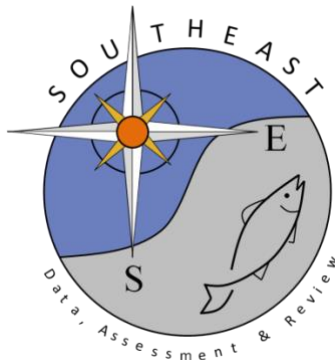


A Summary of Observer Data from the Size Distribution and Release Condition of Vermilion Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

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A Summary of Observer Data from the Size Distribution and Release Condition of Vermilion Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico

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Detailed information on the size and release condition of discarded fish is not collected in traditional dockside surveys of recreational fisheries. At-sea observer surveys provide valuable information on the size and condition of discarded fish, and such surveys have been conducted on for-hire vessels Florida since 2005. For-hire observer surveys have not been consistently funded on both coasts of Florida, which has led to short breaks in the time series in some regions. The majority of these observer trips were conducted on headboat vessels, with charter vessels being surveyed intermittently starting in 2009 (Table 1). This report provides a summary of available information on the size, release condition, and disposition of vermilion snapper collected by trained observers since 2005 during at-sea surveys on for-hire vessels in the Gulf of Mexico and South Atlantic Ocean.

At-Sea Observer Survey Coverage

In 2005, at-sea observer surveys coverage started on headboats operating from the Gulf coast of Florida from the panhandle through the Florida Keys. The at-sea headboat survey was funded by the Gulf Fisheries Information Network (Gulf FIN) continuously through 2007 and was discontinued in 2008. In June 2009 the state of Florida secured alternative funds to continue at-sea observer coverage on both headboats and charter vessels in the northwestern panhandle and central peninsula, and that coverage has continued through 2017. A three-year MARFIN grant allowed coverage to expand to the east coast of Florida from 2013-2015.

At-Sea Observer Survey Methods

Florida – 2005 to 2007

Headboat vessels from three subregions in Florida were randomly selected each week. Florida's western central region also had a separate sample quota for multi-day trips that fish in areas farther offshore. Operators from selected vessels were contacted by state biologists and a single trip was arranged in a selected week. Dependent upon the number of customers on board, one or two biologists accompanied passengers during the scheduled trip. The captain and mates cooperated by making sure fish caught by their anglers were observed by one of the biologists before they were stored in the fish hold or released overboard. Biologists would assist with dehooking fish for data collection but were not permitted to influence the decision to keep or release a fish.

Trip level information for each trip included the area fished, duration of fishing (to the nearest half hour), number of anglers, and minimum and maximum depths (feet) of the fishing sites. Area fished was coded differently for the east and west coasts of Florida.

For each fish, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released.

A brief interview with each angler observed during a trip was also conducted to collect information on primary and secondary target species, angler avidity, and state and county of residence.

Florida – 2009-2017

Similar to methods described above, charter and headboat vessels were randomly selected each week from a list of participating vessels in the northwestern region and central western regions of Florida. Selected vessels are contacted in advance to schedule a single trip during the selected week. Trips are scheduled based on vessel capacity. For example, when 6-pack vessels are selected, a trip is scheduled on a day where the reservation is for a party of 5 or less anglers. If there is no room available on a selected vessel for any reserved trips during the selected week, another vessel is randomly selected. Data from 2014 was omitted from the analysis because it was collected with a special permit, and not representative of the fishery as a whole.

Participating vessel operators permit up to two FWC biologists to board during a scheduled trip, and captains and mates actively assist biologists by permitting them to observe and collect data from fish as they are removed from anglers' gear and before fish are released or placed in the fish box. Vessel operators also provide biologists with information on depth and area fished (commercial statistical area and/or degrees and minutes latitude and longitude) for each fishing station during each observed trip.

For each fish, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released in the same manner as 2005-2007. Additionally, a subset of anglers was tracked by the biologist(s) for the entirety of the trip. For these anglers, hook type, hook size and hook location were recorded the fish that they captured.

A project coordinator conducted quality assurance and quality control checks on all field data as it was collected and submitted. Following data entry, electronic data were proofed against field data sheets.

Data Elements

Disposition was coded as:

Discards

- 1: thrown back alive, legal;
- 2: thrown back alive, not legal;

Harvest

- 3: plan to eat;

- 4: used for bait or plan to use for bait;
- 5: sold or plan to sell;
- 6: thrown back dead or plan to throw away.

Release Condition was coded as:

Good – Fish that were able to submerge and swim away immediately after release

Fair – Fish that re-submerged and swam away with minor difficulty

Bad – Fish released that demonstrated extreme difficulty re-submerging or swimming

Dead – Fish that were released dead, preyed upon by mammals or preyed upon by birds

Area fishes was coded as:

For southeast and northeast Florida:

- 1: 3 miles or less from shore; or
- 2: more than 3 miles from shore

For Keys, western peninsula, and northwest Florida:

- 3: 10 miles or less from shore; or
- 4: more than 10 miles from shore.

Characterization of Trip Duration:

Sampled trips were categorized into the following trip-types based on the duration of the sampled trip:

- Single-Day Trips (<24 hours)
 - Half-Day: < 6 hours
 - Three-Quarter-Day: 6 – 8 hours
 - Full-day: 9 – 24 hours
- Multi-Day Trips (>24 hours)

At-Sea Observer Survey Data Analysis

Proportional Fishing Effort for Headboats

Headboat trips were not sampled proportional to fishing effort. For example, multi-day trips represent less than 3% of headboat fishing effort in Florida but were sampled at a much higher rate in at-sea observer surveys. In the northwestern region of Florida, half-day trips were under-sampled with respect to headboat effort. We generated weighting factors for different trip-types using fishing effort data reported on headboat logbook trip reports for the years 2005 through 2017 (Table 2). Headboat effort data were provided by K. Fitzpatrick from NMFS Southeast Fisheries Science Center in Beaufort, NC.

Proportional fishing effort was calculated as the total numbers of trips reported on logbook trip reports for a given trip-type in a given region, divided by the total number of headboat trips reported in the same region (Table 2). To obtain the sample weight (W_i):

$$W_t = \frac{N_t/N}{n_t/n}$$

Where N_t/N is the number of trips of type t divided by total trips reported on logbook trip reports, and n_t/n is the number of trips of type t in the sample population divided by the total number of sampled trips in each year. Trip-types with $W_t < 1$ are down weighted to account for oversampling and trip-types with $W_t > 1$ are inflated to account for undersampling.

No multi-day charter trips were sampled, and weights were not generated for charter samples (Table 3).

Characterization of Discards:

Fish fork lengths assigned to one cm length bin categories (40 cm bin = fish 40.0 cm to 41.9 cm) and the number of lengths in each length bin category were summed by region, trip-type, and disposition (harvested and discarded).

For fish observed from headboats, counts of fish in each length bin were multiplied times the sample weight (W_t) for each trip-type and sample region. The weighted proportion of fish in a length bin (p_x) was calculated as follows:

$$p_x = \frac{\sum L_H * W_H + \sum L_F * W_F + W_Q * W_Q + W_M * W_M}{\sum (bin = i = 1 \dots n [\sum L_H * W_H + \sum L_F * W_F + W_Q * W_Q + W_M * W_M])}$$

Where L_H equals the number of fishes in length bin x for a given disposition in a given region observed during half-day trips (H); and W_H is the weighting factor for half-day trips in the same region. Q = ¾-day trips, F = full-day trips, and M = multi-day trips. The denominator is the sum of all numerators for length bin 1 to length bin n . The number of discarded fishes was summed by trip type and multiplied by the weighting factor for each trip-type, by year, to construct the weighted discard length frequency distributed. For charter vessels, the discard length frequency was calculated by summing the raw number of discarded vermilion snapper in each length bin and dividing this number by the total number of discarded fishes, by year.

