Yellowedge grouper (*Epinephelus flavolimbatus*) and golden tilefish (*Lopholatilus chamaeleonticeps*) distributions, habitat preferences and available biological samples

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Fishery Independent Surveys

Numerous fishery independent surveys have been conducted since the 1960s to collect deepwater grouper and golden tilefish. In order to account for changes in sampling design, we report on two time periods: historical surveys (1967-1988) and current bottom longline surveys (1999-2006). Various gear types including bottom longlines, fish and shrimp trawls, and traps were used (Cook 2007). Surveys varied in objective and design, resulting in a limited amount of biological samples and length data available for analysis. The recovery of station and meristic data from such surveys has been difficult and, as a consequence, we are only presenting the location of stations that caught either yellowedge grouper or golden tilefish or both. A total of six cruises collected otoliths from yellowedge grouper (n = 96) and golden tilefish (n = 43) (R/V Oregon II: 1979 Cruise 100, 1982 Cruise 125, 1983 Cruise 136, 1984 Cruise 143 and Cruise 147, and 1985 Cruise 155). Historical and current longline surveys have captured yellowedge grouper (Fig. 1) and golden tilefish (Fig. 2) in similar locations throughout the Gulf of Mexico. Due to differences in sampling gear (length of mainline, gangions, hook type and trawl type), sampling design (selected sites, random selection, etc.) and soak time (<1-11 hours), it would be inappropriate to compare catch and effort data.

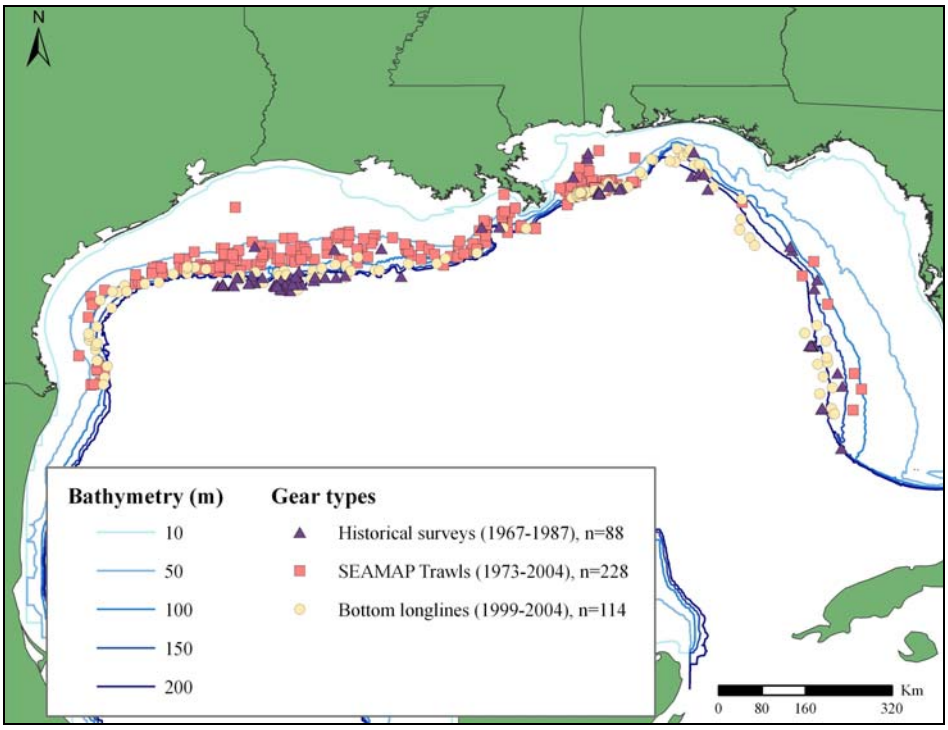

Figure 1. Locations of yellowedge grouper collected on fishery independent surveys from 1967-2004. Gear types used include trawls (shrimp, fish, high opening bottom and mongoose), longlines (vertical, off-bottom and bottom) and fish traps. Data points represent stations where at least one fish was collected. Reprinted from Cook (2007).

