Bottom longline fishery bycatch of red grouper from observer data

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Introduction

The shark bottom longline fishery is active in the Atlantic Ocean from about the Mid-Atlantic Bight to south Florida and throughout the Gulf of Mexico. Vessels in the fishery are typically fiberglass and average 15.25 m in length. Longline characteristics vary regionally with gear normally consisting of between 8 – 24 km of longline and 500-1500 hooks. Gear is set at sunset and allowed to soak overnight before hauling back in the morning. There are currently about 100 active vessels in this fishery out of about 250 vessels that possess directed shark fishing permits. These vessels make between 4000-9000 sets per year. The bottom longline gear targets large coastal sharks, but small coastal sharks, pelagic sharks, and dogfish species are also caught.

Observations of the Atlantic shark directed bottom longline fishery have been conducted since 1994 (Burgess and Morgan, 2003). From 1994 through 2001, observer coverage was conducted on a voluntary basis. Beginning with the 2002 fishing season, observer coverage of the Atlantic shark directed bottom longline fishery became mandatory under authority of 50 CFR 635.7. Observer coverage from 1994 through the 1st trimester season of 2005 was coordinated by the Commercial Shark Fishery Observer Program (CSFOP), Florida Museum of Natural History, University of Florida, Gainesville, FL (Burgess and Morgan, 2003). Observer coverage for this fishery is required under the current federal management plan for highly migratory species (NMFS, 2003). Starting with the 2nd trimester season of 2005, responsibility for the fishery observer program was transferred to National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC), Panama City Laboratory.

The objectives of this study were to observe all catch and bycatch for the second and third trimester seasons of 2005, and the first trimester season of 2006. The goal was to document the catch and bycatch of red grouper (*Epinephelus mori*) in the Gulf of Mexico for all trimesters. Red grouper catch and bycatch was documented for all trimesters except the first trimester of 2006 (January 1st through April 15th); therefore the data below encompasses the 2nd and 3rd trimesters of 2005 only (July 5th – November 15th).

Methods

Observer Protocol

Vessels were randomly selected from a pool of vessels each trimester season based on the following criteria: (1) the vessel/owner must possess a current directed shark permit, (2) the permit holder (i.e. vessel/owner) must have reported fishing for sharks with bottom longline gear in the second season of 2004, (3) the permit holder must have reported greater than 25 percent of landings from sharks during that season and (4) the permit holder must not have been selected for observer coverage for the prior three consecutive shark seasons. Vessels were selected from three fishing regions: North Atlantic, South Atlantic, and Gulf of Mexico. The North Atlantic is defined as from Virginia to Maine, the South Atlantic is defined as the east coast of Florida to North

Carolina and the Caribbean, and the Gulf of Mexico is defined as Texas to west coast of Florida including the Florida Keys (NMFS, 2005).

For consistency among longline observer programs throughout the Southeast Fisheries Science Center, we adopted the methods outlined for the Pelagic Longline Observer Program (Beerkircher et al., 2004). While onboard the vessel, the observer completes three data forms: Longline Gear Characteristic Log, Longline Haul Log, and Individual Animal Log. The Longline Gear Characteristic Log is used to record, for example, the type and length of the mainline used, number and length of gangions, and make and model of hooks used. The Longline Haul Log is used to record the length, location, and time duration for each set and haulback, as well as environmental information and the type(s) of bait used. The Individual Animal Log records all species caught, condition of the catch (e.g. alive, dead, damaged, or unknown) when brought to the vessel, and the final disposition of the catch (e.g. kept, released, finned, etc.). When an animal is brought onboard the vessel, the observer records the species identification, sex (sharks only) and length information. Mortality was determined from visual estimates.

