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APPENDIX 3. CHARACTERIZATION AND MANAGEMENT OF THE NORTH CAROLINA RECREATIONAL STRIPED MULLET FISHERY

ISSUE

Review available data and characterize the North Carolina recreational striped mullet fishery. Recommend potential non-quantifiable management measures in support of sustainable harvest objectives.

ORIGINATION

DMF

BACKGROUND

Striped mullet are not typically targeted by anglers using hook and line though, striped mullet and white mullet are commonly used as bait fish by recreational anglers targeting a wide variety of inshore and offshore species (Nickerson 1984; NCDMF 2020). Juvenile mullet, commonly referred to as finger mullet, caught by cast net are commonly used for bait by recreational anglers and are generally available in the summer and fall with the majority caught in July, August, September, and October (NCDMF 2020). Larger mullet are commonly used as cut bait by anglers fishing from boats, piers, and from the beach and is a popular bait used for targeting red drum.

The [2006 Striped Mullet FMP](#) (NCDMF 2006) characterized the cast net fishery for bait mullet and examined management measures to reduce discarding of bait mullet and prevent recreational cast netters from harvesting large amounts of bait mullet in North Carolina and selling them in other states. The FMP established a possession limit of 200 mullets (white and striped in aggregate) per person per day for recreational purposes. A possession limit in the recreational fishery allows Marine Patrol to distinguish between commercial and recreational fishing operations and enforce accordingly. Marine Fisheries Commission Rule 15A NCAC 03M .0502 was amended to include section (a) “it is unlawful to possess more than 200 mullet per person per day for recreational purposes” and went into effect July 1, 2006. There are no other current measures directly limiting the recreational harvest of striped mullet.

The 2006 stock assessment included estimates of recreational striped mullet harvest and concluded overfishing was not occurring. The 2013 stock assessment and the 2018 stock assessment update did not include estimates of recreational harvest and concluded overfishing was not occurring. In each of these assessments, because overfishing was not occurring there was little concern about the level of recreational harvest and no additional action was taken.

The most recent stock assessment concluded the striped mullet stock was overfished and overfishing is occurring. [Development of recreational harvest estimates are described in the stock assessment report](#) (NCDMF 2022). Briefly, annual estimates of recreational harvest (A, B1, A + B1) and associated PSE values for striped mullet, white mullet, and mullet genus (striped or white mullet that could not be identified to species; National Marine Fisheries Service, Fisheries Statistics Division, personal communication) were obtained from the Marine Recreational Information Program (MRIP). Annual estimates of the average individual weight of harvested striped mullet were also obtained from MRIP. Estimates of live releases were not

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considered for inclusion in the stock assessment because mullet are primarily captured by recreational anglers for use as live bait and releases are assumed to have no associated post-release mortality and the assessment model only considers dead fish.

This paper further characterizes the recreational striped mullet fishery, available data, and data needs. Because estimates of recreational harvest are highly uncertain, management measures resulting in quantifiable harvest reductions cannot be recommended. Non-quantifiable management measures to support sustainable harvest and allow for recreational access to meet fishery needs are discussed.

AUTHORITY

N.C. General Statute

G.S. 113-134 RULES

G.S. 113-182 REGULATION OF FISHING AND FISHERIES

G.S. 113-182.1 FISHERY MANAGEMENT PLANS

G.S. 113-221.1. PROCLAMATIONS; EMERGENCY REVIEW

G.S. 143B-289.52 MARINE FISHERIES COMMISSION-POWERS AND DUTIES

N.C. Rule

15A NCAC 03M .0502 MULLET

15A NCAC 03M .0101 MUTILATED FINFISH

15A NCAC 03H .0103 PROCLAMATIONS, GENERAL

DISCUSSION

Collection of Recreational Data

North Carolina conducts three surveys to collect recreational harvest data. MRIP is the primary survey used to collect data on angler harvest from the ocean 0-3 miles from the coast and inside waters from the Virginia border south to the South Carolina border, excluding the Albemarle Sound. The Recreational Commercial Gear License (RCGL) Survey was conducted from 2002-2008 by NCDMF to collect data from recreational fishermen who are licensed to harvest recreational limits of finfish using commercial gears. The third survey, which began in November 2010, is a monthly mail survey conducted to determine participation and effort of Coastal Recreational Fishing License (CRFL) holders who fish using cast nets and seines.