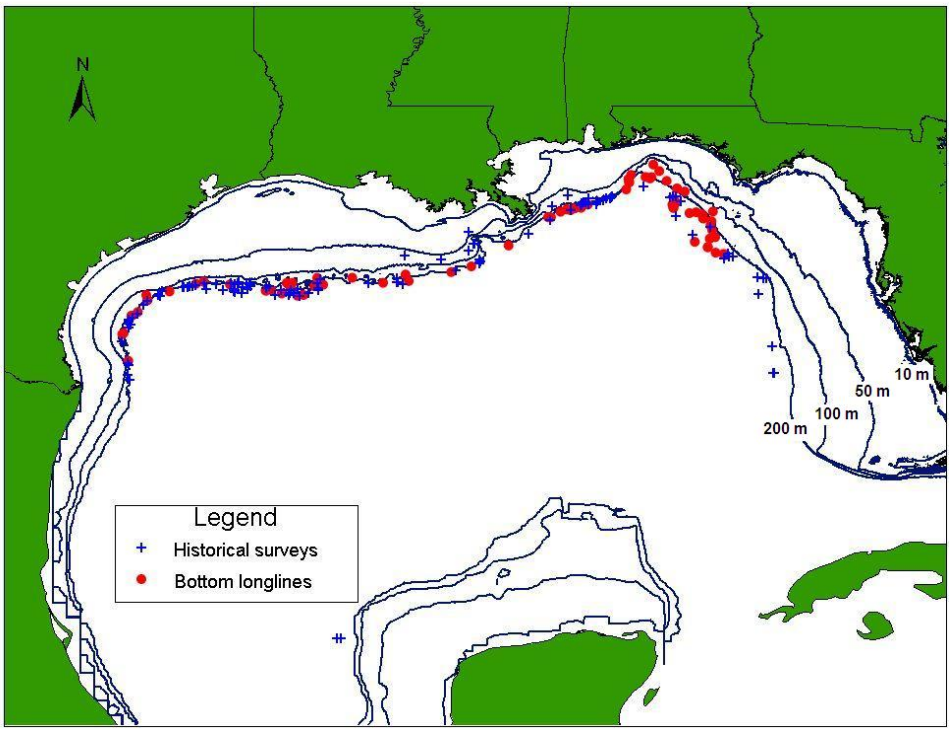

Figure 2. Locations of golden tilefish collected on fishery independent surveys from 1974-2006. Gear types include trawls (fish, shrimp and high opening bottom) and longlines (bottom and off-bottom). Data points represent stations where at least one fish was collected.

Present fishery independent bottom longline surveys (1999-2006) have been conducted using standardized gear (1 nm mainline, 100 3-m gangions with 15/0 circle hooks), bait (Atlantic mackerel), and a randomized sampling design based on three depth strata (9-55 m, 56-183 m, 184-366 m) and allocated effort (Cook 2007). The majority of deepwater grouper and tilefish have been collected from stations fishing in water depths of >50 m with an increase in the number of fish caught with an increase in depth fished (Fig. 3). It should be noted that only 50% of the fishing effort by these surveys occurred in water depths > 50 m (Fig. 4 and 5).

