Transboundary Stocks and Fishery Management Jurisdiction

Spiny lobster stocks in Florida could be of Caribbean origin, being swept into the region by currents of the Gulf Stream. Another hypothesis is that they could comprise a number of different spawning stocks. The actual sources of all Florida and Caribbean lobster stocks (both U.S. and foreign) need to be identified and international management established to prevent overharvesting.

### Management Concerns

Many small spiny lobsters are caught in the Puerto Rican fishery. If these lobsters were allowed to grow larger before harvest, there would be a substantial increase in yield by weight. Modification of the traps to allow more of the small lobsters to escape needs to be investigated. Small lobsters are sometimes used to bait traps in the lobster fishery. This current practice is wasteful and hinders rebuilding of the stock.

The shrimp fisheries are currently overcapitalized, with more fishing effort being expended than needed to harvest the resource. In addition, the harvesting of small shrimp inshore is sacrificing yield and value of the catch by cutting short future growth.

### Bycatch and Multispecies Interactions

Shrimp fisheries use small-mesh nets and can catch nontarget species such as red snappers, croakers, seatrouts, and sea turtles. Juvenile finfish are often harvested, and this may be a major source of mortality for them. Some fish caught by shrimpers are currently at low stock levels (see Unit 9). This bycatch may slow or prevent recovery if not mitigated.

As sea turtles are all listed as endangered or threatened under the Endangered Species Act, shrimp vessels have been required to use turtle excluder devices in their nets since 1988 to avoid capturing sea turtles and thus protect the stocks.

### Progress

The National Marine Fisheries Service and the fishing industry are working together to finalize bycatch-reduction gear development and implementation to address the problems of finfish bycatch by shrimp fisheries in the Gulf of Mexico and South Atlantic.

A gear conflict between stone crab trappers and shrimp trawlers off southwestern Florida has mostly been resolved in the 200-mile Federal zone

with a line separating the fishing areas and seasonal area closures. This approach requires continued monitoring to gauge its success and prevent renewal of conflicts.

### LITERATURE CITED

- Klima, E. F., J. M. Nance, E. X. Martinez, and T. Leary. 1990. Workshop on definition of shrimp recruitment overfishing. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFSC-264, 21 p.
- Nance, J. M. 1993a. Effort Trends for the Gulf of Mexico Shrimp Fishery. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFSC-337, 37 p.
- Nance, J. M. 1993b. Gulf of Mexico shrimp fishery recruitment overfishing definition; workshop 2. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFSC-323, 12 p.
- Nance, J. M. 1997. Stock assessment for brown, white and pink shrimp in the U.S. Gulf of Mexico, 1960–1996. Report to the Gulf of Mexico Fishery Management Council, 13 p.
- Nance, J. M. 1998. Biological review of the 1997 Texas closure. Report to the Gulf of Mexico Fishery Management Council, 25 p.