The Red Grouper of the Gulf of Mexico

Luis R. Rivas

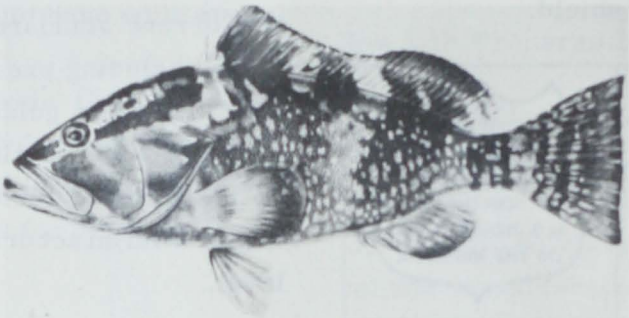

Fig. 1 - The red grouper (Epinephelus morio). B & W photo of color plate. Adult specimen from Puerto Rico. (Evermann & Marsh, 1902.)

The red grouper (Epinephelus morio) is probably the most abundant and commercially important grouper in the Gulf of Mexico, according to Jarvis (1935: 3) and Moe (1969: 2). This is supported by records of the BCF Exploratory Data Center, Pascagoula, Miss., during 1950-1970.

There are 259 stations from which the red grouper was recorded--but only 144 for the scamp (Mycteroperca phenax) and 145 for the black grouper (M. bonaci). Records for other species of groupers (Mycteroperca, Epinephelus) are much fewer, despite the same fishing effort.

Unfortunately, an index of abundance from U.S. catch statistics is not available because the various species are combined as "groupers". Mexican statistics, however, distinguish the red grouper ("mero") from other species. According to Carranza (1959: 222), the Mexican red grouper fishery of Campeche Bank is a very important source of food and revenue: it represented 66% of total fish production in 1955. Between 1950 and 1964, production of red grouper in Mexico increased from 2,000 to 7,000 metric tons. It declined to about 6,450 in 1968 (Solis Ramirez, 1970).

Red grouper was 77% (4,991 m. tons) of Campeche Bank fish production in 1963; it was worth US$726,645 (Gutierrez, 1965). It declined to 70% in 1967-68 (Solis Ramirez, 1970).

In the United States, except for Florida Gulf coast, the red grouper catch is only incidental to red snapper fishery (Moe, 1969: 76;

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Jarvis, 1935: 3; Carpenter, 1965: 27). Commercial snapper fishermen catch very few red grouper because they fish much below these groupers' usual depths.

The red grouper is a valuable fishery because of its relative abundance, excellent flavor, and size suitable for various types of processing. The Florida west coast red grouper stocks may be overfished and should be managed if yield continues to decline despite increasing effort (Moe 1969: 77, 81). A similar situation occurs on Campeche Bank (Solis Ramirez, 1970: 128).

THE RED GROUPER

The red grouper is easily identified by the straight-edged dorsal fin membrane which, in other groupers, is notched between the spines (Figure 1). (For keys, descriptions, and figures to identify genera and species, see Smith, 1961, and Rivas, 1964. Moe (1969: 3) gives a brief taxonomic description). In Mexico, it is called "mero"; in Cuba, "cherna americana", or "cherna de vivero." In addition to Mexico, there is an active Cuban fishery for red grouper on Campeche Bank.

Little is known of the biology, distribution, ecology, and other aspects of its life history. In 1969, Moe dealt mostly with age, growth, and reproduction of red grouper from a small area off the central Florida Gulf coast. Some needed information is presented in this article.

MATERIALS AND METHODS

This study is based on biological, ecological, geographical, and other data stored on IBM cards at the BCF Exploratory Data Center. It comprises 20 years of exploratory work. Data on depth, water temperature, etc., for a given station are punched on "station cards". Data for a given species, its place of capture (station), number of specimens, weights, etc., are punched on "species cards". The cards are read into a Univac 9200 computer and information quickly retrieved in printout form.

The exploratory work extends from Cape Hatteras, N.C., to the bulge of Brazil (Fortaleza); it is most intensive in the Gulf of Mexico. Therefore, horizontal distribution for the red grouper in the Gulf is covered adequately. Over 20 years, 259 stations scattered throughout the Gulf yielded 634 specimens weighing 0.25 to 38.5 pounds, and totaling 4,175. Average weight is 6.6 pounds.

The red grouper is a bottom fish. We have no records at less than 4 or more than 62 fathoms. Work with bottom-sampling gear extended from 2 to 2,000 fathoms, so vertical distribution, too, is covered adequately.