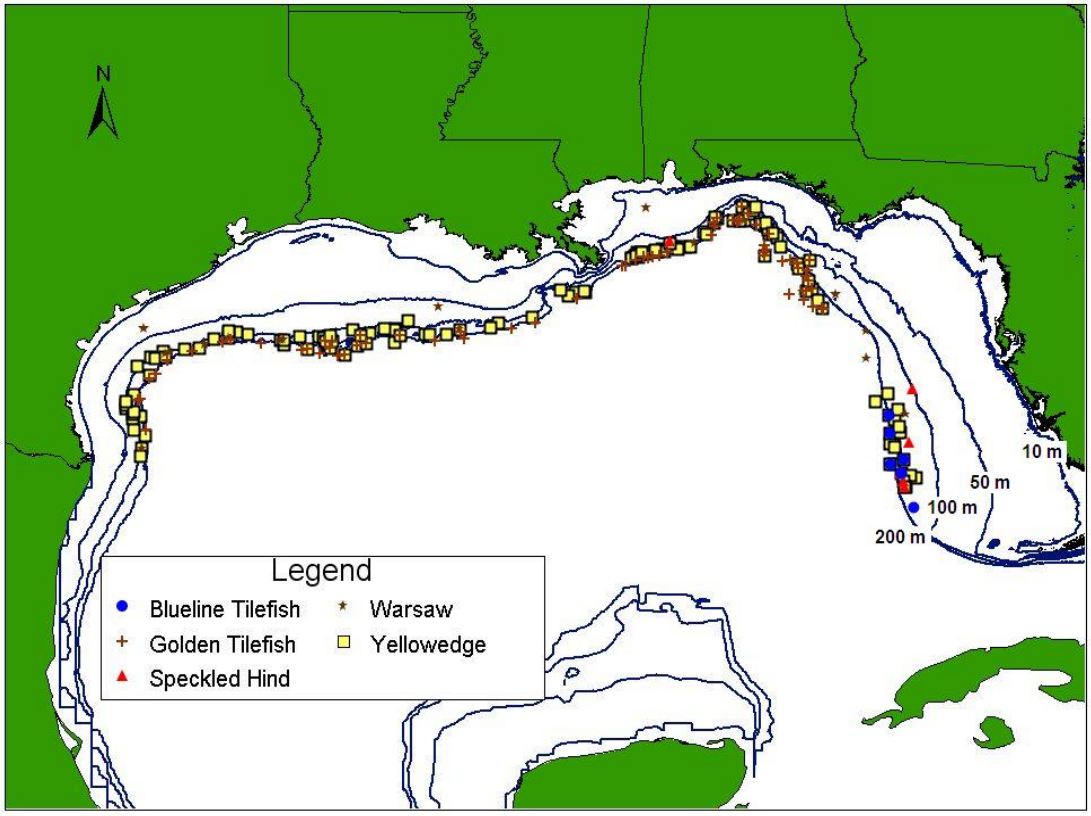

Figure 3. Tilefish and deepwater grouper collected on fishery independent bottom longline surveys from 1999-2006. Symbols represent stations where at least one fish was collected.