Summaries of release condition by fleet were created by summing the number of discarded fishes in each of four release conditions: Good, Fair, Bad, or Dead. The intersection of these release conditions and the hooking location for discarded fish were also calculated.

Lastly, the discard ratio and immediate release mortality for each fleet were calculated, all years combined. For the headboat fleet, a weighted discard ratio or immediate release mortality were also calculated.

Results

At-Sea Observer Trips

The number of sampled trips by month and trip duration for at-sea observer trips are provided in Tables 2 & 3. Sampling weights used to adjust the number of discards, as a function of under- or over-sampling of different trip durations in each region, northwest and southwest Florida (Table 4). Summary statistics for the length distribution of discarded and harvested fish observed during

headboat and charter trips are provided in Tables 5 and 6. A summary of capture depths for discarded vermilion snapper, by fishing fleet (headboats and charterboats) is provided in Table 7. Length frequency histograms for harvested and released (discarded) vermilion snapper by year are presented for Florida headboats (Figure 1) and Florida charterboats (Figure 2).

The majority of vermilion snapper released from both headboat and charterboat vessels were released with a “Good” release condition and “Lip” hooking location, greater than 97% of fish (Table 8). Very few vermilion snapper released on headboat or charter observer trips demonstrated immediate release mortality, less than 1% in both fleet (Table 9).

Table 1. Sampling coverage for At-sea observer trips in Florida, by region and Year. The * indicates that 2009 represents only a half year of coverage.

| Headboat Areas | 2005 | 2006 | 2007 | 2008 | 2009* | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-----------------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Northwest | H | H | H | | H,C | H,C | H,C | H,C | H,C | | H,C | H,C | H,C |
| Southwest | H | H | H | | H,C | H,C | H,C | H,C | H,C | | H,C | H,C | H,C |
| Keys | H | H | H | | | H,C | H,C | H,C | H,C | C | C | H,C | H,C |

Table 2. Florida sampled headboat at-sea observer trips by month, year, and trip duration for 2005-2017, in northwest and southwest Florida.

| YEAR | FLORIDA - HEADBOAT | MONTH | | | | | | | | | | | | YEARLY TOTAL |
|------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------------|
| | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | |
| 2005 | HALF DAY | 1 | 2 | 2 | 2 | 3 | 1 | 2 | 5 | 0 | 1 | 1 | 2 | 22 |
| | THREE-QUARTER DAY | 0 | 6 | 8 | 10 | 11 | 17 | 15 | 7 | 6 | 10 | 7 | 4 | 101 |
| | FULL DAY | 0 | 1 | 1 | 4 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 20 |
| | MULTIDAY | 0 | 1 | 0 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 19 |
| | <i>MONTHLY TOTAL</i> | <i>1</i> | <i>10</i> | <i>11</i> | <i>18</i> | <i>20</i> | <i>22</i> | <i>20</i> | <i>15</i> | <i>10</i> | <i>15</i> | <i>10</i> | <i>10</i> | 162 |
| 2006 | HALF DAY | 2 | 3 | 1 | 6 | 4 | 4 | 2 | 6 | 2 | 1 | 2 | 1 | 34 |
| | THREE-QUARTER DAY | 7 | 7 | 11 | 6 | 15 | 10 | 13 | 9 | 11 | 7 | 6 | 9 | 111 |
| | FULL DAY | 0 | 0 | 3 | 2 | 0 | 5 | 1 | 1 | 1 | 1 | 1 | 0 | 15 |
| | MULTIDAY | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 28 |
| | <i>MONTHLY TOTAL</i> | <i>11</i> | <i>13</i> | <i>18</i> | <i>17</i> | <i>20</i> | <i>21</i> | <i>19</i> | <i>19</i> | <i>16</i> | <i>11</i> | <i>11</i> | <i>12</i> | 188 |
| 2007 | HALF DAY | 2 | 3 | 3 | 3 | 3 | 5 | 4 | 3 | 0 | 2 | 2 | 0 | 30 |
| | THREE-QUARTER DAY | 6 | 5 | 8 | 7 | 8 | 8 | 10 | 9 | 11 | 8 | 7 | 10 | 97 |
| | FULL DAY | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 0 | 1 | 0 | 1 | 13 |
| | MULTIDAY | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 4 | 5 | 2 | 25 |
| | <i>MONTHLY TOTAL</i> | <i>11</i> | <i>11</i> | <i>15</i> | <i>12</i> | <i>13</i> | <i>18</i> | <i>16</i> | <i>15</i> | <i>12</i> | <i>15</i> | <i>14</i> | <i>13</i> | 165 |
| 2009 | HALF DAY | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 1 | 2 | 8 |
| | THREE-QUARTER DAY | 0 | 0 | 0 | 0 | 0 | 8 | 6 | 7 | 6 | 6 | 6 | 3 | 42 |
| | FULL DAY | 0 | 0 | 0 | 0 | 0 | 7 | 4 | 0 | 1 | 0 | 1 | 0 | 13 |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 1 | 2 | 1 | 1 | 9 |
| | <i>MONTHLY TOTAL</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>15</i> | <i>14</i> | <i>11</i> | <i>9</i> | <i>8</i> | <i>9</i> | <i>6</i> | 72 |