In the sections on depth distribution, temperatures of occurrence, and seasonal abundance, the Gulf of Mexico is divided into a northern and a southern portion. The northern Gulf is north of a line from the Rio Grande to Cape Sable, Florida; the southern Gulf is south of that line and west of easternmost edge of Campeche Bank.

GEOGRAPHICAL DISTRIBUTION

The red grouper is restricted to the tropical and subtropical western Atlantic from Cape Hatteras to Brazil (Smith, 1961). Unverified literature records from New England are probably stragglers. Our northernmost record is 50 nautical miles E of Cape Fear, N.C., and the southernmost 107 nautical miles NNW of Cayenne, French Guiana. The red grouper is primarily continental; its center of abundance is Florida shelf and Gulf of Mexico (Moe, 1969: 3).

Our data, Figure 2, show geographical distribution of the red grouper in Gulf. It occurs with less-abundant groupers: the snowy grouper (Epinephelus niveatus), Warsaw grouper (E. nigritus), rock hind (E. adscensionis), Kitty Mitchell (E. drummondhayi), red hind (E. guttatus), yellowfin grouper (Mycteroperca venenosa), scamp (M. phenax), gag (M. microlepis), yellowmouth grouper (M. interstitialis), and black grouper (M. bonaci).

The red hind, although very good to eat, is too small and scarce to attain commercial importance. The scamp, however, is much larger, of excellent flavor, and is served as a delicacy in restaurants along our Gulf coast. The yellowfin grouper is said to be occasionally poisonous.

DEPTH DISTRIBUTION

Data analysis indicates red grouper occurs at different depth ranges and mean depths according to its latitudinal distribution in Gulf (Figures 2, 3). In northern Gulf, depth range extends from 4 to 62 fathoms with a mean