Results and Discussion

A total of 9 vessels were observed on 13 trips (average trip length was 5 days) making 46 sets in the Gulf of Mexico region (Figure 1). All sets utilized bottom longline gear with 87% targeting sharks and 13% targeting a combination of sharks and groupers (within the same set). The length of mainline set ranged from 3.7-28.9 km with an average of 14.3 km (±5.7 S.D.). Number of hooks set ranged from 177-895, with an average of 441 hooks (±177 S.D.) per set. Hooks were fished at a depth range of 9.1-

120.7 m with an average depth of 40.2 m (±18.3 S.D.). Setting of gear averaged 1.5 hrs (±0.6 S.D.), while gear haul back averaged 3.3 hrs (±1.6 S.D.). The gear was soaked an average of 8.5 hrs (±4.1 S.D.). The majority of longline vessels utilized circle hooks (67%) but some (33%) used a combination of circle and J-hooks. Circle hook sizes used included 13/0, 14/0, 16/0 (most common), and 18/0. J-hook sizes included 12/0 and 16/0. Total hook effort was 20311 hooks while total hook hours were 175931.7 hours. The catch per unit effort (CPUE) per 100 hooks was 0.1245 for red grouper. The CPUE for red grouper was much lower in the only other estimate from bottom longline observer data (0.014; NMFS 1995).

Sets when red grouper was caught

Of the 46 bottom longline sets observed, 23 sets (50%) caught red grouper. The range in soak duration was between 1.1 - 14.0 hrs with average soak duration of 4.0 hrs. The depth range was 10.5 - 53.5 fa with an average depth of 23.2 fa. The length of the mainline ranged from 2.0 - 15.1 km with an average mainline length of 4.92 km. The average number of hooks was 362.5 hooks. Vessels targeting red grouper used circle hooks with a combination of sizes in the same set (13/0, 16/0, 18/0).

Observed Gulf of Mexico catches

The observed Gulf of Mexico bottom longline catches consisted of 17 species of sharks, 14 species of teleosts, 1 species of batoid, and 7 species of invertebrates (Table 1). Total observed catch composition (percent of numbers caught) was 83.1% sharks, 16.1% teleosts, 0.1% rays, and 0.7% invertebrates. Five species of shark made up 84.9% (by number) of the observed shark catch. These species were the blacktip shark, *Carcharhinus limbatus*, blacknose shark *C. acronotus*, sandbar shark, *C. plumbeus*, nurse shark *Ginglymostoma cirratum*, and the Atlantic sharpnose shark, *Rhizoprionodon terranovae*.

One species of teleost (red grouper *Epinephelus morio*) made up 86.6% by number of the overall non-shark species (n = 217). The average length of red grouper caught was 48.91 cm total length (TL) (Figure 2). The 40 to 45 and 45 to 50 cm TL categories both had the highest percentage of individuals (21.5% each). Of the red grouper, 57.14% were undersized (less than 20 inches or 50.8 cm TL). In the other NMFS Reef Fish Observer study, undersized fish made up 44% of the catch (NMFS 1995).

The depth range of groupers caught was between 10.5 - 53.5 fa with an average depth of 23.2 fa (Figure 3). The majority of red groupers (72.6%) were caught between 20 and 25 fa depth. The length of red groupers caught increased with depth (Figure 4). This corresponds with the other NMFS Reef Fish Observer study in which the majority of red grouper were caught between 20 and 25 fa (NMFS 1995).

Visual condition of red grouper

Of the red grouper caught, 64 were kept (29.49%), 25 were released dead (11.52%), and 128 were released alive (58.99%). In the other NMFS Reef Fish Observer study, 47% red grouper were kept, 43% were released alive, and 6% were released dead (NMFS 1995). The apparent visual mortality of red groupers showed a decreasing trend with length (Figure 5) and with depth (Figure 6), but this may be due more to the preference for keeping larger red groupers caught at deeper depths. The average soak duration for kept red groupers was 4.43 hrs (range 1.1 - 11.3 hrs), for released dead was 7.04 hrs (range 1.3 - 11.2 hrs), and for released alive was 3.18 hrs (range 1.1 - 14 hrs).

Literature Cited

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National Marine Fisheries Service (NMFS). 2005. 2005 Guide for complying with the regulations for Atlantic Tunas, Swordfish, Sharks, and Billfish. Office of Sustainable Fisheries. Highly Migratory Species Management Division, Silver Spring, Maryland. 39 pp.

Tables

Table 1. Total observed Gulf of Mexico catch and bycatch by species and species disposition in order of decreasing abundance for all observed trips, 2005.