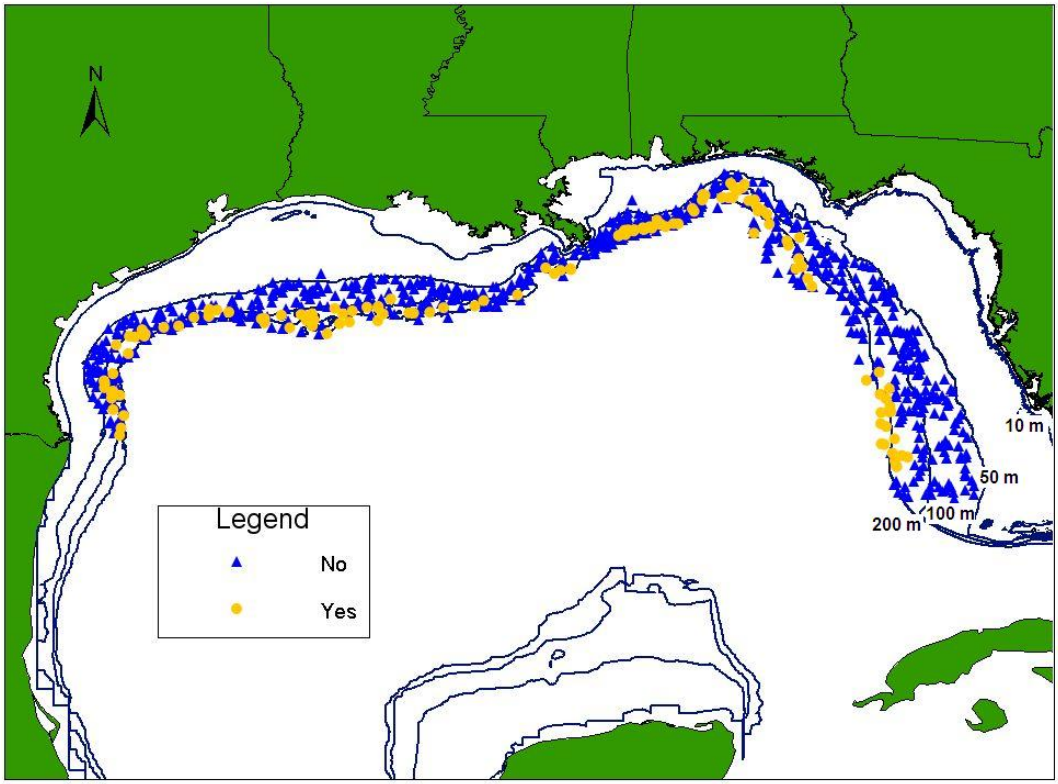

Figure 4. Locations of fishery independent bottom longline stations from 1999-2006. Stations where at least one yellowedge grouper was collected are represented with a circle.

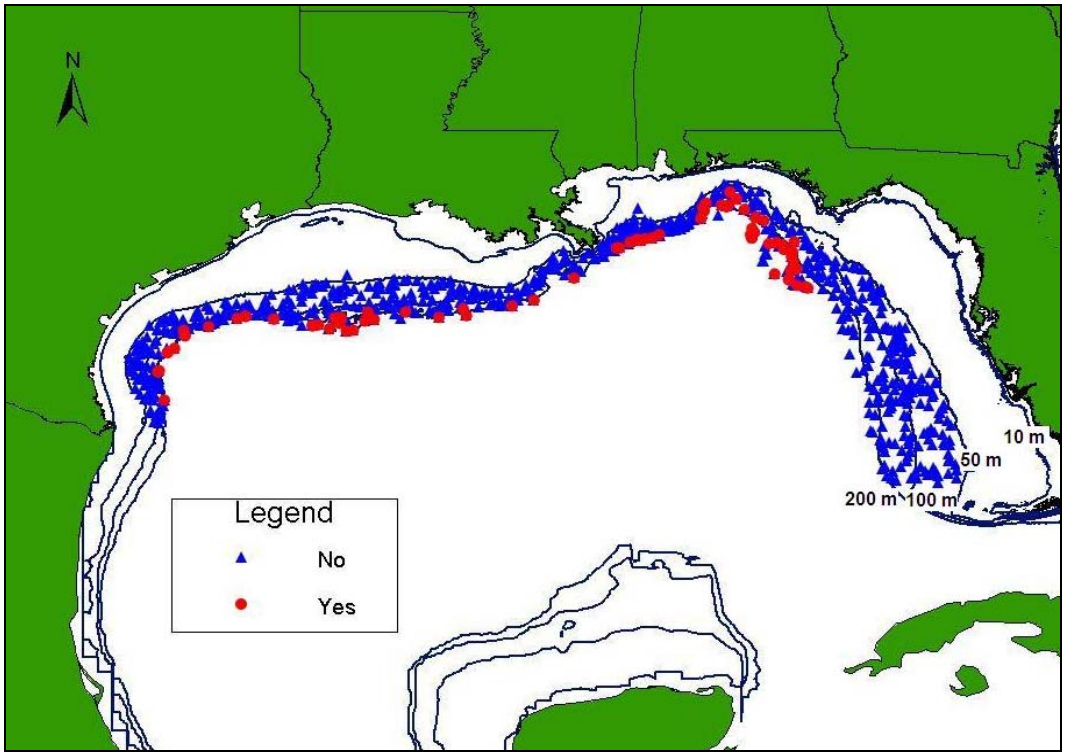

Figure 5. Locations of fishery independent bottom longline stations from 1999-2006. Stations where at least one golden tilefish was collected are represented with a circle.

A total of 299 yellowedge grouper have been collected along with 217 golden tilefish throughout this time period. A total of 185 stations collected yellowedge grouper and/or golden tilefish with only a 13% occurrence of both species at the same station (range of occurrence: 8% - 50%, Fig. 6). Since randomly chosen sampling stations may be as close as a few nautical miles, these species may occur more frequently together (as indicted in Fig. 6). A majority of the stations collected < 5 fish per 100 hooks fished with only two stations collecting more than 9 golden tilefish (Fig. 7 and 8).