| | | | | | | | | | | | | | | |
|-------------|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| 2010 | HALF DAY | 0 | 1 | 0 | 0 | 3 | 1 | 5 | 2 | 1 | 0 | 0 | 0 | 13 |
| | THREE-QUARTER DAY | 4 | 3 | 3 | 6 | 3 | 5 | 3 | 5 | 7 | 6 | 1 | 2 | 48 |
| | FULL DAY | 1 | 2 | 2 | 1 | 0 | 4 | 5 | 1 | 1 | 1 | 3 | 0 | 21 |
| | MULTIDAY | 1 | 1 | 1 | 2 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 2 | 12 |
| | <i>MONTHLY TOTAL</i> | 6 | 7 | 6 | 9 | 6 | 13 | 14 | 8 | 10 | 7 | 4 | 4 | 94 |
| 2011 | HALF DAY | 0 | 0 | 2 | 1 | 5 | 4 | 2 | 2 | 1 | 4 | 1 | 8 | 30 |
| | THREE-QUARTER DAY | 4 | 7 | 6 | 6 | 3 | 5 | 7 | 6 | 5 | 5 | 5 | 7 | 66 |
| | FULL DAY | 0 | 0 | 0 | 1 | 0 | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 9 |
| | MULTIDAY | 0 | 1 | 0 | 3 | 0 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 14 |
| | <i>MONTHLY TOTAL</i> | 4 | 8 | 8 | 11 | 8 | 18 | 11 | 9 | 8 | 11 | 7 | 16 | 119 |
| 2012 | HALF DAY | 1 | 4 | 2 | 2 | 4 | 5 | 5 | 5 | 2 | 2 | 0 | 3 | 35 |
| | THREE-QUARTER DAY | 8 | 3 | 3 | 7 | 4 | 3 | 5 | 4 | 4 | 5 | 6 | 5 | 57 |
| | FULL DAY | 1 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | MULTIDAY | 0 | 1 | 1 | 1 | 0 | 2 | 3 | 1 | 1 | 0 | 1 | 1 | 12 |
| | <i>MONTHLY TOTAL</i> | 10 | 9 | 6 | 10 | 8 | 13 | 13 | 10 | 7 | 7 | 7 | 9 | 109 |
| 2013 | HALF DAY | 4 | 2 | 5 | 2 | 2 | 4 | 6 | 4 | 3 | 2 | 0 | 5 | 39 |
| | THREE-QUARTER DAY | 1 | 4 | 4 | 1 | 2 | 4 | 1 | 1 | 1 | 4 | 0 | 0 | 23 |
| | FULL DAY | 3 | 1 | 0 | 3 | 2 | 5 | 2 | 4 | 2 | 3 | 4 | 2 | 31 |
| | MULTIDAY | 1 | 1 | 1 | 1 | 0 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 11 |
| | <i>MONTHLY TOTAL</i> | 9 | 8 | 10 | 7 | 6 | 17 | 10 | 10 | 7 | 9 | 4 | 7 | 104 |
| 2015 | HALF DAY | 1 | 4 | 7 | 5 | 8 | 3 | 6 | 11 | 7 | 8 | 3 | 10 | 73 |
| | THREE-QUARTER DAY | 4 | 5 | 6 | 6 | 7 | 4 | 8 | 4 | 6 | 6 | 6 | 8 | 70 |
| | FULL DAY | 5 | 1 | 2 | 5 | 4 | 3 | 2 | 5 | 2 | 2 | 2 | 5 | 38 |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 4 |
| | <i>MONTHLY TOTAL</i> | 10 | 10 | 15 | 16 | 19 | 12 | 17 | 20 | 15 | 16 | 12 | 23 | 185 |
| 2016 | HALF DAY | 6 | 8 | 7 | 6 | 7 | 6 | 8 | 6 | 8 | 5 | 11 | 11 | 89 |
| | THREE-QUARTER DAY | 9 | 5 | 11 | 8 | 4 | 4 | 7 | 8 | 8 | 11 | 3 | 3 | 81 |

| | | | | | | | | | | | | | | |
|-------------|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| | FULL DAY | 7 | 8 | 3 | 4 | 2 | 4 | 5 | 3 | 3 | 4 | 5 | 6 | 54 |
| | MULTIDAY | 0 | 1 | 1 | 0 | 1 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 8 |
| | <i>MONTHLY TOTAL</i> | <i>22</i> | <i>22</i> | <i>22</i> | <i>18</i> | <i>14</i> | <i>16</i> | <i>20</i> | <i>20</i> | <i>19</i> | <i>20</i> | <i>19</i> | <i>20</i> | 232 |
| 2017 | HALF DAY | 10 | 10 | 10 | 5 | 11 | 7 | 6 | 13 | 6 | 12 | 10 | 4 | 104 |
| | THREE-QUARTER DAY | 6 | 6 | 6 | 5 | 6 | 7 | 4 | 7 | 7 | 3 | 4 | 5 | 66 |
| | FULL DAY | 5 | 3 | 2 | 1 | 7 | 2 | 3 | 2 | 2 | 4 | 4 | 3 | 38 |
| | MULTIDAY | 0 | 1 | 1 | 0 | 0 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 8 |
| | <i>MONTHLY TOTAL</i> | <i>21</i> | <i>20</i> | <i>19</i> | <i>11</i> | <i>24</i> | <i>17</i> | <i>16</i> | <i>23</i> | <i>15</i> | <i>19</i> | <i>19</i> | <i>12</i> | 216 |

Table 3. Florida sampled charterboat at-sea observer trips by month, year, and trip duration for 2009 – 2017 (Sampling in 2009 only represents half of the year – June to December).

| YEAR | FLORIDA - CHARTERBOAT | MONTH | | | | | | | | | | | | YEARLY TOTAL | |
|------|--------------------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------|---|
| | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | | |
| 2009 | HALF DAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | THREE-QUARTER DAY | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 8 | 0 | 1 | 0 | 14 | |
| | FULL DAY | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 2 | 2 | 1 | 0 | 11 | |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | <i>MONTHLY TOTAL</i> | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 5 | 10 | 2 | 2 | 0 | 25 | |
| 2010 | HALF DAY | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | |
| | THREE-QUARTER DAY | 0 | 1 | 3 | 0 | 4 | 2 | 1 | 3 | 3 | 5 | 4 | 0 | 26 | |
| | FULL DAY | 0 | 0 | 1 | 0 | 4 | 3 | 0 | 0 | 0 | 2 | 2 | 0 | 12 | |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | <i>MONTHLY TOTAL</i> | 0 | 1 | 4 | 0 | 8 | 5 | 2 | 4 | 3 | 7 | 7 | 0 | 41 | |
| 2011 | HALF DAY | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | |
| | THREE-QUARTER DAY | 1 | 2 | 2 | 4 | 6 | 4 | 4 | 8 | 6 | 5 | 2 | 3 | 47 | |
| | FULL DAY | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 6 | |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | <i>MONTHLY TOTAL</i> | 1 | 2 | 3 | 5 | 6 | 6 | 6 | 8 | 7 | 7 | 2 | 3 | 56 | |
| 2012 | HALF DAY | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 1 | 1 | 2 | 0 | 1 | 8 | |
| | THREE-QUARTER DAY | 2 | 4 | 2 | 4 | 2 | 4 | 3 | 3 | 2 | 3 | 3 | 1 | 33 | |
| | FULL DAY | 0 | 0 | 2 | 1 | 2 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 9 | |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | <i>MONTHLY TOTAL</i> | 2 | 4 | 5 | 5 | 4 | 6 | 5 | 5 | 3 | 5 | 4 | 2 | 50 | |