Species	Common Name	Total Number Caught	Kept (%)	Discard Alive (%)	Discard Dead (%)	Unknown (%)
Carcharhinus acronotus	blacknose shark	259	78.0	1.9	19.3	0.8
Carcharhinus limbatus	blacktip shark	259	97.3	0.0	1.2	1.5
Epinephelus morio	red grouper	219	29.7	58.4	11.4	0.5
Carcharhinus plumbeus	sandbar shark	218	98.6	0.0	0.0	1.4
Rhizoprionodon terraenovae	Atlantic sharpnose shark	189	78.3	0.5	21.2	0.0
Ginglymostoma cirratum	nurse shark	187	0.5	98.9	0.5	0.0
Galeocerdo cuvier	tiger shark	64	39.1	46.9	10.9	3.1
Negaprion brevirostris	lemon shark	31	90.3	0.0	3.2	6.5
Carcharhinus brevipinna	spinner shark	31	96.8	0.0	0.0	3.2
Carcharhinus leucas	bull shark	24	79.2	0.0	0.0	20.8
Carcharhinus falciformis	silky shark	20	95.0	5.0	0.0	0.0
Sphyrna mokarran	great hammerhead shark	12	100.0	0.0	0.0	0.0
Mycteroperca microlepis	gag	8	75.0	0.0	25.0	0.0
Echeneis naucrates	sharksucker	7	14.3	85.7	0.0	0.0
Mustelus canis	smooth dogfish shark	5	0.0	20.0	80.0	0.0
Epinephelus itajara	goliath grouper	5	0.0	80.0	20.0	0.0
Porifera	sponge	5	0	100	0	0
Sphyrna lewini	scalloped hammerhead shark	4	75.0	0.0	0.0	25.0
Calamus bajonado	jolthead porgy	4	100.0	0.0	0.0	0.0
Anthozoa	coral	4	0	75	25	0
Carcharhinus obscurus	dusky shark	2	0.0	0.0	100.0	0.0
Mycteroperca bonaci	black grouper	2	0.0	50.0	50.0	0.0
Rachycentron canadum	cobia	2	50.0	50.0	0.0	0.0
Eleganyis bipinnulata	rainbow runner	2	100.0	0.0	0.0	0.0
Opsanus beta	gulf toadfish	2	50.0	0.0	50.0	0.0
Calappa flammea	flame box crab	2	0	100	0	0
Sphyrna tiburo	bonnethead shark	1	100.0	0.0	0.0	0.0
Sphyrnidae	hammerhead shark family	1	0.0	0.0	100.0	0.0
Carcharhiniformes	shark order	1	0.0	100.0	0.0	0.0
Seriola fasciata	lesser amberjack	1	100.0	0.0	0.0	0.0
Diplectrum formosum	sand perch	1	0.0	0.0	100.0	0.0
Sciaenops ocellatus	red drum	1	0.0	100.0	0.0	0.0
Seriola zonata	banded rudderfish	1	100.0	0.0	0.0	0.0
Epinephelus drummondhayi	speckled hind	1	0.0	100.0	0.0	0.0
Lutjanus griseus	gray snapper	1	100.0	0.0	0.0	0.0
Aetobatis narinari	spotted eagle ray	1	0.0	100.0	0.0	0.0