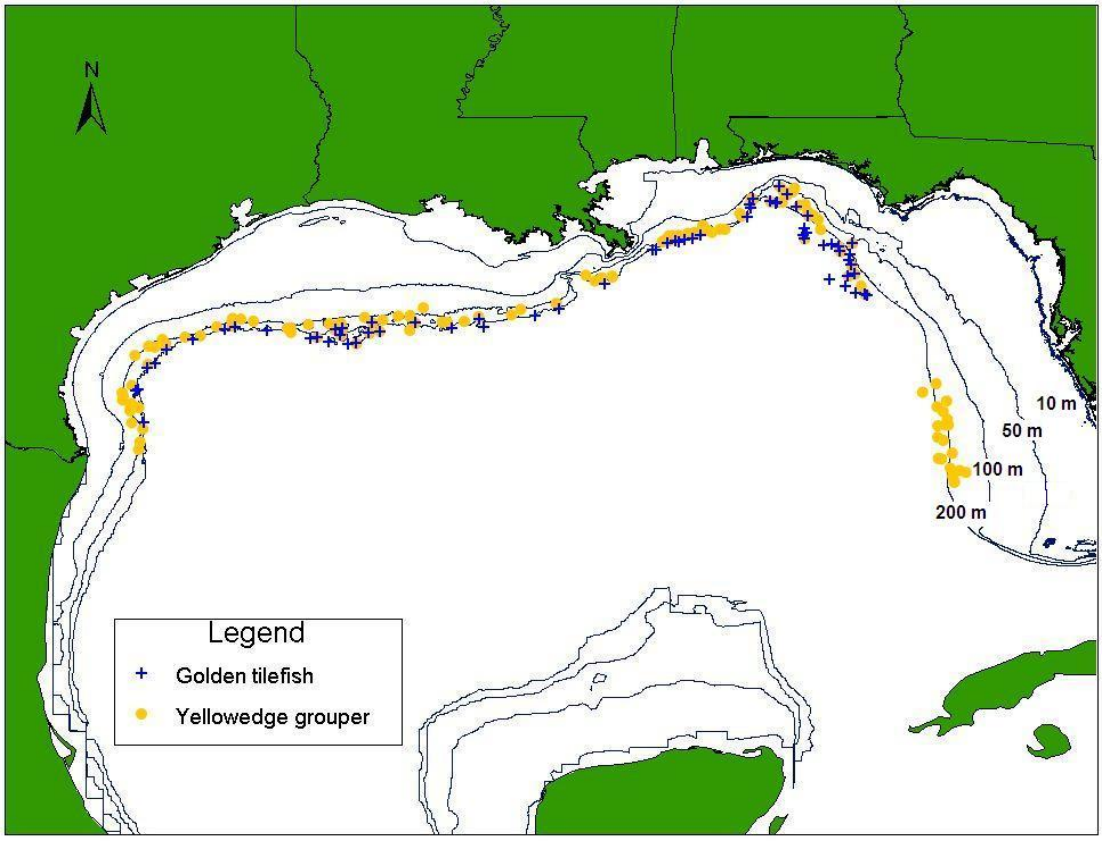

Figure 6. Yellowedge grouper (n = 299) and golden tilefish (n = 217) collected on fishery independent bottom longline surveys from 1999-2006. Symbols represent stations where at least one fish was collected.