| | | | | | | | | | | | | | | |
|-------------|----------------------|----------|----------|-----------|----------|-----------|-----------|-----------|----------|-----------|----------|----------|-----------|-----------|
| 2013 | HALF DAY | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 2 | 2 | 0 | 3 | 2 | 14 |
| | THREE-QUARTER DAY | 0 | 0 | 4 | 1 | 3 | 3 | 4 | 2 | 1 | 1 | 1 | 2 | 22 |
| | FULL DAY | 2 | 1 | 0 | 2 | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 0 | 12 |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | <i>MONTHLY TOTAL</i> | <i>2</i> | <i>1</i> | <i>4</i> | <i>5</i> | <i>3</i> | <i>5</i> | <i>8</i> | <i>4</i> | <i>5</i> | <i>2</i> | <i>5</i> | <i>4</i> | 48 |
| 2014 | HALF DAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 | 8 |
| | THREE-QUARTER DAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 4 |
| | FULL DAY | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 5 |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | <i>MONTHLY TOTAL</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>2</i> | <i>0</i> | <i>0</i> | <i>0</i> | <i>5</i> | <i>5</i> | <i>5</i> | 17 |
| 2015 | HALF DAY | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 2 | 2 | 1 | 1 | 7 | 17 |
| | THREE-QUARTER DAY | 0 | 0 | 4 | 5 | 3 | 2 | 2 | 4 | 5 | 5 | 8 | 4 | 42 |
| | FULL DAY | 0 | 0 | 1 | 0 | 1 | 5 | 4 | 3 | 4 | 3 | 0 | 3 | 24 |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | <i>MONTHLY TOTAL</i> | <i>1</i> | <i>0</i> | <i>7</i> | <i>6</i> | <i>4</i> | <i>7</i> | <i>6</i> | <i>9</i> | <i>11</i> | <i>9</i> | <i>9</i> | <i>14</i> | 83 |
| 2016 | HALF DAY | 1 | 1 | 8 | 2 | 3 | 0 | 1 | 0 | 2 | 1 | 3 | 1 | 23 |
| | THREE-QUARTER DAY | 6 | 2 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 1 | 2 | 3 | 44 |
| | FULL DAY | 0 | 4 | 0 | 0 | 2 | 1 | 3 | 1 | 0 | 3 | 0 | 2 | 16 |
| | MULTIDAY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | <i>MONTHLY TOTAL</i> | <i>7</i> | <i>7</i> | <i>13</i> | <i>6</i> | <i>9</i> | <i>5</i> | <i>8</i> | <i>5</i> | <i>7</i> | <i>5</i> | <i>5</i> | <i>6</i> | 83 |
| 2017 | HALF DAY | 3 | 2 | 3 | 2 | 2 | 0 | 2 | 0 | 0 | 2 | 3 | 2 | 21 |
| | THREE-QUARTER DAY | 0 | 3 | 6 | 0 | 5 | 2 | 3 | 3 | 4 | 1 | 1 | 1 | 29 |
| | FULL DAY | 0 | 1 | 2 | 1 | 4 | 8 | 7 | 3 | 4 | 6 | 1 | 2 | 39 |
| | MULTIDAY | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | <i>MONTHLY TOTAL</i> | <i>3</i> | <i>7</i> | <i>11</i> | <i>3</i> | <i>11</i> | <i>11</i> | <i>12</i> | <i>6</i> | <i>8</i> | <i>9</i> | <i>5</i> | <i>5</i> | 91 |

Table 4. Weights generated to correct length frequencies to account for uneven sampling of trips with varying duration, for headboats only.

| Headboat Region | Year | Trip Duration | | | |
|----------------------------|-------------|----------------------|--------------------------|---------------------|------------------|
| | | <i>Half Day</i> | <i>Three-Quarter Day</i> | <i>Full Day</i> | <i>Multi-Day</i> |
| NWFL | 2005 | 1.992 | 0.833 | 1.188 | - |
| | 2006 | 1.983 | 0.746 | 1.592 | - |
| | 2007 | 2.044 | 0.683 | 2.184 | - |
| | 2009 | 2.383 | 0.643 | . | - |
| | 2010 | 1.626 | 1.058 | 0.488 | - |
| | 2011 | 1.359 | 0.844 | 1.988 | - |
| | 2012 | 0.834 | 0.984 | 2.222 | - |
| | 2013 | 0.820 | 0.842 | 1.812 | - |
| | 2015 | 1.193 | 0.622 | 2.011 | - |
| | 2016 | 1.227 | 0.638 | 1.941 | - |
| 2017 | 0.861 | 0.736 | 2.569 | - | |
| SWFL | 2005 | 1.928 | 0.861 | 2.536 | 0.002 |
| | 2006 | 1.584 | 1.310 | 0.699 | 0.010 |
| | 2007 | 2.408 | 0.967 | 0.935 | 0.001 |
| | 2009 | 4.957 | 1.198 | 0.175 | 0.037 |
| | 2010 | 3.534 | 0.994 | 0.138 | 0.047 |
| | 2011 | 1.789 | 1.163 | 0.200 | 0.038 |
| | 2012 | 1.477 | 1.155 | 0.483 | 0.037 |
| | 2013 | 1.074 | 12.183 | 0.867 | 0.112 |
| | 2015 | 0.803 | 2.052 | 1.215 | 0.491 |
| | 2016 | 0.979 | 1.378 | 0.986 | 0.390 |
| 2017 | 0.835 | 1.516 | 1.295 | 0.484 | |

Table 5. Length summaries for discarded and harvested vermillion snapper observed on headboats trips in Florida, by year.

| Year | DISCARD | | | | HARVEST | | | |
|--------------------------|---------|-----|---------|-----|---------|-----|---------|-----|
| | N | Min | Mean | Max | N | Min | Mean | Max |
| <i>NORTHWEST FLORIDA</i> | | | | | | | | |
| 2005 | 820 | 129 | 224.518 | 346 | 1812 | 170 | 274.901 | 440 |
| 2006 | 1291 | 107 | 231.349 | 350 | 2796 | 200 | 282.655 | 472 |
| 2007 | 506 | 121 | 224.383 | 350 | 1774 | 170 | 279.249 | 565 |
| 2009 | 85 | 173 | 217.435 | 378 | 351 | 215 | 277.644 | 410 |
| 2010 | 17 | 161 | 232 | 472 | 596 | 229 | 290.909 | 409 |
| 2011 | 58 | 141 | 212.655 | 258 | 1256 | 207 | 303.103 | 448 |
| 2012 | 94 | 143 | 213.947 | 250 | 809 | 185 | 291.286 | 451 |
| 2013 | 51 | 180 | 218.49 | 242 | 615 | 194 | 280.53 | 443 |
| 2015 | 331 | 111 | 211.879 | 245 | 2922 | 162 | 278.401 | 450 |
| 2016 | 551 | 145 | 211.207 | 240 | 3889 | 202 | 280.519 | 466 |
| 2017 | 245 | 164 | 214.576 | 245 | 2812 | 224 | 282.206 | 465 |
| <i>SOUTHWEST FLORIDA</i> | | | | | | | | |
| 2005 | 9 | 202 | 234.222 | 361 | 84 | 184 | 289.44 | 431 |
| 2006 | 111 | 112 | 246.802 | 350 | 285 | 160 | 292.537 | 559 |
| 2007 | 52 | 157 | 263.538 | 332 | 246 | 190 | 294.663 | 528 |
| 2009 | 22 | 193 | 252.864 | 359 | 217 | 184 | 288.548 | 452 |
| 2010 | 15 | 181 | 230.733 | 387 | 399 | 210 | 317.18 | 480 |
| 2011 | 7 | 175 | 259.857 | 356 | 407 | 195 | 305.619 | 554 |
| 2012 | 5 | 201 | 216 | 255 | 220 | 145 | 286.768 | 476 |
| 2013 | 4 | 220 | 230.5 | 244 | 188 | 204 | 312.388 | 430 |
| 2015 | 3 | 185 | 222.667 | 260 | 6 | 255 | 360.167 | 425 |
| 2016 | 29 | 189 | 236.621 | 400 | 125 | 165 | 298.296 | 467 |
| 2017 | 10 | 200 | 236.8 | 288 | 198 | 220 | 318.061 | 435 |

Table 6. Length summaries for discarded and harvested vermillion snapper observed on charterboat trips in Florida, by year and region (2009 represents a half year of data June through December).