Figures

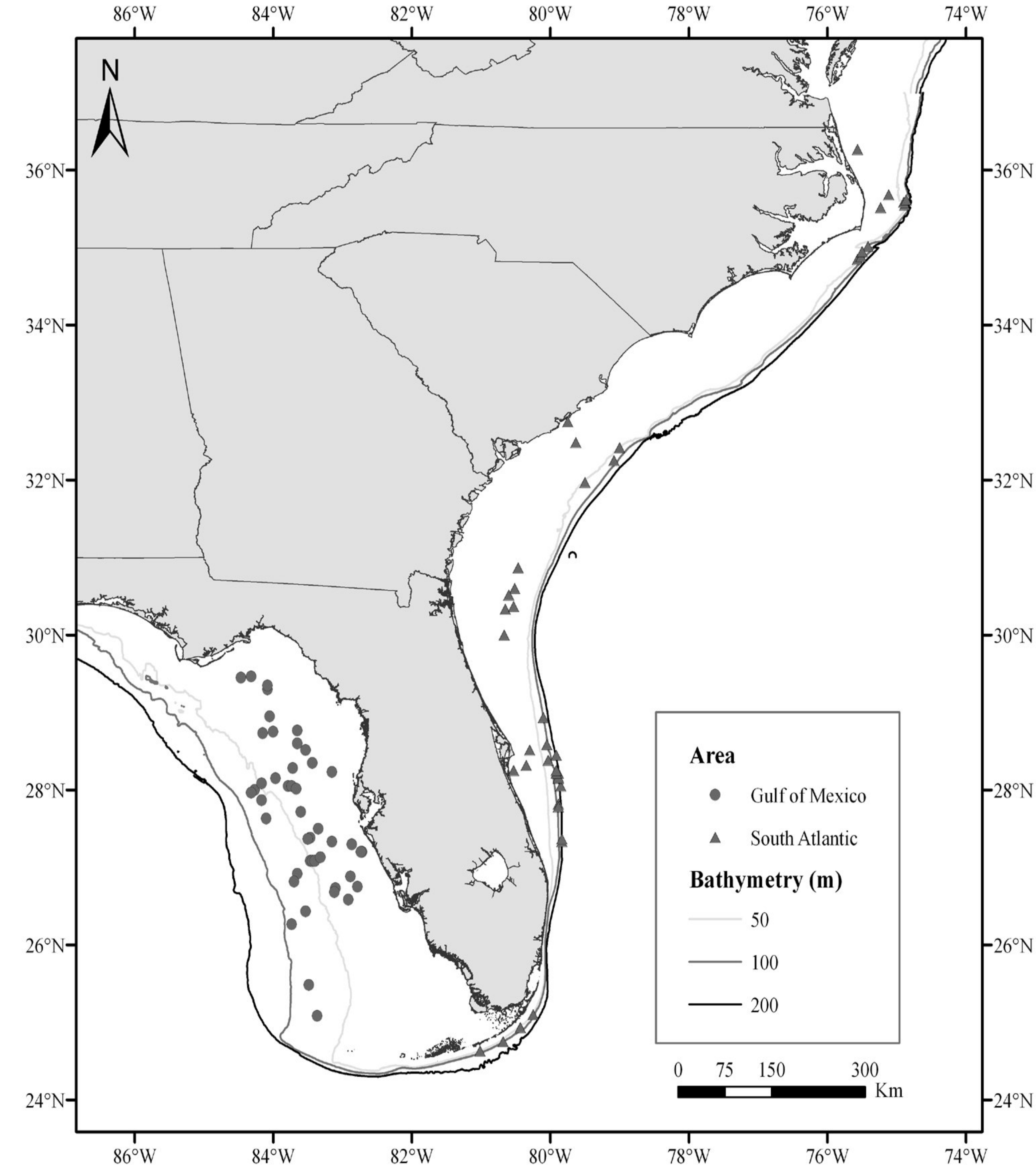

Figure 1. Distribution of observed longline sets, 2nd and 3rd trimester seasons, 2005.