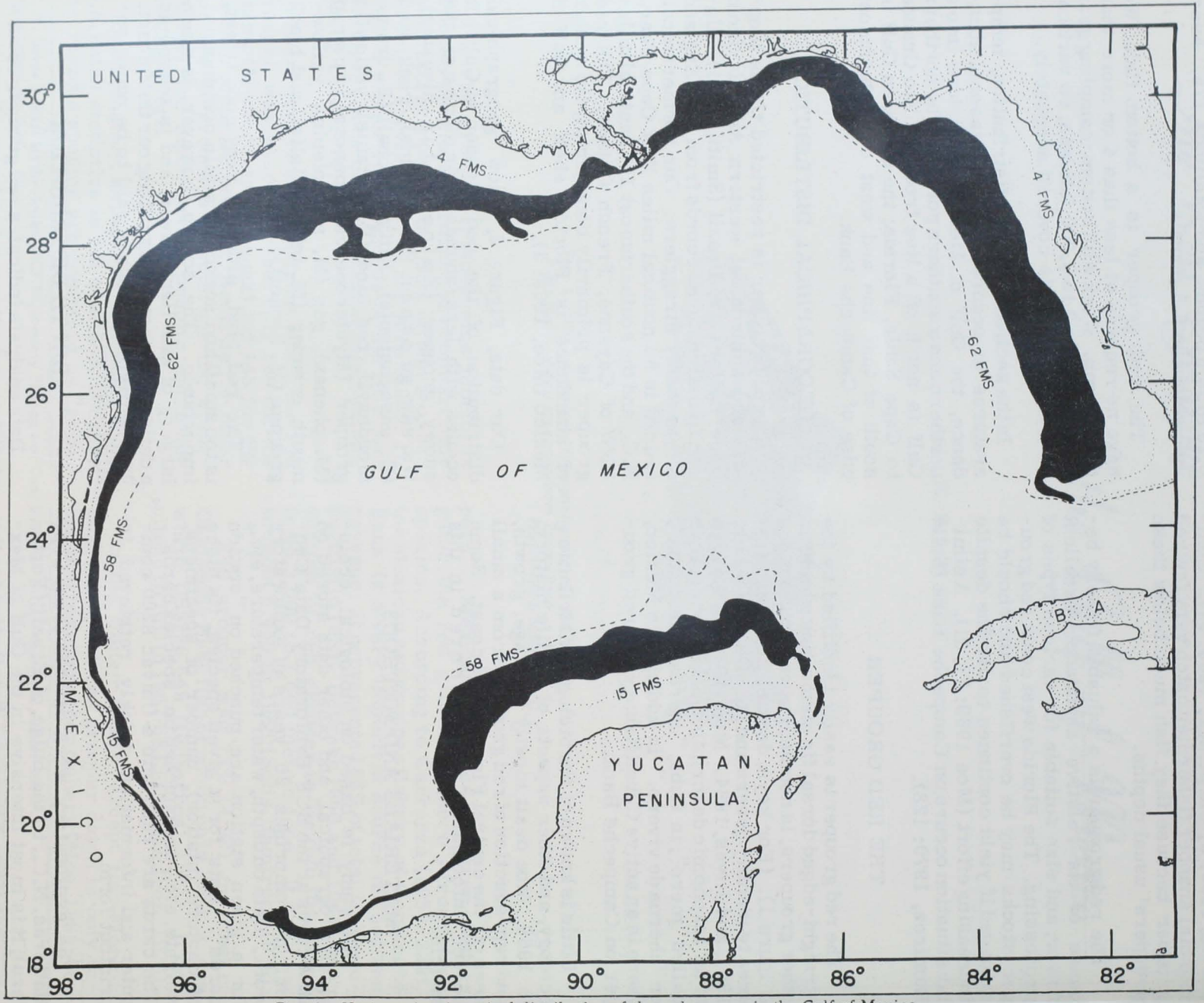

Fig. 2 - Horizontal and vertical distribution of the red grouper in the Gulf of Mexico.

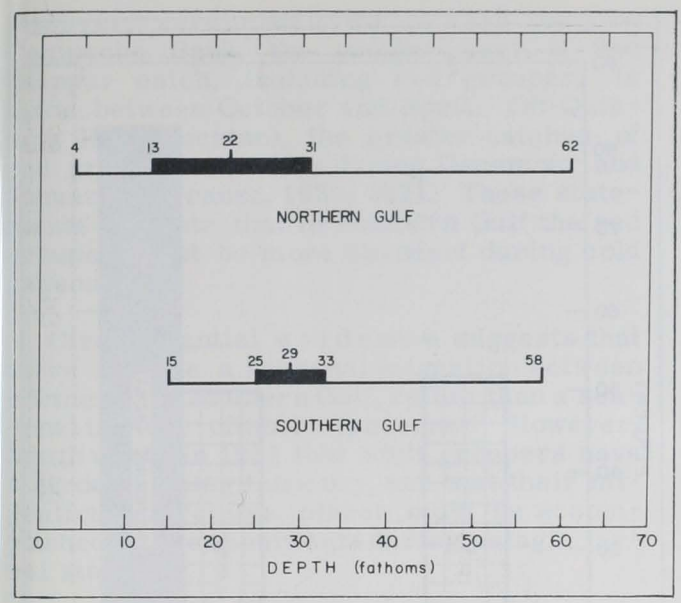

Fig. 3 - Depth distribution (fathoms) of red grouper in Gulf. Black bar indicates 68.26% of records, obtained from one standard deviation on each side of mean and rounded to 70% and nearest fathom for convenience.

depth of 22; about 70% of records extend from 13 to 31 fathoms. The red grouper is found between about 10 and 400 feet (about 2 to 67 fathoms) off the central Florida west coast (Moe, 1969: 68). In southern Gulf, range extends from 15 to 58 fathoms--a mean depth of 29, and about 70% of records extend from 25 to 33 fathoms.

As with the snappers (Rivas, 1970: 43), juveniles and young of the red grouper occur shallower than the mean depth, and larger adults occur deeper than the mean depth (Figure 4). Only specimens weighing an average of 3 pounds were taken at depths of less than 15 fathoms, and only specimens weighing an average of 11 pounds were taken at more than 40 fathoms. This agrees with indications of size/depth relationship discussed by Moe (1966: 17, 1969: 71) for red grouper off central Florida Gulf coast. According to our records, its average weight in Gulf is 6.6 pounds. The largest specimen weighed 38.5 pounds.