| Year | DISCARD | | | | HARVEST | | | |
|--------------------------|---------|-----|---------|-----|---------|-----|---------|-----|
| | N | Min | Mean | Max | N | Min | Mean | Max |
| <i>NORTHWEST FLORIDA</i> | | | | | | | | |
| 2009* | 30 | 192 | 221.5 | 261 | 323 | 220 | 282.307 | 460 |
| 2010 | 7 | 197 | 220 | 246 | 451 | 212 | 291.251 | 460 |
| 2011 | 54 | 145 | 231.148 | 304 | 1312 | 184 | 305.519 | 460 |
| 2012 | 18 | 195 | 220.5 | 239 | 489 | 199 | 282.229 | 459 |
| 2013 | 19 | 166 | 221.684 | 239 | 813 | 138 | 283.293 | 424 |
| 2014 | 10 | 211 | 225.8 | 268 | 262 | 228 | 288.901 | 384 |
| 2015 | 108 | 142 | 210.491 | 340 | 1704 | 148 | 284.518 | 460 |
| 2016 | 131 | 168 | 216.435 | 285 | 1412 | 166 | 278.481 | 450 |
| 2017 | 150 | 128 | 221.28 | 310 | 1476 | 196 | 290.653 | 490 |
| <i>SOUTHWEST FLORIDA</i> | | | | | | | | |
| 2009* | 1 | 238 | 238 | 238 | - | - | - | - |
| 2010 | 10 | 220 | 225.7 | 250 | 31 | 210 | 239.355 | 272 |
| 2011 | 1 | 248 | 248 | 248 | - | - | - | - |
| 2015 | 10 | 200 | 243 | 275 | 17 | 250 | 300.706 | 390 |
| 2016 | 11 | 200 | 211.182 | 235 | 34 | 205 | 264.5 | 340 |
| 2017 | 16 | 183 | 224.75 | 250 | 156 | 158 | 253.314 | 420 |

Table 7. Summary of capture depths (in meters) for discarded vermilion snapper by year and fishing fleet: Headboat or Charterboats (2009 represents a half year of data June through December). The sample size, N, corresponds with the number of fishes caught at a given depth.

| Year | HEADBOAT | | | | CHARTERBOAT | | | |
|-------|----------|------------|-------------|------------|-------------|------------|-------------|------------|
| | <i>N</i> | <i>Min</i> | <i>Mean</i> | <i>Max</i> | <i>N</i> | <i>Min</i> | <i>Mean</i> | <i>Max</i> |
| 2009* | 107 | 24 | 34 | 73 | 31 | 27 | 36 | 55 |
| 2010 | 32 | 29 | 39 | 60 | 17 | 26 | 34 | 50 |
| 2011 | 65 | 25 | 35 | 68 | 55 | 21 | 37 | 60 |
| 2012 | 99 | 24 | 35 | 62 | 18 | 29 | 33 | 41 |
| 2013 | 55 | 24 | 30 | 58 | 19 | 21 | 31 | 43 |
| 2014 | - | - | - | - | 10 | 21 | 26 | 32 |
| 2015 | 334 | 21 | 34 | 63 | 118 | 20 | 27 | 48 |
| 2016 | 580 | 21 | 32 | 67 | 142 | 20 | 28 | 51 |
| 2017 | 255 | 22 | 35 | 72 | 166 | 15 | 31 | 66 |

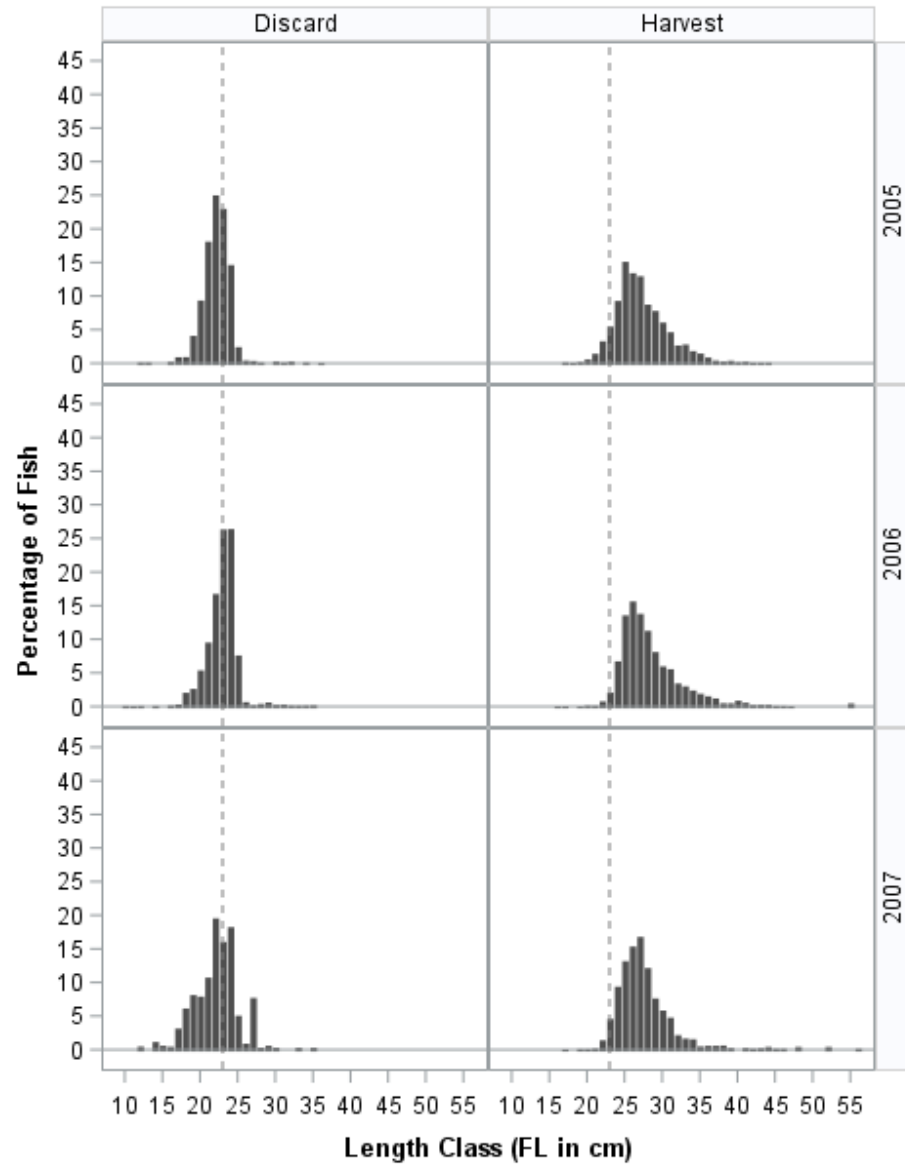
Table 8. Intersection of release condition and hook position for vermilion snapper released from the headboat and charter recreational fleets.

| Fleet | Hook Position | Good | % | Fair | % | Bad | % | Dead | % | Total |
|----------|---------------|-------------|--------------|-----------|--------------|-----------|--------------|-----------|--------------|-------------|
| Headboat | Lip | 1351 | 97.6 | 26 | 100.0 | 47 | 94.0 | 12 | 100.0 | 1436 |
| | Foul | 9 | 0.7 | 0 | 0.0 | 2 | 4.0 | 0 | 0.0 | 11 |
| | Eye | 1 | 0.1 | 0 | 0.0 | 1 | 2.0 | 0 | 0.0 | 2 |
| | Unknown | 23 | 1.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 23 |
| | <i>Total</i> | <i>1384</i> | <i>100.0</i> | <i>26</i> | <i>100.0</i> | <i>50</i> | <i>100.0</i> | <i>12</i> | <i>100.0</i> | <i>1472</i> |
| Charter | Lip | 554 | 99.8 | 7 | 100.0 | 7 | 87.5 | - | - | 568 |
| | Throat | 1 | 0.2 | 0 | 0.0 | 1 | 12.5 | - | - | 2 |
| | <i>Total</i> | <i>555</i> | <i>100.0</i> | <i>7</i> | <i>100.0</i> | <i>8</i> | <i>100.0</i> | <i>-</i> | <i>-</i> | <i>570</i> |