Marine Recreational Information Program

The MRIP is a national program administered through NOAA Fisheries that uses several surveys to obtain catch and effort data at a regional level. The Access Point Angler Intercept Survey (APAIS) provides the catch rates and species composition from anglers fishing in estuarine or marine waters (not freshwater). Anglers who have completed a fishing trip are intercepted and interviewed to gather catch and demographic data, including fishing mode (charter boat, private/rental boat, beach/bank, and man-made structures), area fished, and wave (each two-month sampling period). The MRIP implemented the Fishing Effort Survey (FES) in 2018, an improved methodology of the prior effort survey (Coastal Household Telephone Survey). The data from the APAIS and FES are combined to provide estimates of

DRAFT – SUBJECT TO CHANGE

the total number of fish caught, released, and harvested. Additionally, information is collected on the weight of the harvest, total number of trips, and the number of people participating in marine recreational fishing. Additional information on MRIP is available through the [NOAA MRIP Webpage](#).

Striped mullet landings reported through MRIP are available at the species level through direct observation; however, releases are not observed and therefore are only available at the genus level, which includes both striped mullet and white mullet. Juvenile striped mullet and white mullet are not easily distinguished by recreational anglers, and harvest levels reported through MRIP at the species level are imprecise for both striped mullet and white mullet. To estimate species-level recreational harvest of striped mullet more accurately, the sum of recreational harvest reported for striped mullet and a proportion (29%) of the recreational harvest reported at the mullet genus level are used. This proportion was derived from a study by the NCDMF, indicating that about 29% of mullet harvested using cast nets are striped mullet. The option to record harvest at the genus level for unobserved harvest of mullet only became available in 2002, therefore, MRIP estimates for recreational striped mullet harvest prior to 2002 are unreliable. Additionally, recreational harvest is estimated by the number of fish harvested rather than in pounds because most mullet reported by anglers are not observed or weighed.

Estimates for recreational harvest of striped mullet peaked in 2002 and 2003 at about six million and four million fish harvested, respectively (Table 1). This increase coincides with an increase in commercial harvest (see base plan Commercial Fishery section) and appears to be the result of increased striped mullet abundance. From 2004 to 2017, recreational harvest fluctuated between roughly 1 million and 1.8 million fish, then dropped to around 500 thousand fish harvested per year until 2021 when harvest increased to about 1.5 million fish (Table 1). The decline in harvest from 2018-2020 was likely the result of decreased striped mullet abundance and management measures that significantly shortend the recreational fishing season for souther flounder (*Paralichthys lethostigma*), a fishery where live finger mullet are a popular bait.

Recreational harvest increases beginning in May/June coinciding with increasing recreational fishing effort and peaks in September/October (Table 2, Figure 1). A cast net study conducted by the NCDMF in 2002 and 2003 found the composition of cast net catches was primarily white mullet but in November, striped mullet comprised 74% of the catch (NCDMF 2006). White mullet also comprised a higher proportion of the catch at ocean or inlet stations compared to estuarine stations which had a higher percentage of striped mullet.

The average length of striped mullet encountered in North Carolina's MRIP survey has ranged from a minimum 7.2 inches (182 mm) in 2009 to a maximum of 13.6 inches (345 mm) in 2005 (Table 3). Because of small sample sizes, average lengths in almost all years of the time series are associated with high degrees of imprecision and are not considered reliable for characterizing recreational mullet harvest. Typically, only the largest mullet are harvested by anglers and available to be sampled by MRIP staff. Most mullet are harvested for use as bait, are released prior to returning to the dock. The cast net survey conducted by NCDMF found striped mullet in cast net samples ranging from 1.9-15.3 inches FL (50-390 mm) with 76% of the fish from 2.8-5.5 inches FL (70-140 mm; NCDMF 2006; Figure 2). White mullet from cast net samples ranged from 1.6-7.4 inches FL (40-190 mm) with 98% of the fish between 2.4-5.9 inches FL (60-50 mm). Sub-adult and adult striped mullet were occasionally caught in the independent samples, but no sub-adult or adult white mullet were captured.

DRAFT – SUBJECT TO CHANGE

Table 1. Recreational harvest (number of fish landed) of striped mullet and mullet genus estimated from MRIP sampling for 2002 to 2021. Type A harvest is observed while Type B1 harvest is reported by the angler and never observed. Proportional standard error (PSE) values greater than 50 indicate an imprecise estimate and are highlighted in gray.