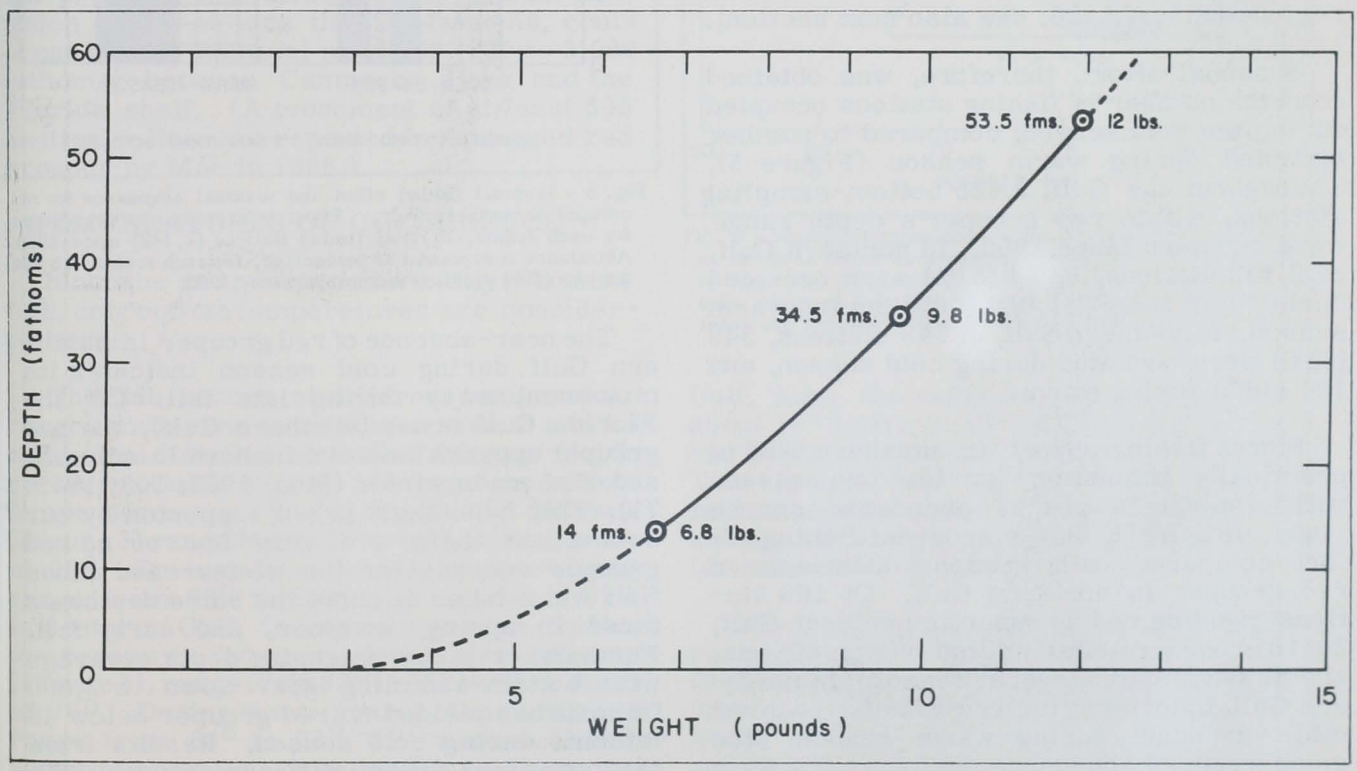

Fig. 4 - Weight/depth relationship of red grouper. The curve was constructed by joining 3 points, each representing average weight at average depths of 3 depth intervals (4 to 24, 25 to 44, and 45 to 62 fathoms) comprising species' entire depth range.

SEASONAL ABUNDANCE AND MIGRATION

Seasonal changes in water temperature cause seasonal fluctuation in occurrence and abundance of fishes in Gulf. In northern Gulf, tropical species appear in spring, become more abundant in summer, and are absent or nearly absent in winter (Rivas, 1968: 2).

To establish seasonal abundance from catch records, the seasonal fishing effort must be determined--because greater fishing effort during a season could indicate greater abundance due to increased effort and not to favorable temperatures.

Temperature fluctuations in Gulf do not reflect the four seasons. Rather, these fluctuations may be better interpreted in terms of the "cold season" (November through April) and "warm season" (May through October) of the year. Also, there are seasonal temperature differences between northern and southern Gulf, and within each of these regions (Rivas, 1968; see also next section).

Seasonal effort, therefore, was obtained from the number of fishing stations occupied during the cold season, compared to number occupied during warm season (Figure 5). Throughout the Gulf, 2,685 bottom-sampling stations, within red grouper's depth range, were occupied since 1950. In northern Gulf, of 2,142 stations, 1,093 (51%) were occupied during cold season; 1,040 (49%) during warm season. In southern Gulf, of 543 stations, 349 (64%) were occupied during cold season, and 194 (36%) during warm.