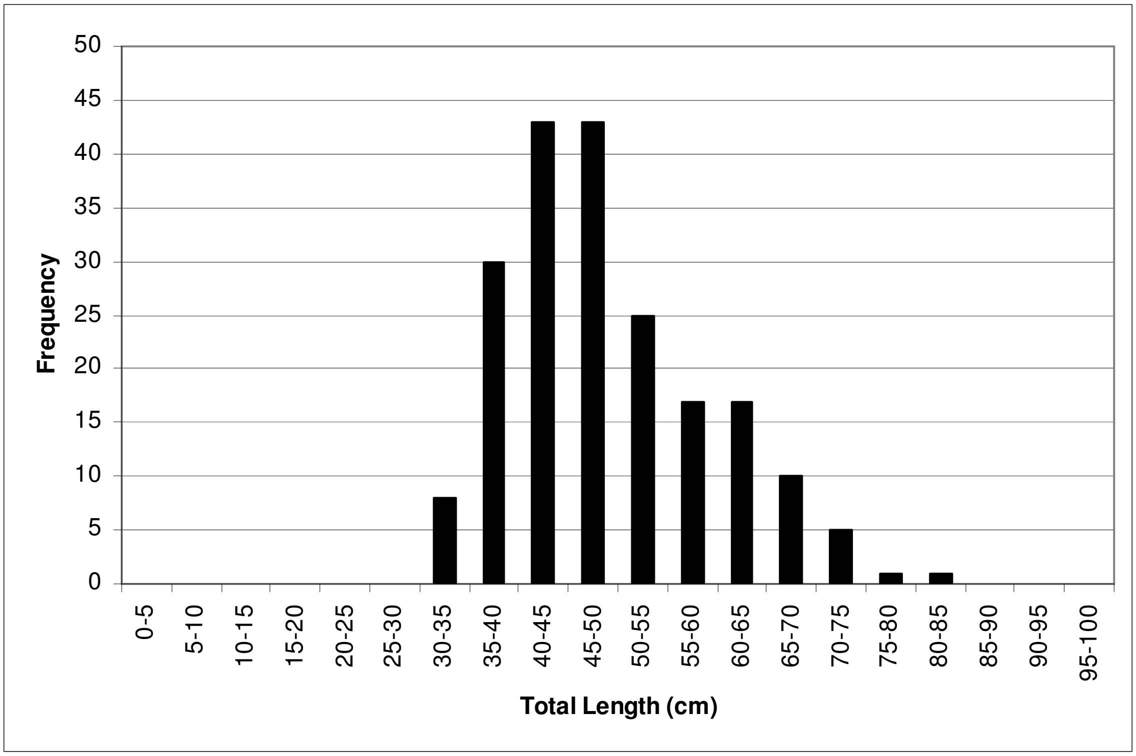

Figure 2. Length frequency (TL in cm) of red grouper caught in the bottom longline fishery.

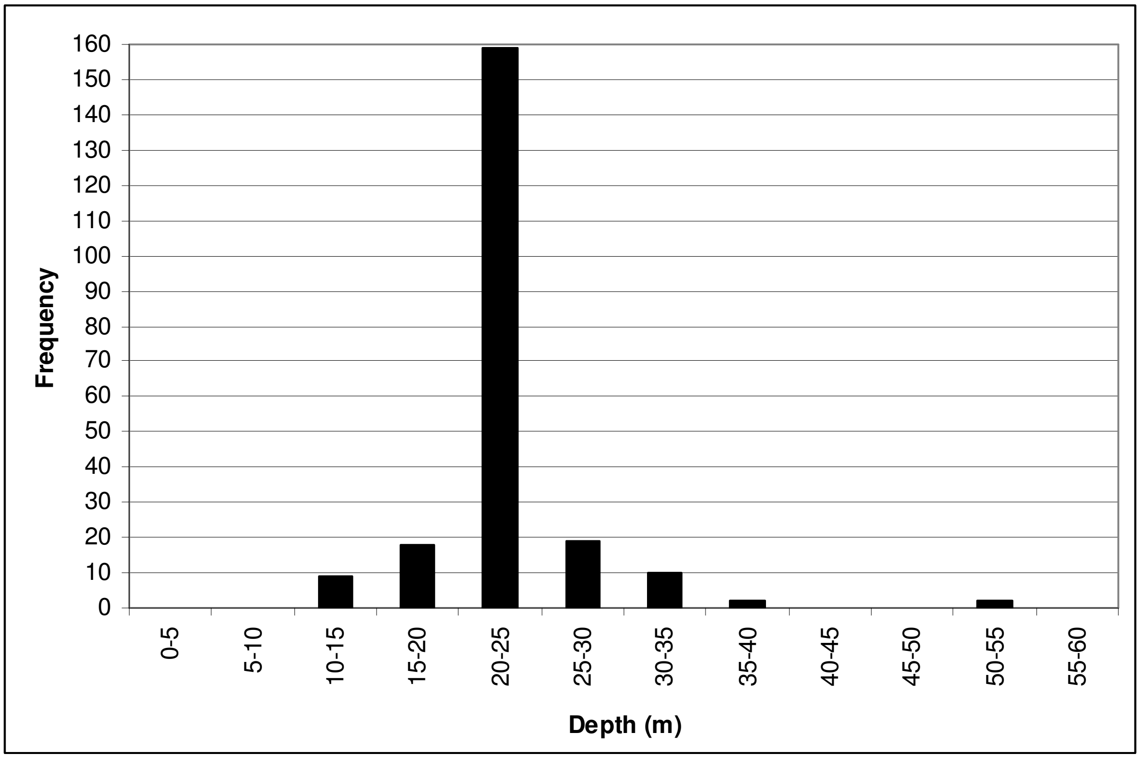

Figure 3. Depth frequency of red groupers caught in the bottom longline fishery.