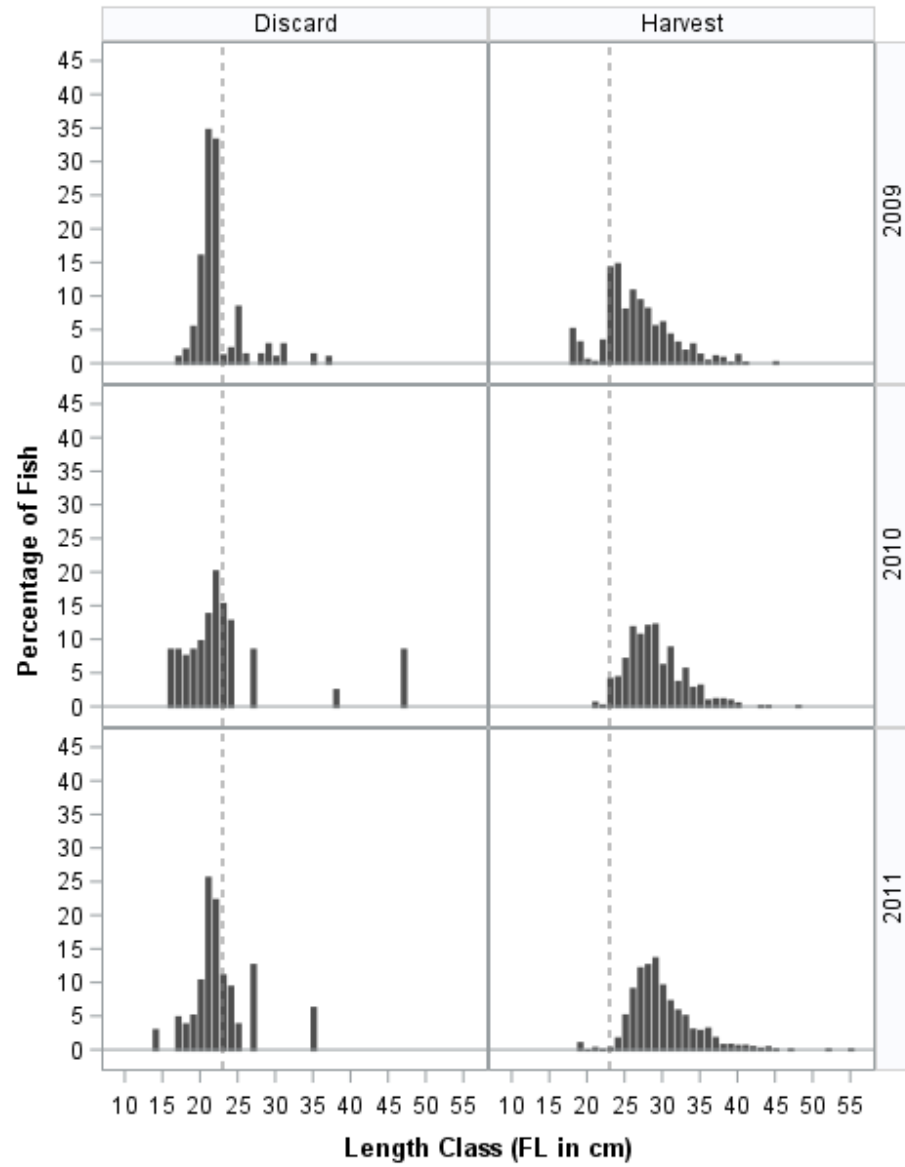
Table 9. Immediate mortality and discard ratios by region and fishing fleet (Headboat – raw / weighted, Charter – raw), all years combined.

| Fleet | Headboat Region | Immediate Mortality | Discard Ratio | Weighted Immediate Mortality | Weighted Discard Ratio |
|--------------|------------------------|----------------------------|----------------------|-------------------------------------|-------------------------------|
| Headboat | NWFL | 0.0029 | 0.0341 | 0.0024 | 0.0323 |
| | SWFL | 0.0075 | 0.0455 | 0.0004 | 0.0127 |
| Charter | NWFL | - | 0.0679 | - | 0.0679 |
| | SWFL | - | 0.2305 | - | 0.2305 |

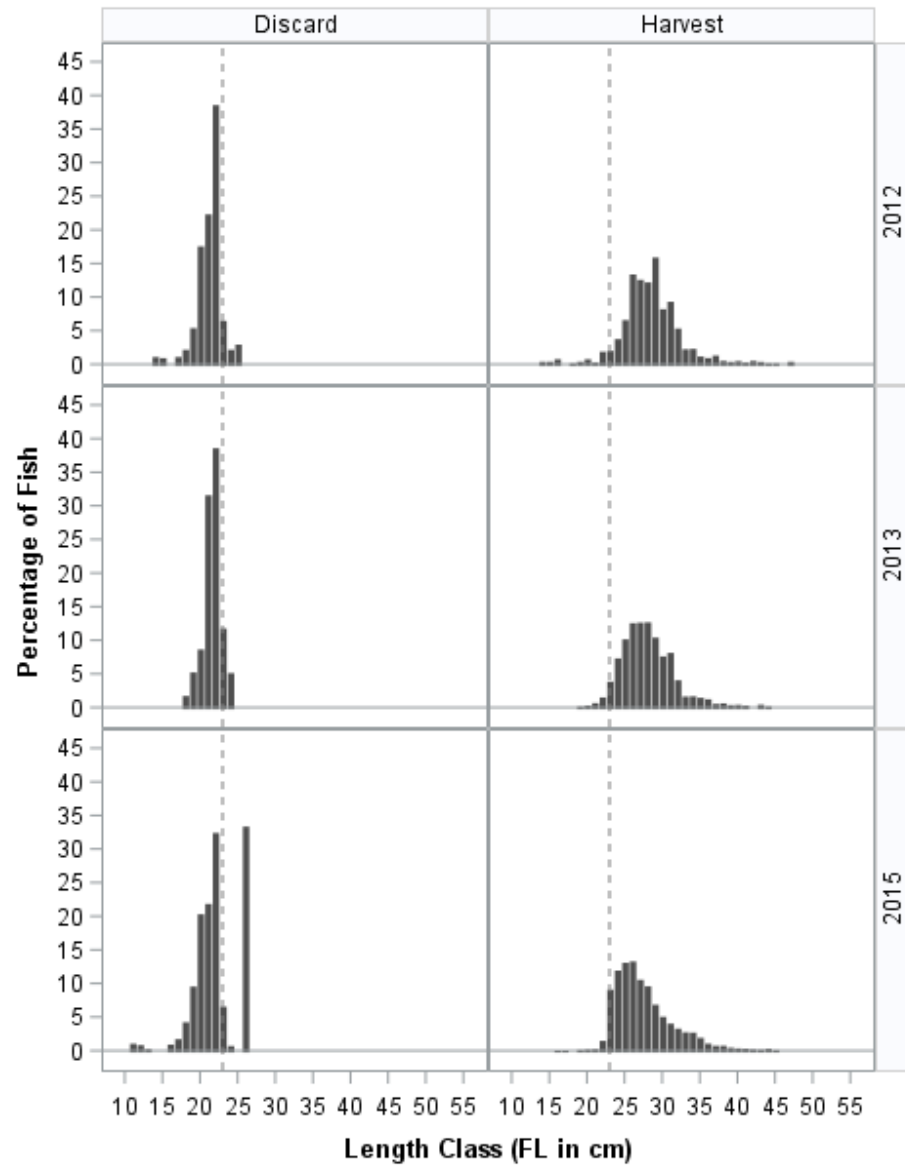
Vermilion Snapper Length Frequency - Headboats



