

(c) Recruitment of reef fish. (1) Source of recruitment in Gulf and South Atlantic waters, especially for snappers, groupers, amberjacks, and other reef fish.

(2) Annual estimation of the absolute or relative recruitment of juvenile gag, gray snapper, and lane snapper to estuarine habitats off the west coast of Florida and to similar estuarine nursery habitats along the South Atlantic Bight; development of an index of juvenile gag recruitment for the South Atlantic based on historical databases and/or field studies.

(3) The contribution of live-bottom habitat and habitat areas of particular concern (Oculina banks) off Fort Pierce, Florida and off west central Florida to reef fish recruitment.

(d) Stock structure of reef fish. (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) Stock structure of greater amberjack in the Gulf and South Atlantic.

(3) Fishery dependent and fishery independent data of wreckfish from the eastern North 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) Determination of the habitat and limiting factors for important reef fish resources in the Gulf and South Atlantic.

(c) Description of habitat and fish populations in the deep reef community and the prey distributions supporting the community.

(d) Development of statistically valid indices of abundance for important reef fish species in the South Atlantic and Gulf, especially red grouper, Goliath grouper, speckled hind, red porgy, Warsaw grouper and Nassau grouper.

(e) 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.

3. Management of reef fish. (a) Research in direct support of management, including catch-and-release mortalities, by gear and depth.

(b) Characterization and evaluation of biological impacts (e.g., changes in age

or size structure of reef fish populations in response to management strategies).

#### *C. Red Snapper Research*

1. Red snapper bycatch. The bycatch of red snapper can have significant impacts from a fisheries management and ecological standpoint. Research on bycatch of red snapper should focus on the following:

(a) Directed red snapper fisheries. The reef fish fishery is exploited by a variety of fishing gear and tactics. The following research on regulatory discards is needed to better evaluate the effectiveness of management measures such as minimum size limits and closed seasons:

(1) Development and evaluation of gear and fishing tactics to minimize the bycatch of or increase the survival of discarded red snapper and other reef fish species.

(2) Characterization and assessment of the impact of bycatch of undersized reef fish species, including release mortality, during recreational and commercial fishing. Research on the catch-and-release mortality of red snapper and other reef fish species, by gear (e.g., capture by commercial bandit rigs that are electrically or hydraulically powered), fishery (e.g., headboat, private boat, charter boat, commercial), and depth. Studies are needed to specifically relate "sink or swim" data, which can be obtained through observer programs, with long-term survival rates.

(3) Research to document predation rates on discarded red snapper and other reef fish species.

3. Red snapper population assessment. (a) Determination of the habitat and limiting factors for important red snapper populations in the Gulf.

(b) Estimates of red snapper abundance, age structure and population dynamics on oil platforms and other artificial structures.

4. Management of red snapper. (a) Characterization and evaluation of biological impacts (e.g., changes in age or size structure of red snapper populations in response to management strategies).

(b) Research to evaluate the use of minimum size limits as a management tool in the red snapper fishery.

#### *D. Coastal Migratory Pelagic Fisheries*

The commercial and recreational demand for migratory coastal pelagics has led to overfishing for certain species. 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, wahoo, and bluefish, primarily from fishery-independent data sources.

2. Fishery-independent methods of assessing stock abundance of king and Spanish mackerel, dolphin and wahoo.

3. Release mortality data for all coastal pelagic species.

4. Improved catch statistics for all species in Mexican waters, with special emphasis on king mackerel, dolphin, and wahoo. This includes length-frequency and life history information.

5. Information on populations of coastal pelagics overwintering off the Gulf of Mexico and the South Atlantic States of North Carolina, South Carolina, Georgia, and Florida, especially concerning population size, age, and movement patterns; and for dolphin and wahoo during the entire year throughout their migratory patterns. Calculate the mixing rates for Atlantic/Gulf king mackerel on an annual basis.

6. Development of a practical method for aging dolphin.

7. Basic biostatistics for cobia, dolphin, and wahoo to develop age-length keys and maturation schedules for stock assessments and to evaluate stock structures.

8. Impact of bag limits on total catch and landings of king and Spanish mackerel, dolphin, wahoo, and cobia.

#### *E. Groundfish and Estuarine Fishes*

Substantial stocks of groundfish and estuarine species occur in the Gulf and South Atlantic. Most of the database for assessments comes from studies conducted by NMFS and state fishery management agencies. Because of the historical and current size of these fish stocks, of their importance as predator and prey species, and of their current or potential use as commercial and recreational fisheries, more information on their biology and life history is needed. General research needs are:

1. Red drum. (a) Size and age structure of the offshore adult stock in the Gulf and South Atlantic.

(b) Catch-and-release mortality rates from inshore and nearshore waters.

(c) Estimates of absolute abundance of red drum in the Gulf of Mexico and the Atlantic.

2. Life history and stock structure for weakfish, menhaden, spot, croaker, flounder, sheepshead, black drum, mullet, and white trout in the Gulf and the South Atlantic: Migratory patterns, long-term changes in abundance, growth rates, and age structure and comparisons of the inshore and offshore components of recreational and commercial fisheries.