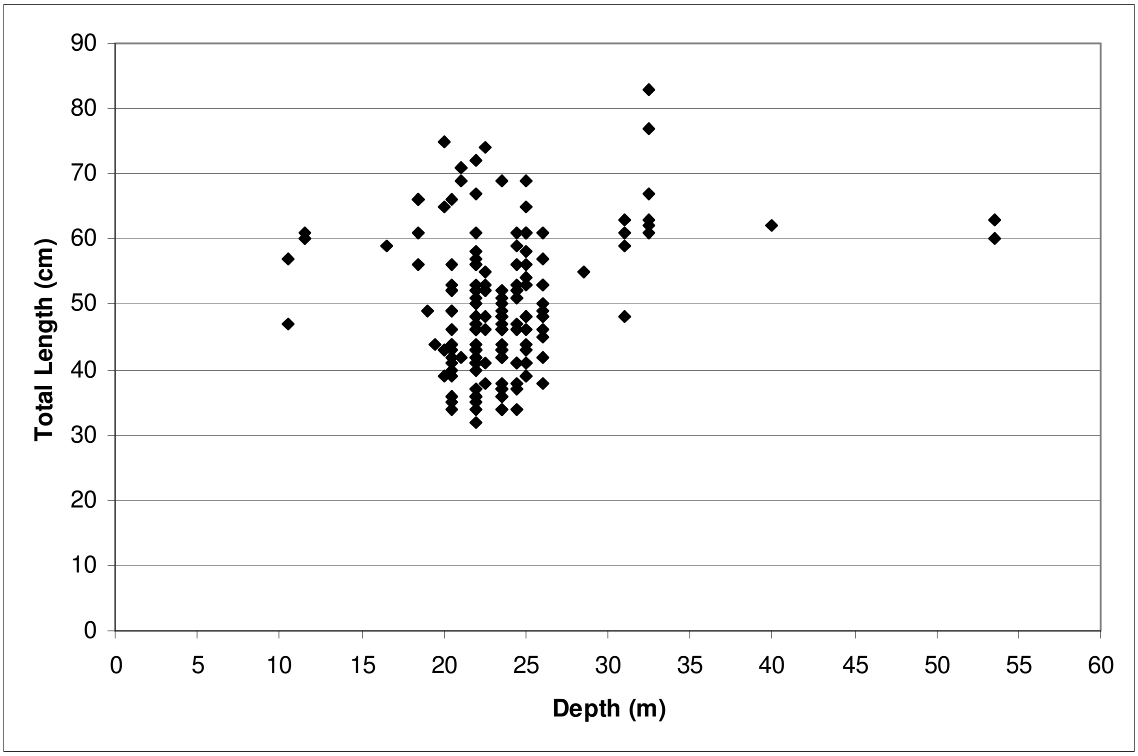

Figure 4. Total length (cm) of red groupers captured in the bottom longline fishery versus depth.