Vermilion Snapper Length Frequency - Headboats



Vermilion Snapper Length Frequency - Headboats



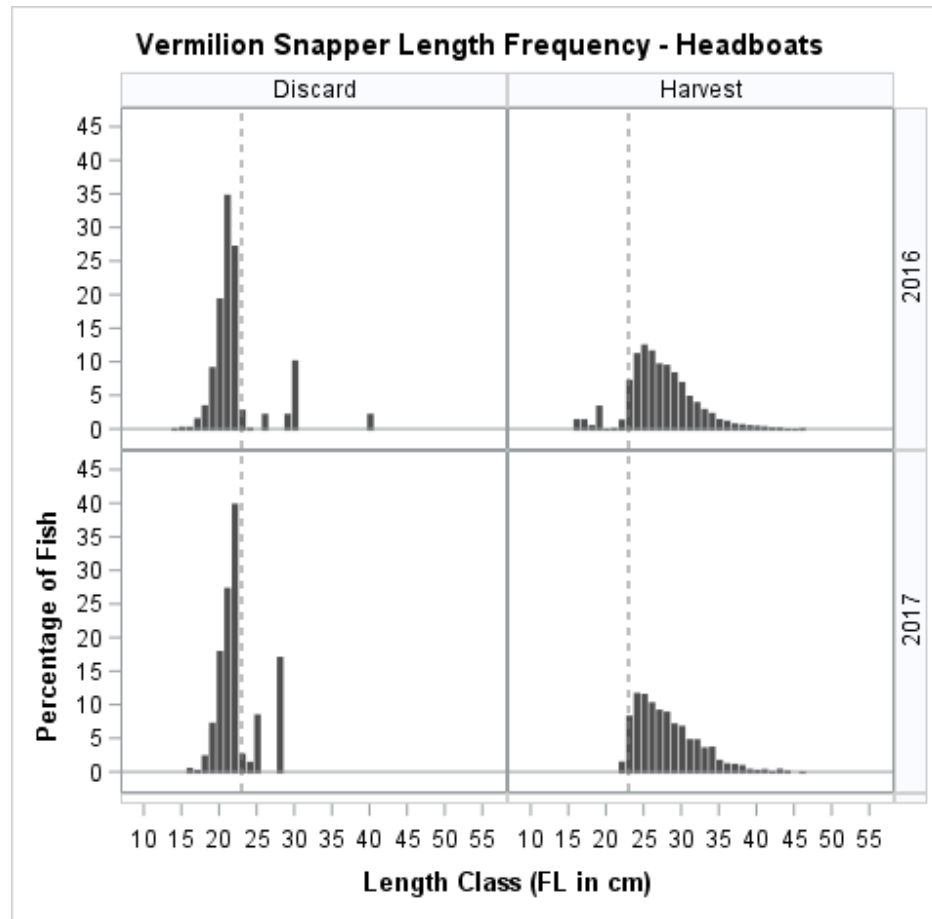
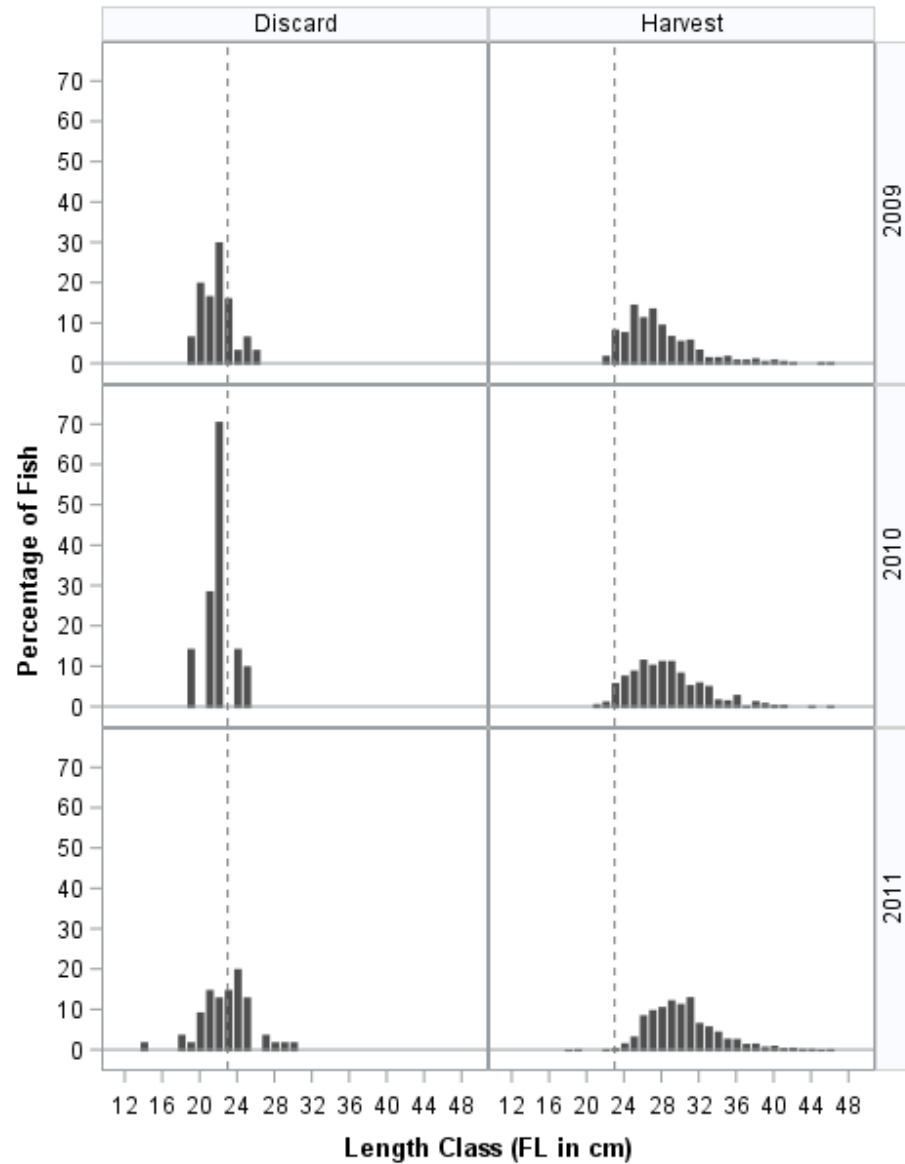
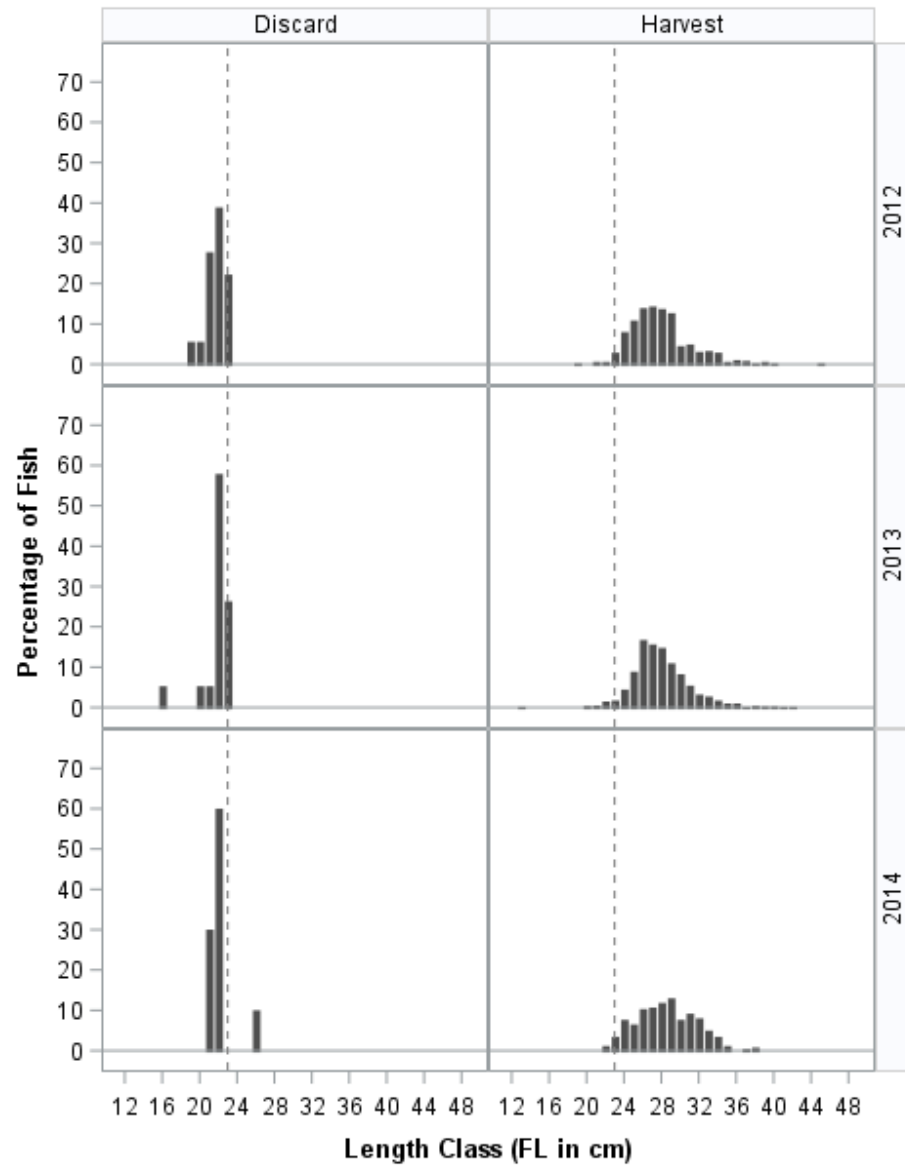


