- (1) Movement and migration patterns of commercially and recreationally valuable reef fish species, especially gag in the Gulf and South Atlantic and greater amberjack between the South Atlantic and Gulf.
- (2) Biochemical/immunological techniques to allow field separation of lesser amberjack, almaco jack, and banded rudderfish from greater amberjack to facilitate accurate reporting of catch.
- (3) Stock structure for wreckfish in the South Atlantic, and for greater amberjack in the Gulf and South Atlantic.
- 2. Population assessment of reef fish.
- a. Effect of reproductive mode and sex change (protogynous hermaphroditism) on population size and characteristics, with reference to sizes of fish exploited in the fisheries and the significance to proper management.
- b. Source and quantification of natural and human-induced mortalities, including release mortality estimates for charter, headboat and private recreational vessels, especially for red snapper and the grouper complex.
- c. Determination of the habitat and limiting factors for important reef fish resources in the Gulf and South Atlantic.
- d. Description of habitat and fish populations in the deep reef community and the prey distributions supporting the community.
- e. Development of statistically valid indices of abundance for important reef fish species in the South Atlantic and Gulf, especially red grouper, jewfish and Nassau grouper.
- f. Assessment of tag performance on reef fish species, primarily snappers and groupers. Characteristics examined should include shedding rate, effects on growth and survival, and ultimately, the effects of these characteristics on estimations of vital population parameters.
- g. Stock assessments to establish the status of major recreational and commercial species. Innovative methods are needed for stock assessments of aggregate species, including the effect of fishing on genetic structure and the incorporation of sex change for protogynous hermaphrodites into stock assessment models.
- h. Fishery-independent assessments of spawning aggregations of gag, scamp, yellowedge and other groupers, using hydroacoustic and underwater video technology.
- i. Assessment of Florida Bay recovery actions on reef fish recruitment and survival.
 - 3. Management of reef fish.

- a. Research in direct support of management, including catch-andrelease mortalities, by gear and depth.
- b. Evaluation of the use of reef fish marine reserves as an alternative or supplement to current fishery management measures and practices, especially in the South Atlantic. Field studies should focus on the Experimental Oculina Reef Reserve and Florida Keys National Marine Sanctuary sites and contrast these with control open sites.
- c. Characterization and evaluation of the biological, economic, and social impacts.
- d. Evaluation of vessel logs and log data for monitoring the fishery; for providing biological, economic, and social information for management; and matching log data to Trip Information Program samples for indices of effort.

C. Sharks.

The Secretarial fishery management plan (FMP) for sharks identifies a number of research needs, including:

- 1. Characterization of the commercial and recreational fisheries from historical and current databases. Emphasis should be on species composition, bycatch, stock identification, size, sex ratios and catch-per-unit-effort by season, area, and gear type.
- 2. Collection and analysis of basic biological data on movements, habitats, growth rates, mortality rates, age structure and reproduction parameters. These data are of particular importance for blacktip and sandbar sharks.
- 3. Determination of baseline cost and returns for commercial fisheries that land sharks, and estimations of demand curves for shark products and recreational shark fisheries.
- 4. Development of species profiles and stock assessments for sharks taken in significant quantities by commercial, recreational, and bycatch fisheries. Assessments can be species-specific or for species groups, following those identified in the Atlantic Sharks FMP.
- 5. Identification of coastal sharks using laboratory methodologies.
- 6. Identification of nursery area and methods to protect young sharks.
- 7. Evaluation of present regulations and improvement of methods to determine landings.

D. Coastal Migratory Pelagic Fisheries.

The commercial and recreational demand for migratory coastal pelagics has led to overfishing for certain species, including some stocks of king and Spanish mackerel. Additionally, some are transboundary with Mexico and other countries and may ultimately demand international management

- attention. Current high priorities include:
- 1. Recruitment indices for king and Spanish mackerel, cobia, dolphin, and bluefish, primarily from fisheryindependent data sources.
- 2. Assessment and management models for coastal pelagic resources that are dominated by single year classes, such as Spanish mackerel, dolphin, and bluefish.
- 3. Fishery-independent methods of assessing stock abundance of king and Spanish mackerel.
- 4. Release mortality data for all coastal pelagic species.
- 5. Improved catch statistics for all species in Mexican waters, with special emphasis on king mackerel. This includes length-frequency and life history information.
- 6. Information on populations of coastal pelagics overwintering off Gulf of Mexico and the South Atlantic States of North Carolina, South Carolina, Georgia, and Florida, especially concerning population size, age and movement patterns.
- 7. Development of a practical method for aging dolphin.
- 8. Basic biostatistics for cobia and dolphin to develop age-length keys and maturation schedules for stock assessments.
- 9. Impact of bag limits on total catch and landings of king and Spanish macketel
- 10. Demand and supply functions for recreational and commercial king mackerel fisheries. Emphasis should be on changes in marginal values of producer and consumer surplus, since the studies would be used in allocation frameworks where total values are not necessarily required.
- 11. Determination of the stock structure of king mackerel from South Atlantic and Gulf waters.
- 12. Sociological and anthropological surveys of coastal pelagic fisheries.
- 13. Economic surveys of coastal pelagic fisheries.

E. Highly Migratory Pelagic Species.

A number of pelagic fisheries exist in the Gulf and South Atlantic that target highly migratory species such as tunas, sharks, and swordfish. Changes in the temporal and spatial components of fishing effort, and fishing gear and tactics need to be characterized and the effects quantified. Priority areas include:

1. Characterization of specific longline fisheries, including targeted species, stock identification, catch-perunit- effort, and biological parameters (e.g., sex ratios and reproductive state) by gear type, area and season.

2. Evaluation of vessel log data for monitoring the fisheries.