SEDAR 50 Discard Mortality Ad-Hoc Group Working Paper

Discard Mortality Ad-hoc Group

SEDAR50-DW22

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Discard Mortality Ad-Hoc Group Working Paper for SEDAR 50 – SA Blueline Tilefish – SEDAR50DW22

1. **Commercial Fisheries**

The dataset used in the analysis is fishery dependent catch information collected by the National Marine Fisheries Service (NMFS) Galveston Lab Reef Fish Observer Program (RFOP) on board commercial vessels from July 2006 through December 2015 using standardized data protocols (NMFS 2016). For the Gulf reef fish fishery mandatory program, vessels were randomly selected quarterly each year to carry an observer. Sampling effort was stratified by season and gear in the eastern and western Gulf based on annually updated vessel logbook data (Scott-Denton et al. 2011). Beginning in February 2009, increased observer coverage levels were directed at the bottom longline fishery in the eastern Gulf due to concerns regarding sea turtle interactions. Additionally, in 2011, increased funding allowed enhanced coverage of both the vertical line and bottom longline fisheries through 2014. Because of these actions, observer coverage levels did not remain consistent throughout the years (< 1 to ~5%), but varied depending on funding levels. Despite these variations in coverage levels, catch data were collected from vessels using multiple gear types across broad spatial and temporal scales.

Similar to other studies, the NMFS RFOP fishery observer program currently determines immediate discard mortality through surface observations of individual fish after discard (Patterson et al. 2002; Stephen and Harris 2010). Short-term survival was assumed if the fish rapidly or slowly was able to descend and immediate mortality was classified when the fish floated on the surface or floated on the surface then slowly descended (not swimming). Although submergence ability as a proxy for mortality is problematic since it does not account for any long-term effects, similar studies have shown that when other factors, such as hook trauma or barotrauma, are included it can be used as a reasonably accurate method for inferring mortality rates (Patterson et al. 2002; Rudershausen et al. 2014). Fishery observers on reef fish vessels assigned one of the following dispositions to each fish captured by the vessel: kept, used for bait, discarded alive, discarded dead, discarded unknown if dead or alive, and unknown if kept or discarded. For the discarded fish, the alive or dead determination was based on surface observation of individual fish. If the fish rapidly or slowly descended, even with barotraumatic stress indicators, it was recorded as alive. It was considered dead if it floated on the surface or floated on the surface then slowly descended (not swimming). Some fish were recorded with an unknown discarded disposition due to the difficulty in observing discards attributed to poor lighting, high seas, or other factors. In this study, only individual fish that were discarded as either alive or dead were used to examine immediate mortality. Individual fish recorded as dead upon arrival were included in the analyses since the goal was to examine total discard mortality.

Onboard reef fish vessels, observers assign a condition of capture for each individual fish based on external indicators of barotrauma. Research has shown that external indicators of barotraumatic stress will likely have an implication for the survival of the discarded fish (Rudershausen et al. 2007; Rudershausen et al. 2014; Sauls 2014). The condition categories were assigned as follows: normal appearance, everted stomach (protrusion from the buccal cavity), exopthalmia (eyes bulging out of the socket), both everted stomach and exopthalmia, dead on arrival, damaged by predators, and unknown. These condition categories attempt to quantify the level of barotraumatic stress on the fish based on expansion of the swim bladder. The expansion of the swim bladder can force the stomach and/or eyes out of the body cavity. Observers also recorded if the fish was vented (air bladder punctured) prior to release by the vessel; however, no distinction on the quality of the observed technique was recorded. Bottom depths were recorded in feet using fishing vessel equipment, i.e. typically depth sounders, and for vertical line vessels a fishing depth was estimated by monitoring gear deployment at each fishing site. All depths were converted to meters for the analyses.

There were 5,226 blueline tilefish with a discard disposition of either alive or dead recorded by the RFOP from 78 trips (Table 1.1). The observed immediate discard mortality rate based on the surface estimates was 80.3% for gear types combined. Blueline tilefish with a dead disposition category recorded were on average captured at a deeper depth, exhibited a higher percentage of barotraumatic stress indicators, and had a smaller percentage of fish vented compared to fish recorded as released alive. The majority of captures (97.8%) were from vessels using bottom longline fishing gear (Table 1.2). Blueline tilefish captured by vessel using vertical line gear were captured at shallower depths and had a smaller percentage of barotraumatic stress indicators than fish captured with bottom longline gear. For each condition category indicating barotraumatic stress, a greater number of blueline tilefish recorded were recorded as dead than alive (Table 1.3). The depth distributions revealed some overlap between discard dispositions, but generally, more blueline tilefish were released alive at shallower depths than fish released dead (Figure 1.1). Similarly, the depth distributions overlapped between gear types, but blueline tilefish captured with vertical line gear were captured at shallower depths; however, each gear type had a similar trend with a higher proportion if fish released alive at the shallower depth bins (Figure 1.2).