Since fishing effort in northern Gulf is practically the same for the two seasons, valid interpretations of abundance can be made. Figure 5 shows seasonal fishing effort compared with seasonal abundance of red grouper in northern Gulf. Of 109 stations yielding red grouper in northern Gulf, 20 (18%) occurred during cold season of year, and 89 (82%) during warm season. In northern Gulf, therefore, the red grouper is much more abundant during warm season. The much-reduced abundance during cold season is emphasized further by paucity or absence of records during November through March. There are only two records for November, none for December, one for January, one for February, and one for March.

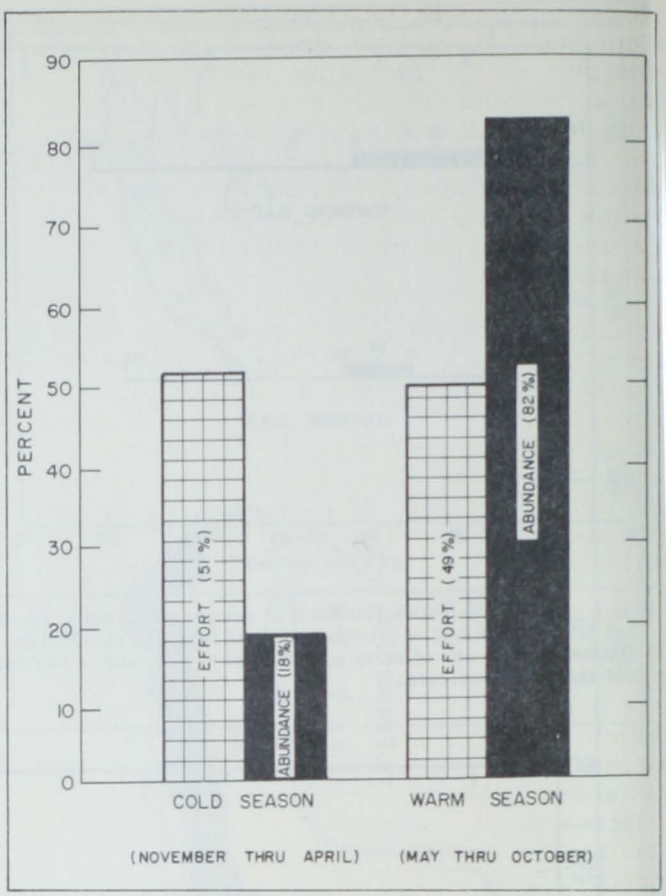

Fig. 5 - Seasonal fishing effort and seasonal abundance for red grouper in northern Gulf. Effort is expressed as percentage, for each season, of total fishing stations (2,142) since 1950. Abundance is expressed as percentage, for each season, of total stations (109) yielding red grouper since 1950.

The near-absence of red grouper in northern Gulf during cold season indicates its movement away during late fall. Off the Florida Gulf coast (northern Gulf), the red grouper appears to move inshore in summer and offshore in winter (Moe, 1963: 103; 1969: 71). This hypothesis is not supported by our data since there are very few or no red grouper records for the winter--and those fish were taken at about the same depths as those in spring, summer, and early fall. Furthermore, our extensive depth coverage with bottom-sampling gear down to 2,000 fathoms has yielded no red grouper below 46 fathoms during cold season. Results from tagging are inconclusive (Beaumariage, 1969: 13; Moe, 1966: 17; 1967: 228).

Because of the unequal seasonal fishing effort in the southern Gulf, no valid interpretations of seasonal abundance can be made.

However, Jarvis stated in 1935 that, on Campeche Bank, the greater part of red snapper catch, including red grouper, is made between October and April. Off Quintana Roo (Yucatan), the greater catches of red grouper are made during December and January (Carranza, 1959: 222). These statements indicate that in southern Gulf the red grouper must be more abundant during cold season.

Circumstantial evidence suggests that there may be a seasonal migration between northern and southern Gulf, rather than a seasonal inshore-offshore movement. However, Smith wrote in 1961 that adult groupers have a strong homing tendency, and that their migration to remote places must be accomplished by ocean currents during pelagic larval stages.

If migrations of adult red grouper actually occur between northern and southern Gulf, the path must be along western perimeter. It is not probable that these strictly bottom fish, which occur at less than 70 fathoms, could cross the 185-nautical mile gap (100 to 2,000 fathoms) between Campeche Bank and the Florida shelf. (A movement of at least 500 nautical miles was reported for a tagged red grouper by Moe in 1966.)

TEMPERATURES OF OCCURRENCE

Since the red grouper is strictly a bottom fish, only bottom temperatures are considered here.