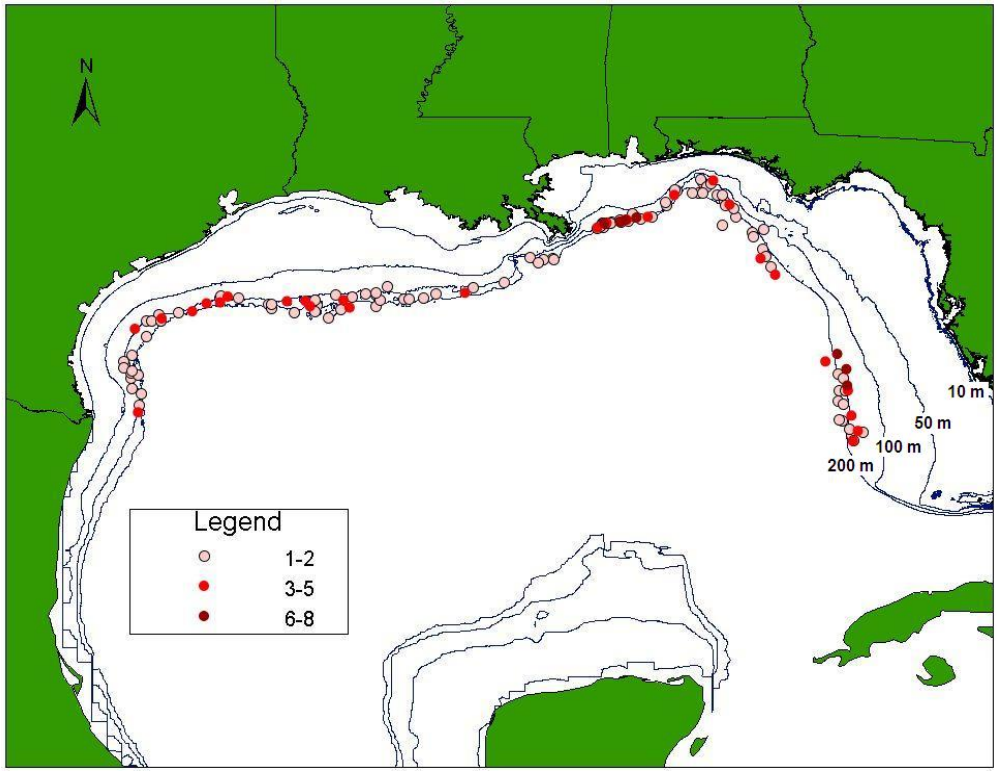

Figure 7. Density (number per 100 hooks per hour) of yellowedge grouper (n = 299) in the Gulf of Mexico. Yellowedge grouper were collected on fishery independent bottom longline surveys from 1999-2006.

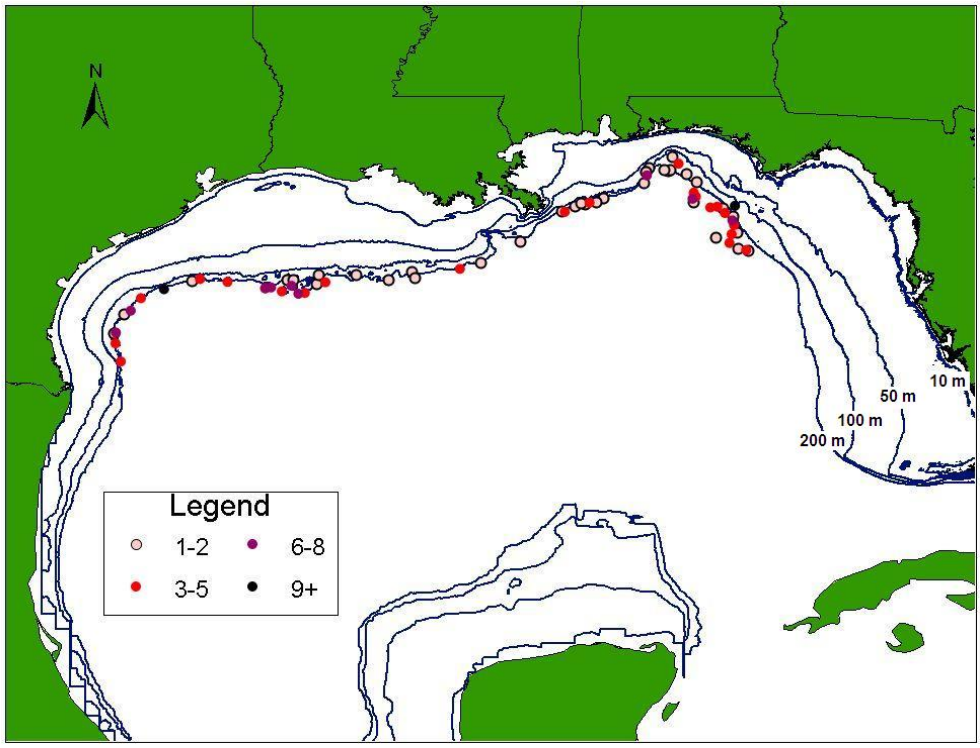

Figure 8. Density (number per 100 hooks per hour) of golden tilefish (n = 217) in the Gulf of Mexico. Golden tilefish were collected on fishery independent bottom longline surveys from 1999-2006.