Based on observer data from the Gulf of Mexico for the commercial fishery, a discard mortality estimate of 80% would assume that all blueline tilefish that fail to successful resubmerge are dead and fish that resubmerge have 100% survival. However, the estimate is not probable since some fish that fail to resubmerge may survive and not 100% of all fish that resubmerge survive (Rudershausen et al. 2014; Sauls 2014). In addition, no studies of comparable species could be found at these depths and very limited information was available for the minimum blueline tilefish released depths observed. A meta-analysis of red snapper survival by Campbell et al. (2014) predicted at least 40% mortality at 100 m, depending on other covariates, and an overall predicted mortality of approximately 80% for the commercial sector at 100 m. A study by Wilson and Burns (1996) of red, gag, and scamp groupers captured between 44 and 75 m determined fish captured at the deeper depths (75 m) had very low survival, in some cases none survived. Rudershausen et al. (2007) determined a wide range of delayed mortality estimates from approximately 30 to 90% depending on the species and depth of capture. Based on the capture information at these depths, the most optimistic estimate would be a post-release survival of 50% for blueline tilefish that did resubmerge (released alive). The most optimistic estimate is based on the limited literature available and that ~50% of blueline tilefish released alive did not have external signs of barotrauma, thus presumably lower delayed mortality rates. Assuming no fish that failed to resubmerge survived, the combined immediate discard mortality estimate would be 90%. Since the mean depth of capture for blueline tilefish released alive (190.4 m) was significantly greater than the depths of other studies of reef fish mortality; it is likely that a much lower percentage of fish that resubmerge survive and overall mortality may be closer to 100%.

In conclusion, it should be noted that these estimates were done for blueline tilefish captured in the commercial Gulf of Mexico fishery and may differ from the South Atlantic due to differences in gears used, depth of capture, water temperatures, or differences in other variables not specified that could affect discard mortality. The reliability of this analysis is dependent upon the accuracy of the underlying data and input assumptions. This analysis assumes that the commercial discard of blueline tilefish in the Gulf of Mexico while carrying a fishery observer from 2006-2015 reflects the fishery during that period.

Table 1.1. The total number of blueline tilefish captures with an alive or dead disposition with the mean depth of capture (S.D.), range of depths captured, percent exhibiting signs of external barotrauma, and percent vented prior to release recorded by the RFOP from July 2006 through December 2015.

Disposition Category	Number Observed	Mean Depth (m)	Depth Range (m)	External Barotrauma	Vented
Alive	1,029	190.4 (38.7)	76.2–278.0	53.5%	82%
Dead	4,197	213.0 (33.5)	86.9–352.7	70.6%	61.9%
Combined	5,226	208.5 (35.8)	76.2–352.7	66.9%	65.9%

Table 1.2. The number of blueline tilefish captures by gear type with an alive or dead disposition with the mean depth of capture (S.D.), range of depth captured, percent exhibiting signs of external barotrauma, and percent vented prior to release recorded by the RFOP from July 2006 through December 2015.

Gear Type	Number Observed	Alive	Dead	Mean Depth (m)	Depth Range (m)	External Barotrauma	Vented
Vertical Line	114	52	62	134.0 (39.9)	76.2–235.6	41.2%	29.8%
Bottom Longline	5,112	977	4,135	210.2 (34.1)	104.5–352.7	67.4%	66.7%

Table 1.3. The number blueline tilefish captures for each condition category by disposition recorded by the RFOP from July 2006 through December 2015.

Condition Category	Alive	Dead	Combined
Normal	477	1,113	1,590
Stomach Eversion (SE)	531	1,679	2,210
Exopthalmia	5	344	349
Both SE and Exopthalmia	12	649	661
Dead on Arrival	0	395	395
Unknown	4	17	21

Figure 1.1. Histogram of the density observed in each 25 m depth bin for alive or dead disposition recorded by the RFOP from July 2006 through December 2015. The density of each disposition was scaled to equal one.