Figure 1. Weighted length frequencies of harvested and released vermilion snapper measured by at-sea observers on headboats in northwest and southwest Florida from 2005-2017. Harvest includes fish that were released dead. Reference line represents the fork length associated with a 10-inch fish (TL).

Vermilion Snapper Length Frequency - Charterboats



Vermilion Snapper Length Frequency - Charterboats



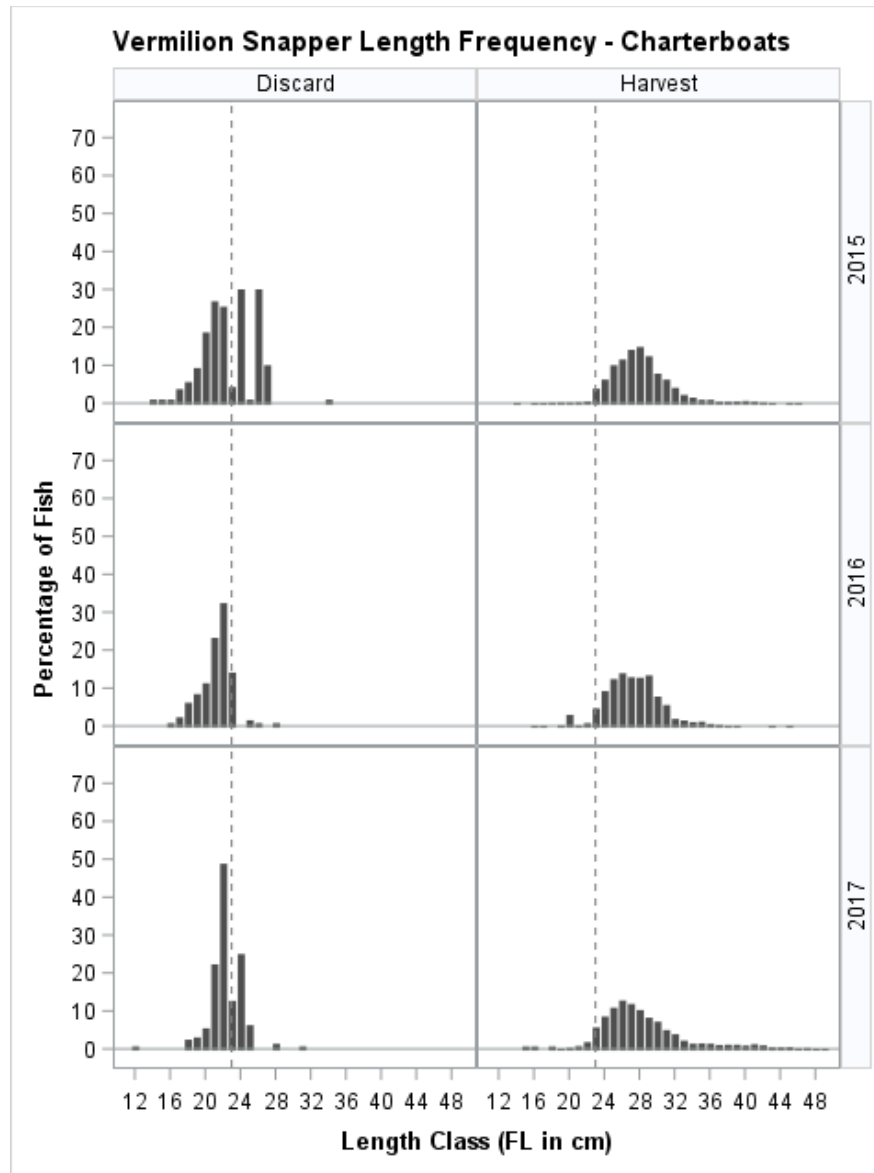


Figure 2. Length frequency of harvested and released vermilion snapper measured by at-sea observers on charterboats in Florida 2009-2017. Harvest includes fish that were released dead. Reference line represents the fork length associated with a 10-inch fish.