| Year | Striped Mullet | | Mullet Genus | | Striped Mullet from Mullet Genus (29%) | Striped Mullet + Mullet Genus |
|------|----------------|-------|--------------|------|--|-------------------------------|
| | Harvest (A+B1) | PSE | Harvest (B1) | PSE | Harvest (B1) | Striped Mullet Total Harvest |
| 2002 | 4,668,427 | 18 | 4,480,197 | 36.3 | 1,299,257 | 5,967,684 |
| 2003 | 3,368,881 | 29.6 | 2,487,885 | 20.4 | 721,487 | 4,090,368 |
| 2004 | 5,496 | 101.7 | 4,790,382 | 16.1 | 1,389,211 | 1,394,707 |
| 2005 | 10,795 | 61.5 | 4,487,719 | 21.4 | 1,301,439 | 1,312,234 |
| 2006 | 15,706 | 63.5 | 3,599,098 | 21.4 | 1,043,738 | 1,059,444 |
| 2007 | 301,004 | 81.3 | 5,052,995 | 22.3 | 1,465,369 | 1,766,373 |
| 2008 | 3,458 | 65.0 | 4,097,156 | 14.4 | 1,188,175 | 1,191,633 |
| 2009 | 83,480 | 90.6 | 3,736,571 | 14.3 | 1,083,606 | 1,167,086 |
| 2010 | 126,250 | 44.7 | 4,113,171 | 14.3 | 1,192,820 | 1,319,070 |
| 2011 | 80,267 | 28.6 | 3,653,514 | 14.3 | 1,059,519 | 1,139,786 |
| 2012 | 351,960 | 79.5 | 3,510,395 | 16.3 | 1,018,015 | 1,369,975 |
| 2013 | 150,020 | 53.9 | 4,493,166 | 20.5 | 1,303,018 | 1,453,038 |
| 2014 | 50,381 | 67.0 | 4,490,722 | 26.2 | 1,302,309 | 1,352,690 |
| 2015 | 142,696 | 64.5 | 4,405,800 | 21.5 | 1,277,682 | 1,420,378 |
| 2016 | 29,965 | 50.6 | 5,039,891 | 55.6 | 1,461,568 | 1,491,533 |
| 2017 | 37,791 | 43.9 | 5,170,318 | 55.2 | 1,499,392 | 1,537,183 |
| 2018 | 35,565 | 59.3 | 1,564,676 | 31.7 | 453,756 | 489,321 |
| 2019 | 324,986 | 52.0 | 817,596 | 25.3 | 237,103 | 562,089 |
| 2020 | 323,102 | 43.2 | 719,908 | 23.2 | 208,773 | 531,875 |
| 2021 | 1,194,213 | 73.6 | 1,002,195 | 31.6 | 290,637 | 1,484,850 |

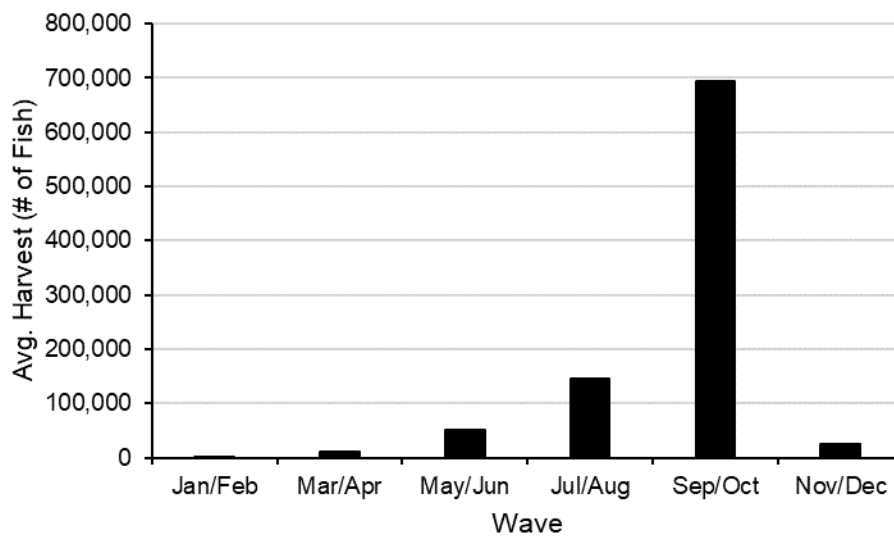


Figure 1. Average number of striped mullet harvested by the recreational fishery by wave based on MRIP estimates for 2017 to 2021.