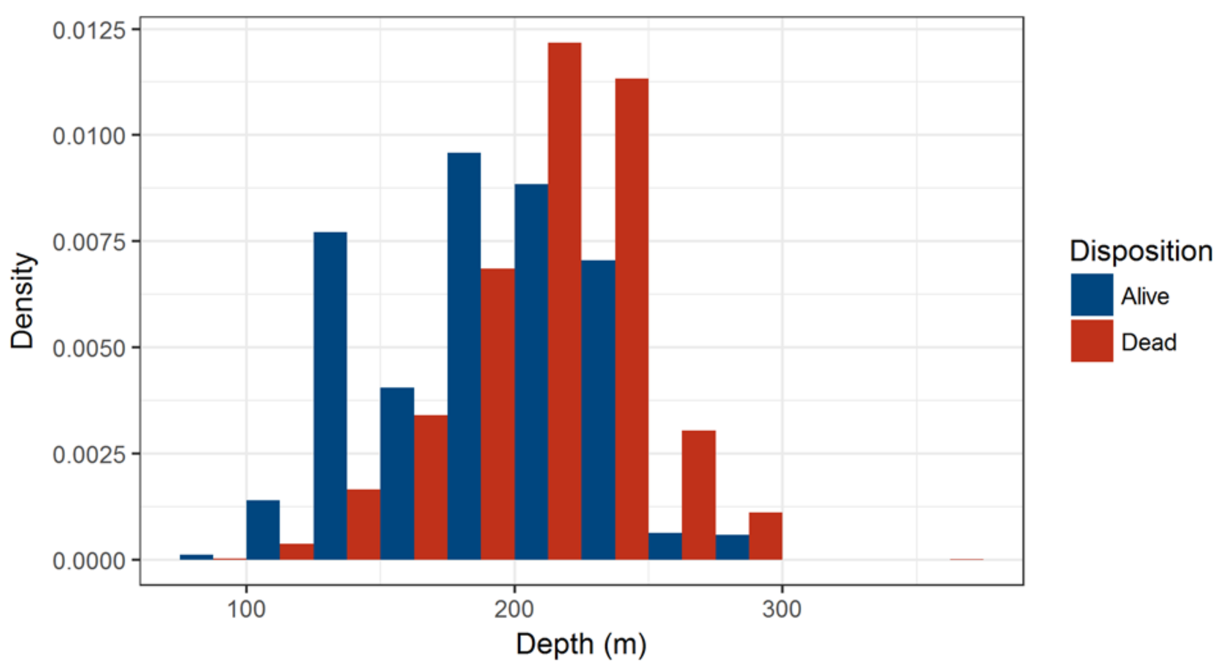
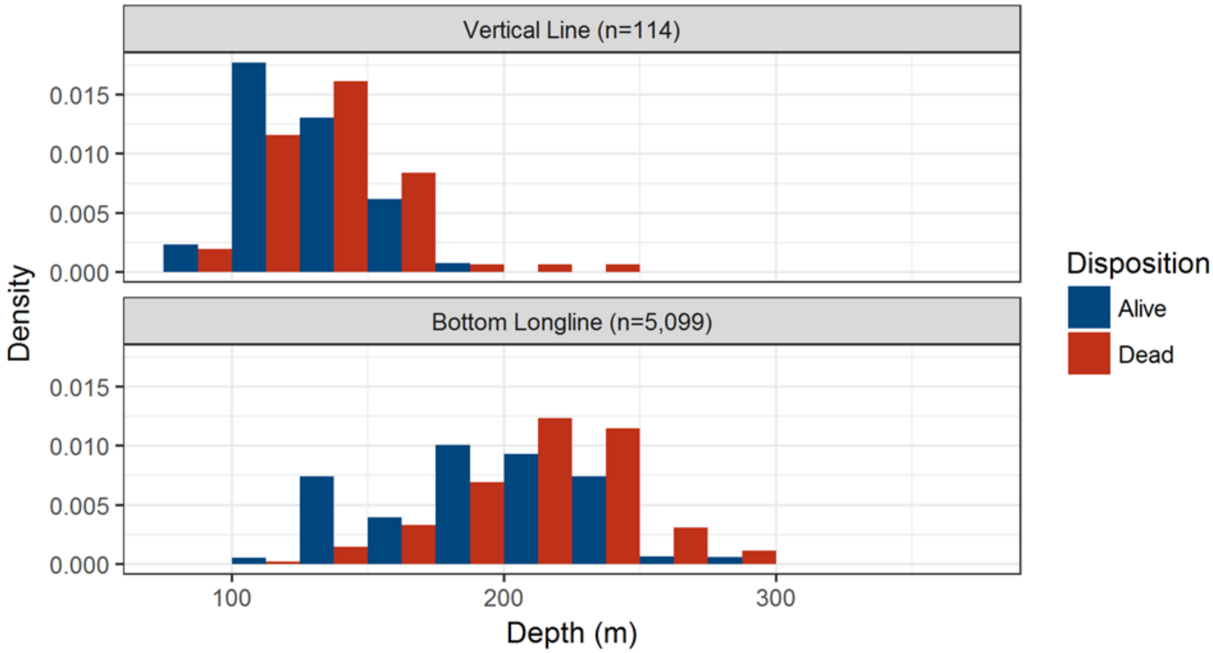


Figure 1.2. Histogram of the density observed in each 25 m depth bin by gear type for alive or dead disposition recorded by the RFOP from July 2006 through December 2015. The density of each disposition was scaled to equal one for each gear type.