Habitat Preferences

In the 1980s several submersible research projects investigated habitat preferences for both yellowedge grouper and golden tilefish (Able et al. 1982, Grimes et al. 1986, Jones et al. 1989). Both of these species had numerous habitat types (yellowedge grouper: vertical, crater, and trench burrows; rugged, rocky habitats; golden tilefish: rocks, boulders, pueblo and vertical burrows). As established by the studies above, yellowedge grouper (90-364 m) and golden tilefish (80-450 m) inhabited similar depth ranges and may compete for space, food, and other resources given the location (Jones et al. 1989). Yellowedge grouper habitat choice was variable, given that yellowedge grouper were found in burrows along northwestern Gulf of Mexico but in rugged, rocky outcroppings along the west Florida shelf (Jones et al. 1989). For a more detailed description of yellowedge grouper habitat preferences see Cook (2007). Grimes et al. (1986) found that golden tilefish were more prevalent around submarine canyons possible due to the depth relief (100-300 m), the temperature range (9-14^{o}C), and the availability of clay and silt sediments preferred for burrow construction. The lengths of golden tilefish were correlated to the size of their burrows, and burrows may be occupied long-term (Grimes et al. 1986).

Fishery Dependent Data

Otoliths and gonads were collected by numerous federal and state sources intercepting commercial vessels (1991-2007 Trip Interview Program, Beaufort Head Boat Survey, Alabama Division of Marine Resources). Our facility historically relies on biological sampling collected through the interception of commercial catches at fish houses and dockside; however, deepwater species are typically thoroughly gutted at-sea which limits the retrieval of reproductive tissue dockside. Therefore, additional sampling methodologies including scientific observers on-board commercial vessels provided biological samples and capture information (latitude, longitude, depths) that we are unable to obtain through dockside sampling. During a two month period in the spring of 2007, Shark Bottom Longline Observer Program observers (program coordinator John Carlson, NOAA Fisheries Panama City, FL) collected catch and biological samples from four tilefish and deepwater grouper trips, providing 311 otoliths, 273 gonads, length data, catch per unit effort, and set-specific location data.

Over all collections, yellowedge grouper have been collected in larger numbers and more consistently since 2001 (otoliths, n = 5591; gonads, n = 430) compared to golden tilefish (otoliths, n = 2240; gonads, n = 176) (see Table 1 for annual effort).

Table 1. The number of otoliths and gonads collected from yellowedge grouper and golden tilefish from fishery dependent sources from the Gulf of Mexico.

	Yellowedge Grouper		Golden Tilefish	
Year	# of Gonads	# of Otoliths	# of Gonads	# of Otoliths
1991		293		
1992		74		
1993		22		3
1994		2		
1995				
1996			1	1
1997				
1998		50		5
1999		57		
2000		189		17
2001	5	664		44
2002		202		100
2003	208	1003		316
2004	110	615	9	516
2005	76	749	69	636
2006		492	28	256
2007	31	1179	69	346
Total	430	5591	176	2240

Literature Cited

Able, K. W., C. B. Grimes, R. A. Cooper and J. R. Uzmann. 1982. Burrow construction and behavior of tilefish, *Lopholatilus chamaeleonticeps*, in Hudson Submarine Canyon. Env. Biol. Fish. 7:199-205.

Cook, M. 2007. Population dynamics, structure and per-recruit analysis of yellowedge grouper, *Epinephelus flavolimbatus*, from the northern Gulf of Mexico. Doctoral dissertation, University of Southern Mississippi, Hattiesburg, MS, 172p.

Grimes, C. B., K. W. Able, and R. S. Jones. 1986. Tilefish, *Lopholatilus chamaeleonticeps*, habitat, behavior and community structure in the Mid-Atlantic and southern New England waters. Env. Biol. Fish. 4:273-292.

Jones, R. S., E. J. Gutherz, W. R. Nelson and G. C. Matlock. 1989. Burrow utilization by yellowedge grouper, *Epinephelus flavolimbatus*, in the northwestern Gulf of Mexico. Env. Biol. Fish. 26:277-284.