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Table 2. Recreational harvest (number of fish landed) of striped mullet and mullet genus by wave estimated from MRIP sampling, 2002-2021. Striped mullet assumed as 29% of mullet genus.

| Year | Wave | Striped Mullet | Mullet Genus | Striped Mullet from Mullet Genus (29%) | Striped Mullet + Mullet Genus |
|------|---------|-------------------|--------------|---|----------------------------------|
| | | Harvest (A+B1) | Harvest (B1) | Harvest (B1) | Striped Mullet Total Harvest |
| 2017 | Jan/Feb | . | . | . | . |
| 2017 | Mar/Apr | . | 82,931 | 24,050 | 24,050 |
| 2017 | May/Jun | 27,708 | 284,430 | 82,485 | 110,193 |
| 2017 | Jul/Aug | 8,505 | 354,629 | 102,842 | 111,347 |
| 2017 | Sep/Oct | 1,579 | 4,432,737 | 1,285,494 | 1,287,073 |
| 2017 | Nov/Dec | . | 15,590 | 4,521 | 4,521 |
| 2018 | Jan/Feb | . | . | . | . |
| 2018 | Mar/Apr | . | . | . | . |
| 2018 | May/Jun | 2,239 | 136,595 | 39,613 | 41,852 |
| 2018 | Jul/Aug | 18,993 | 750,891 | 217,758 | 236,751 |
| 2018 | Sep/Oct | 13,505 | 457,709 | 132,736 | 146,241 |
| 2018 | Nov/Dec | 828 | 219,480 | 63,649 | 64,477 |
| 2019 | Jan/Feb | . | . | . | . |
| 2019 | Mar/Apr | . | 32,700 | 9,483 | 9,483 |
| 2019 | May/Jun | 11,773 | 86,637 | 25,125 | 36,898 |
| 2019 | Jul/Aug | 82,801 | 280,921 | 81,467 | 164,268 |
| 2019 | Sep/Oct | 217,317 | 367,020 | 106,436 | 323,753 |
| 2019 | Nov/Dec | 13,096 | 50,318 | 14,592 | 27,688 |
| 2020 | Jan/Feb | 1,648 | 1,540 | 447 | 2,095 |
| 2020 | Mar/Apr | . | 21,050 | 6,105 | 6,105 |
| 2020 | May/Jun | 6,308 | 78,303 | 22,708 | 29,016 |
| 2020 | Jul/Aug | 40,470 | 239,694 | 69,511 | 109,981 |
| 2020 | Sep/Oct | 274,675 | 370,617 | 107,479 | 382,154 |
| 2020 | Nov/Dec | . | 8,704 | 2,524 | 2,524 |
| 2021 | Jan/Feb | . | 6,340 | 1,839 | 1,839 |
| 2021 | Mar/Apr | 7,087 | . | . | 7,087 |
| 2021 | May/Jun | 1,336 | 144,319 | 41,853 | 43,189 |
| 2021 | Jul/Aug | 21,670 | 292,846 | 84,925 | 106,595 |
| 2021 | Sep/Oct | 1,164,119 | 558,690 | 162,020 | 1,326,139 |
| 2021 | Nov/Dec | . | . | . | . |

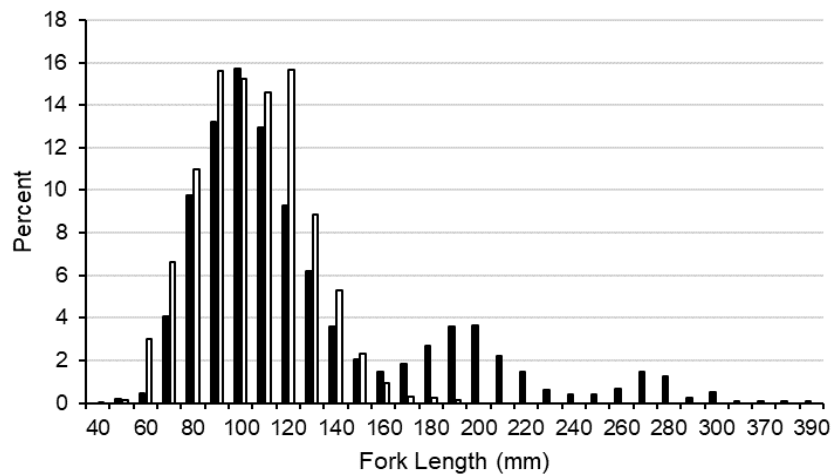


Figure 2. Length-frequency distributions of striped mullet (black bars) and white mullet (white bars) collected in the NCDMF fisheries-independent cast net study, 2002-2003.