The fish occurs at different temperature ranges and means according to season and its latitudinal distribution in Gulf (Figure 6). In northern Gulf, during cold season, bottom temperatures at mean depth of 22 fathoms (Figure 3) range from 61° to 69°, with a mean of 65°. During warm season, temperatures range from 63° to 84°, with a mean of 67°. In southern Gulf, during cold season, bottom temperatures, at mean depth of 29 fathoms (Figure 3), range from 73° to 78°, with a mean of 76°. During warm season, temperatures range from 68° to 82°, with a mean of 77°. These temperature patterns for northern and southern Gulf agree with vertical extent of surface temperatures (Rivas, 1968: 3).

In northern Gulf, therefore, there is a seasonal fluctuation of 2° in mean bottom temperature at 22 fathoms, but only of 1° in southern Gulf at 29 fathoms. In northern

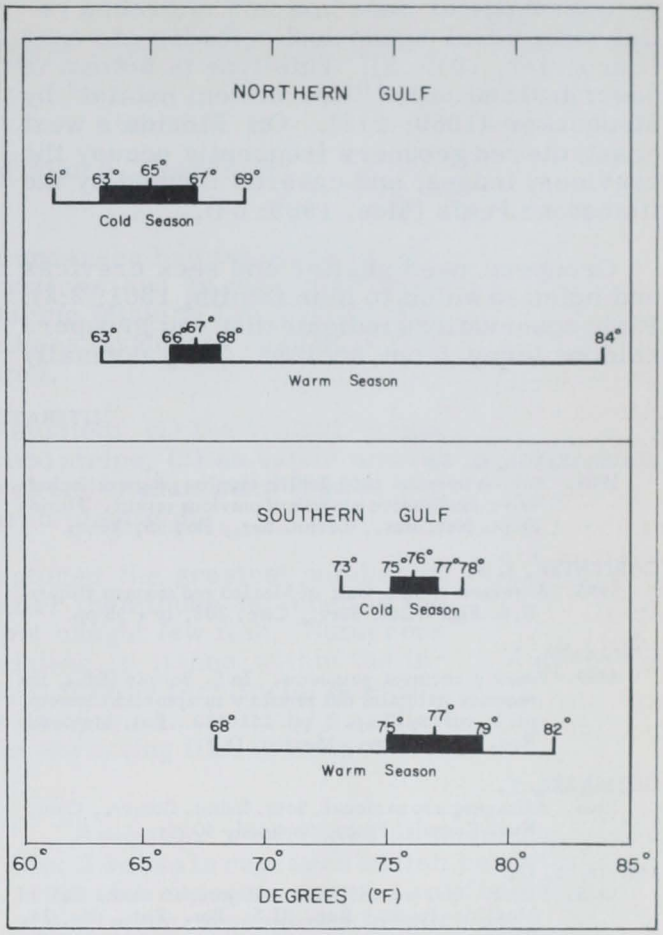

Fig. 6 - Seasonal temperatures of occurrence (°F) of red grouper at its mean depth of occurrence in northern (22 fathoms) and southern Gulf (29 fathoms). Black bar indicates 68.26% of records, obtained from one standard deviation of each side of mean and rounded to 70% and nearest degree for convenience.

Gulf, also, the mean bottom temperature is about 10° lower at 22 fathoms than in southern Gulf at 29 fathoms, regardless of season. This is explained by the 735-nautical mile latitudinal extension of Gulf comprising about equal portions of temperate and tropical zones (see also Rivas, 1968: 2).

The temperature range of 61° to 84° for red grouper, including all seasons and entire Gulf, indicates a wide temperature tolerance. This is supported by its latitudinal range, which extends from north temperate zone southward to Brazil.

HABITAT

Optimal temperatures, depths, or seasons are not necessarily indicative of red grouper abundance unless they are associated with suitable bottoms. As do the snappers,

groupers prefer hard bottoms of broken relief with coral heads and outcrops of rocks (Carpenter, 1965: 8). This type of bottom is described and called "live-bottom habitat" by Struhsaker (1969: 272). Off Florida's west coast, the red groupers frequently occupy the crevices, ledges, and caverns formed by the limestone reefs (Moe, 1969: 68).

Groupers need shelter and seek crevices and holes in which to hide (Smith, 1961: 2:2). Field observations indicate that red groupers seldom stray from shelter. They normally avoid midwater and, usually, stay on or very near the bottom. Usually, a grouper hooked on very light tackle will dart for the nearest hole, from which it is difficult to dislodge.

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