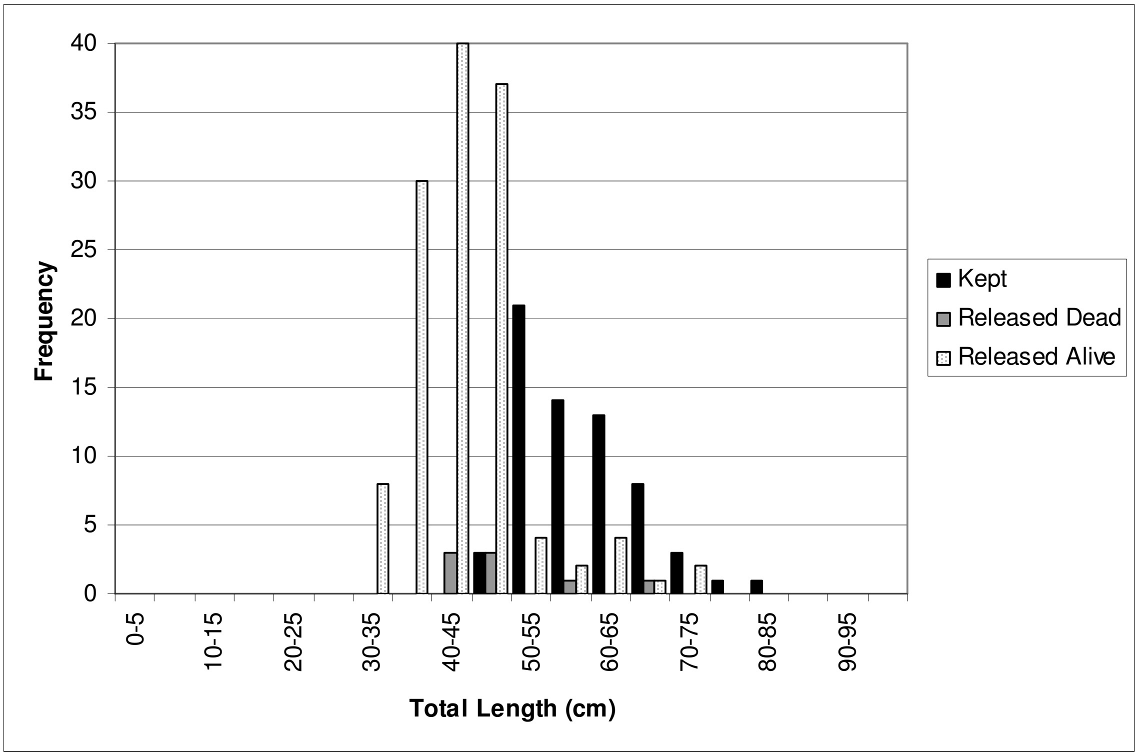

Figure 5. Mortality frequency of red groupers captured in the bottom longline fishery versus total length (cm).

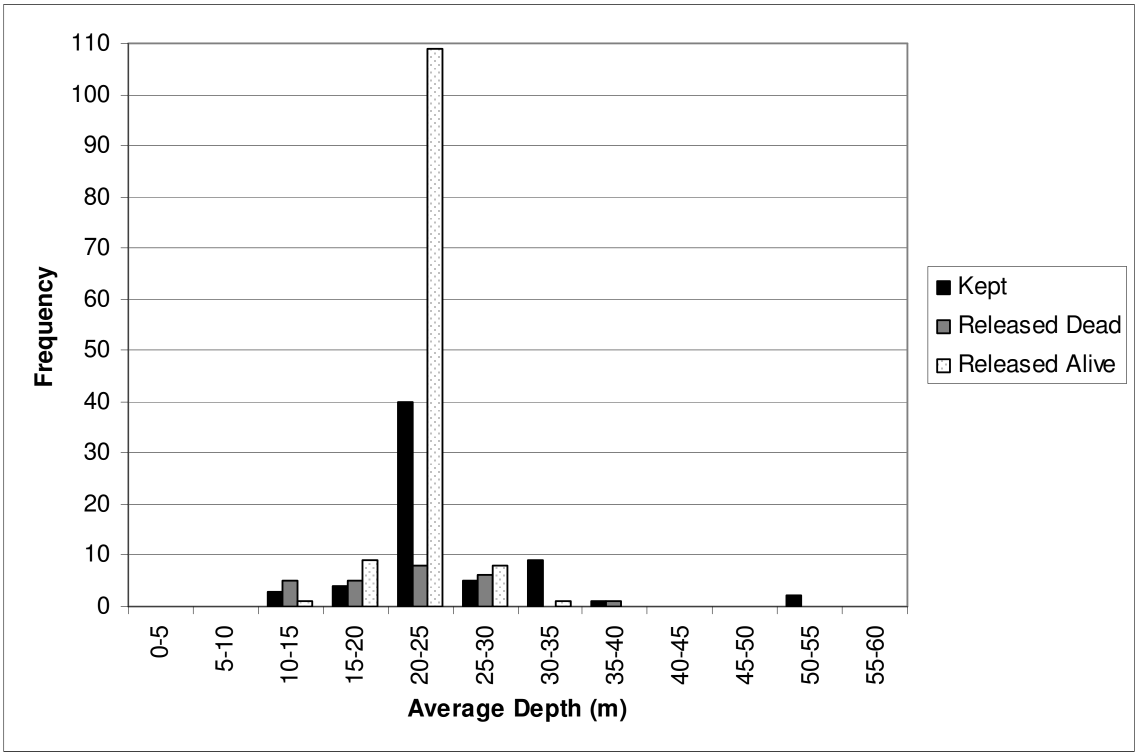

Figure 6. Mortality frequency of red groupers captured in the bottom longline fishery versus depth (m).