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Table 3. Average length and weight of individual striped mullet intercepted by APAIS interviewers in North Carolina, 2002–2021. Proportional standard error (PSE) values greater than 50 indicate an imprecise estimate and are highlighted in gray.

| Year | Avg Length (in) | PSE | Avg Weight (lb) | PSE |
|------|-----------------|-------|-----------------|-------|
| 2002 | 8.2 | 26 | 0.4 | 30.2 |
| 2003 | 9.2 | 44.9 | 0.4 | 48.8 |
| 2004 | 10.0 | 143.8 | 0.4 | 143.8 |
| 2005 | 13.6 | 87.2 | 1.3 | 88.1 |
| 2006 | 11.9 | 86.4 | 0.9 | 83.1 |
| 2007 | 10.6 | 113.5 | 0.7 | 110.4 |
| 2008 | 10.8 | 90.9 | 0.7 | 90.6 |
| 2009 | 7.2 | 122.9 | 0.2 | 110.1 |
| 2010 | 10.4 | 63.7 | 0.9 | 73.2 |
| 2011 | 10.7 | 41.4 | 0.7 | 48 |
| 2012 | 10.5 | 112.5 | 0.7 | 112.8 |
| 2013 | 10.8 | 74.9 | 0.9 | 76.8 |
| 2014 | 12.9 | 96.4 | 1.1 | 97 |
| 2015 | 12.4 | 91.7 | 1.3 | 94.9 |
| 2016 | 11.9 | 71.7 | 0.9 | 72.3 |
| 2017 | 10.8 | 62.3 | 0.7 | 61.8 |
| 2018 | 10.9 | 83.3 | 0.7 | 82 |
| 2019 | 12.5 | 73.9 | 1.1 | 77 |
| 2020 | 13.4 | 63.1 | 1.5 | 67.8 |
| 2021 | 7.8 | 100.6 | 0.2 | 92.1 |

Recreational Commercial Gear Landings

Harvest data from the Recreational Commercial Gear License (RCGL) survey were collected from 2002 to 2008. The program was discontinued in 2009 due to a lack of funding and the minimal contributions from RCGL to overall harvest. From 2002 to 2008, it is estimated that RCGL holders harvested an average of 41,512 pounds per year (Table 4). Estimated landings of striped mullet by RCGL holders peaked in 2002 and 2008, the first and final years of the survey. See [Amendment 2 to the Striped Mullet Fishery Management Plan](#) for detailed summary of RCGL landings and effort (NCDMF 2015). Since the discontinuation of the RCGL survey in 2008, the number of RCGL issued each year has declined. In 2008, 5,503 RCGL were issued and in 2021, 2,143 RCGL were issued ([NCDMF 2022a](#)) so it is unlikely harvest from this license type has increased substantially, particularly as additional restrictions have been placed on the use of gill nets.

Table 4. North Carolina RCGL number of striped mullet harvested, pounds harvested, number released, and total number caught. Estimates are from a RCGL survey conducted from 2002–2008.

| Year | Number Harvested | Pounds Harvested | Number Released | Total Number |
|------|------------------|------------------|-----------------|--------------|
| 2002 | 66,305 | 64,213 | 6,549 | 72,854 |
| 2003 | 28,757 | 24,774 | 3,514 | 32,270 |
| 2004 | 34,736 | 35,947 | 2,875 | 37,611 |
| 2005 | 35,888 | 36,314 | 3,492 | 39,380 |
| 2006 | 38,175 | 37,385 | 5,352 | 43,527 |
| 2007 | 35,472 | 40,168 | 7,449 | 42,921 |
| 2008 | 51,465 | 51,785 | 9,207 | 60,672 |

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Coastal Recreational Fishing License Survey

In October 2011, NCDMF began a [mail survey](#) to develop catch and effort estimates for recreational cast net and seine use. The mail survey was established as a direct response to a lack of precision in MRIP estimates for difficult to sample or overlooked recreational fisheries and activities. The survey does not distinguish between striped and white mullet and all data should be interpreted with caution because the ratio of striped mullet to white mullet in the recreational catch differs between seasons and areas of the state. Estimates from the NCDMF CRFL mail survey vary by month but generally peak between July and October, consistent with MRIP harvest estimates. The mail survey is a good source of recreational mullet effort, catch, and harvest information because of the relatively high precision of estimates.

Between 2012 and 2021, estimated annual harvest by cast nets of striped and white mullet from the mail survey ranged from 347,187 fish in 2018 to 942,521 fish in 2015 and the estimated number of trips that harvested mullet ranged from 88,939 trips in 2018 to 206,876 trips in 2015 (Table 5).