2. Recreational Fisheries

Information on discards from the recreational hook-and-line fishery is limited to a small number of fish sampled during observer coverage in the for-hire headboat and charter fisheries. Since 2005, fishery observers have conducted ride-along surveys on large capacity headboats from Maine through Florida and along Florida's Gulf coast (Table 2.1). Since 2004, an average of 642 headboat trips have been sampled each year from Maine through Georgia. During each year that observer coverage for headboats was funded in Florida, 120 trips were sampled on the Atlantic coast, 20 to 50 trips were sampled in the Keys, and an average of 115 trips were sampled on the Gulf coast. Multi-day headboat trips sampled on the Gulf coast of Florida take place farther offshore (80 miles and greater) and represent <5% of total effort by headboats in that region. Florida has also employed fishery observers on charter boats intermittently on the Gulf coast since 2009 (72-152 trips per year), and 671 charter trips were sampled during a recent three-year study (2013-2015) along the Atlantic coast and Keys (Table 2.1). For a detailed description of methods and sample coverage, see Sauls et al. (2014, 2015).

Table 2.1. Fishery observer coverage for single-day headboat trips (H), multi-day headboat trips (M), and single-day charter trips (C). Regions in Florida include: EFL=eastern Atlantic coast, Keys= Gulf and Atlantic coasts of Florida Keys, WFL=western Gulf coast.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ME - MD	H	H	H	H	H	H	H	H	H	H	H	H
VA	H	H	H	H	H	H	H	H	H	H	H	H
NC	H	H	H	H	H	H	H	H	H	H	H	H
SC	H	H	H	H	H	H	H	H	H	H	H	H
GA	H	H	H	H	H	H	H	H	H	H	H	H
EFL		H	H	H	H	H	H	H	H	HC	HC	HC
Keys		H	H	H			HC	HC	HC	C	C	C
WFL		HM	HM	HM		HMC	HMC	HMC	HMC	HMC	H	HMC

Blueline tilefish are rarely observed north of Florida. Since headboat coverage began from Maine through Georgia, only 11 blueline tilefish have been observed and all were harvested off New Jersey (C. Wilson, NC DENR, personal communication). Capture depth was not recorded in headboat observer surveys north of Florida.

On the Atlantic coast of Florida, blueline tilefish have only been observed in the southeast portion of the state. A total of 34 harvested blueline tilefish have been observed from headboat trips between Palm Beach and Dade counties. In addition, 34 harvested fish were observed from charter trips during a three year study on the Atlantic coast of Florida, and all were from trips that took place between Palm Beach and Monroe counties (Florida Keys). All 68 fish observed were from trips that were directly targeting tilefish. Capture depths for blueline tilefish observed on the Atlantic coast of Florida ranged between 64 meters and 162 meters (Table 2.2).

On the Gulf coast of Florida, only two blueline tilefish have been observed during multi-day headboat trips from the Gulf coast, and both trips were primarily targeting grouper and snapper species more than 80 miles offshore. Both fish were caught in less than 70 meters (Table 2.2), one was harvested, and the other was observed to be in good condition upon release (able to submerge). Blueline tilefish were never observed during single-day headboat or charter trips on the Gulf coast of Florida.

Based on this limited information available from the recreational fishery, it may be inferred that charter and headboat trips that target tilefish on the southeast Atlantic coast of Florida take place in shallower depths compared to the commercial longline or vertical line fishery (discussed in section 1 above), and trips that target other species are not likely to encounter blueline tilefish. On the Gulf coast of Florida, blueline tilefish are only encountered during multi-day trips that occur farther offshore (which are relatively rare trip types), and are not likely to be encountered during single-day recreational trips that occur in shallower depths.

Table 2.2. Numbers of trips in Florida where blueline tilefish (BLT) were observed, numbers of fish observed, mean length, and mean capture depth.

Florida Region	Number of trips with BLT	Number of BLT observed	Mean fork length in mm (min, max)	Mean depth in meters (min, max)
Southeast	5	51	361 (248, 651)	130 (64, 151)
Keys	3	17	499 (366, 626)	163 (160, 162)
Gulf	2	2	499 (364, 634)	64 (63, 65)

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