Table 5. Total mullet (striped and white) harvest, releases, catch and effort from the Coastal Recreational Fishing License Survey by wave, 2012-2021. Proportional standard error (PSE) values greater than 50 indicate an imprecise estimate and are highlighted in gray.

| Year | Wave | Total Effort | PSE for Effort | Total Mullet Harvest | PSE Harvest | Total Mullet Release | PSE for Release | Total Mullet Catch | PSE for Total Catch |
|------|---------|--------------|----------------|----------------------|-------------|----------------------|-----------------|--------------------|---------------------|
| 2021 | Jan/Feb | 10,518 | 27.9 | 15,365 | 61.1 | 4,615 | 56.7 | 19,980 | 57.7 |
| | Mar/Apr | 50,726 | 29.9 | 52,766 | 42.7 | 14,592 | 46.4 | 67,358 | 42.0 |
| | May/Jun | 45,681 | 11.8 | 133,646 | 26.9 | 34,978 | 50.6 | 168,624 | 26.9 |
| | Jul/Aug | 41,346 | 15.3 | 254,681 | 22.8 | 69,914 | 24.5 | 324,594 | 20.7 |
| | Sep/Oct | 65,736 | 11.4 | 582,176 | 24.5 | 169,786 | 25.5 | 751,961 | 21.1 |
| | Nov/Dec | 36,335 | 14.6 | 183,488 | 27.2 | 57,966 | 29.4 | 241,453 | 26.9 |
| | Total | 250,379 | 9.3 | 1,222,120 | 14.2 | 351,850 | 15.9 | 1,573,970 | 12.8 |
| 2020 | Jan/Feb | 11,690 | 23.9 | 8,878 | 37.9 | 1,077 | 53.3 | 9,955 | 36.8 |
| | Mar/Apr | 11,799 | 17.5 | 25,426 | 29.9 | 4,549 | 47.5 | 29,975 | 29.7 |
| | May/Jun | 24,586 | 16.9 | 51,327 | 21.1 | 19,058 | 31.5 | 70,385 | 20.6 |
| | Jul/Aug | 64,789 | 14.8 | 152,144 | 21.3 | 78,864 | 25.8 | 231,008 | 19.8 |
| | Sep/Oct | 34,501 | 13.0 | 254,362 | 18.0 | 56,512 | 18.5 | 310,874 | 16.8 |
| | Nov/Dec | 26,203 | 14.9 | 136,348 | 19.6 | 46,406 | 22.1 | 182,754 | 18.7 |
| | Total | 173,568 | 7.6 | 628,485 | 10.5 | 206,466 | 13.0 | 834,951 | 9.9 |
| 2019 | Jan/Feb | 12,139 | 18.4 | 27,088 | 35.1 | 7,351 | 33.7 | 34,439 | 32.7 |
| | Mar/Apr | 9,674 | 21.4 | 11,023 | 37.4 | 3,517 | 47.8 | 14,540 | 34.7 |
| | May/Jun | 44,262 | 14.5 | 143,824 | 21.9 | 35,856 | 25.0 | 179,680 | 20.9 |
| | Jul/Aug | 39,904 | 14.5 | 210,967 | 20.3 | 122,890 | 33.6 | 333,857 | 20.8 |
| | Sep/Oct | 40,143 | 13.3 | 219,358 | 14.8 | 124,146 | 22.7 | 343,504 | 15.3 |
| | Nov/Dec | 16,819 | 20.1 | 76,555 | 30.7 | 27,125 | 33.3 | 103,680 | 30.0 |
| | Total | 162,941 | 7.1 | 688,815 | 10.0 | 320,885 | 16.5 | 1,009,700 | 10.2 |
| 2018 | Jan/Feb | 4,121 | 30.4 | 3,935 | 65.2 | 450 | 70.5 | 4,385 | 62.1 |
| | Mar/Apr | 8,950 | 20.8 | 16,051 | 41.4 | 4,560 | 43.2 | 20,611 | 39.5 |
| | May/Jun | 32,021 | 14.3 | 58,694 | 25.2 | 12,577 | 29.5 | 71,271 | 24.8 |
| | Jul/Aug | 11,125 | 20.3 | 43,317 | 24.2 | 13,418 | 33.4 | 56,735 | 24.5 |
| | Sep/Oct | 11,832 | 71.1 | 139,578 | 72.5 | 56,912 | 85.8 | 196,490 | 76.1 |
| | Nov/Dec | 20,890 | 16.3 | 85,612 | 18.4 | 20,987 | 23.6 | 106,599 | 18.4 |
| | Total | 88,939 | 12.1 | 347,187 | 30.1 | 108,904 | 45.4 | 456,091 | 33.5 |
| 2017 | Jan/Feb | 6,178 | 25.3 | 7,047 | 55.9 | 994 | 70.9 | 8,042 | 56.7 |
| | Mar/Apr | 16,513 | 15.9 | 36,630 | 25.7 | 13,572 | 30.5 | 50,202 | 26.3 |
| | May/Jun | 37,371 | 13.2 | 175,562 | 20.3 | 56,093 | 21.8 | 231,656 | 19.4 |
| | Jul/Aug | 54,353 | 13.8 | 218,395 | 15.6 | 89,636 | 19.3 | 308,031 | 15.0 |

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| Year | Wave | Total Effort | PSE for Effort | Total Mullet Harvest | PSE Harvest | Total Mullet Release | PSE for Release | Total Mullet Catch | PSE for Total Catch |
|------|---------|--------------|----------------|----------------------|-------------|----------------------|-----------------|--------------------|---------------------|
| | Sep/Oct | 41,186 | 13.8 | 195,901 | 15.9 | 54,855 | 24.7 | 250,756 | 16.1 |
| | Nov/Dec | 27,259 | 14.4 | 89,393 | 18.6 | 24,847 | 28.1 | 114,240 | 18.9 |
| | Total | 182,861 | 6.7 | 722,929 | 8.8 | 239,998 | 11.3 | 962,927 | 8.7 |
| 2016 | Jan/Feb | 11,910 | 27.1 | 6,927 | 51.1 | 3,283 | 73.2 | 10,210 | 55.4 |
| | Mar/Apr | 13,803 | 20.5 | 17,333 | 44.5 | 1,238 | 63.5 | 18,571 | 42.0 |
| | May/Jun | 39,127 | 13.7 | 141,203 | 25.2 | 47,699 | 29.9 | 188,903 | 23.6 |
| | Jul/Aug | 51,085 | 11.8 | 306,614 | 18.3 | 109,938 | 22.3 | 416,552 | 17.7 |
| | Sep/Oct | 41,325 | 12.1 | 173,517 | 18.6 | 26,096 | 21.3 | 199,613 | 17.2 |
| | Nov/Dec | 34,673 | 16.3 | 102,800 | 26.5 | 31,637 | 33.1 | 134,437 | 27.0 |
| | Total | 191,922 | 6.4 | 748,394 | 10.9 | 219,892 | 14.3 | 968,286 | 10.7 |
| 2015 | Jan/Feb | 6,730 | 25.4 | 19,540 | 38.2 | 3,060 | 52.0 | 22,600 | 37.0 |
| | Mar/Apr | 13,981 | 18.5 | 25,446 | 28.2 | 5,880 | 33.6 | 31,326 | 27.9 |
| | May/Jun | 50,315 | 12.1 | 147,726 | 17.8 | 50,052 | 25.7 | 197,778 | 16.9 |
| | Jul/Aug | 71,656 | 10.7 | 400,123 | 13.9 | 156,696 | 19.1 | 556,819 | 14.1 |
| | Sep/Oct | 40,078 | 10.6 | 232,037 | 15.4 | 43,801 | 19.1 | 275,837 | 15.1 |
| | Nov/Dec | 24,116 | 17.8 | 117,650 | 21.6 | 36,550 | 26.2 | 154,200 | 21.9 |
| | Total | 206,876 | 6.0 | 942,521 | 8.4 | 296,039 | 12.2 | 1,238,561 | 8.5 |
| 2014 | Jan/Feb | 5,206 | 25.0 | 12,023 | 46.3 | 1076 | 57.9 | 13,099 | 44.3 |
| | Mar/Apr | 16,131 | 19.0 | 13,949 | 45.0 | 1,859 | 60.3 | 15,807 | 43.0 |
| | May/Jun | 35,945 | 13.5 | 110,839 | 20.8 | 28,262 | 22.4 | 139,101 | 19.5 |
| | Jul/Aug | 52,883 | 13.7 | 208,730 | 18.1 | 63,626 | 19.8 | 272,356 | 16.8 |
| | Sep/Oct | 63,224 | 12.7 | 362,912 | 14.6 | 136,337 | 16.4 | 499,250 | 13.5 |
| | Nov/Dec | 23,867 | 14.5 | 74,605 | 19.7 | 20,344 | 26.7 | 94,949 | 19.2 |
| | Total | 197,257 | 6.8 | 783,058 | 9.4 | 251,504 | 11.1 | 1,034,561 | 8.9 |
| 2013 | Jan/Feb | 13,053 | 18.3 | 57,047 | 30.0 | 7,862 | 36.4 | 64,909 | 29.7 |
| | Mar/Apr | 9,079 | 23.4 | 20,839 | 41.4 | 4,021 | 49.4 | 24,860 | 41.4 |
| | May/Jun | 24,541 | 11.8 | 65,072 | 24.4 | 21,957 | 30.5 | 87,030 | 24.8 |
| | Jul/Aug | 41,197 | 11.3 | 324,616 | 16.2 | 121,012 | 21.7 | 445,628 | 15.9 |
| | Sep/Oct | 25,872 | 16.3 | 159,790 | 20.9 | 39,065 | 26.1 | 198,855 | 19.8 |
| | Nov/Dec | 25,544 | 15.3 | 83,943 | 21.1 | 35,592 | 31.0 | 119,534 | 21.5 |
| | Total | 139,286 | 6.3 | 711,307 | 10.1 | 229,509 | 13.9 | 940,816 | 9.9 |
| 2012 | Jan/Feb | 10,484 | 22.1 | 23,346 | 32.8 | 9,050 | 42.3 | 32,395 | 32.4 |
| | Mar/Apr | 9,734 | 19.8 | 17,055 | 32.0 | 3,931 | 57.2 | 20,986 | 31.8 |
| | May/Jun | 20,903 | 12.5 | 84,180 | 25.7 | 26,845 | 32.9 | 111,025 | 23.9 |
| | Jul/Aug | 32,810 | 13.3 | 181,667 | 19.6 | 76,701 | 26.0 | 258,368 | 18.3 |
| | Sep/Oct | 30,377 | 11.2 | 292,859 | 13.0 | 72,004 | 16.1 | 364,862 | 12.6 |
| | Nov/Dec | 21,315 | 15.8 | 94,155 | 21.1 | 31,676 | 26.7 | 125,831 | 20.7 |
| | Total | 125,623 | 6.2 | 693,262 | 8.9 | 220,205 | 12.2 | 913,467 | 8.6 |

Additional sampling effort should focus on better characterizing the recreational fishery for striped mullet by contextualizing data collected by the CRFL Mail Survey through fishery-independent sampling. Characterization of cast net fishery catch composition was completed by NCDMF in 2022-2003. While this data has been important for understanding the recreational fishery, particularly the proportion of striped mullet in the cast harvest, updating the study in the context of the current recreational fishery, should be completed. Further sampling should be stratified based on effort, timing and locations reported in the CRFL Mail Survey and, in addition to collecting species composition information, should focus on collecting length and age data.

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Non-Quantifiable Management Options

Because of uncertainty in recreational harvest estimates, it is not possible to calculate harvest reductions from any specific management measure. Assumptions about species composition and imprecision of harvest estimates at the wave (two month) level prevent quantifying harvest reductions from season closures and bag limits. Lack of length composition information prevent calculation of harvest reductions from size limits. However, stock assessment sensitivity runs using alternative proportions of striped mullet in recreational landings had very little effect on model outputs and stock status (NCDMF 2022b). Regardless of recreational fishery magnitude or importance, implementing management on the commercial fishery without limiting recreational harvest could shift effort and have the potential to complicate enforcement. For example, the commercial striped mullet fishery supplies significant amounts of live and dead mullet to bait shops, which are purchased by recreational anglers for use as bait. If limits are put on commercial harvest, recreational anglers could increase directed effort for mullet to continue meeting the need for bait.

Whether recreational harvest reductions are quantifiable or not, sustainability objectives should be consistent between commercial and recreational fisheries management. Management options can be developed for the recreational fishery allowing for traditional resource use while supporting sustainability objectives.

If management measures like size limits, season closures or day of week closures are adopted for the commercial fishery the same measures could be applied equally to the recreational fishery. However, given differing resource uses, and fishery characteristics between the commercial and recreational fisheries it is likely unnecessary to manage the sectors jointly. Using available data for guidance, specific management measures for the recreational fishery should be considered allowing for traditional use while supporting sustainability objectives.

Bag and Size Limits

The Striped Mullet FMP (NCDMF 2006) established a possession limit of 200 mullets (white and striped in aggregate) per person in the recreational fishery. The intent of this bag limit was not to limit harvest but rather to prevent excessive recreational harvest of finger mullet to be sold out of state and allow Marine Patrol to distinguish between commercial and recreational fishing operations and enforce accordingly.

The current 200 fish bag limit does little to limit recreational harvest (Table 6). Most recreational fishing trips that harvest mullet harvest less than 25 fish. Reducing the bag limit could further prevent excessive recreational harvest of finger mullet while continuing to meet fishery demands. In addition, a vessel limit could be implemented in addition to an individual bag limit to prevent excessive harvest and waste. Cast net sampling indicates most finger mullet captured in cast nets are white mullet, and sub-adult and adult white mullet are rarely encountered in North Carolina waters. Implementing a reduced bag limit for mullet over a certain size would specifically prevent excessive harvest of striped mullet and could be implemented specifically during the spawning season to reduce harvest on the spawning stock while allowing continued harvest of finger mullet. For example, implementing a bag limit on mullet greater than 8-inches (Figure 2), would still allow harvest of finger mullet, which are primarily white mullet and prevent excessive recreational harvest of larger mullet. A bag limit, somewhere in the range of 10-25 mullet greater than 8-inches would allow continued use of striped mullet as cut bait.

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Table 6. Frequency and percentage of recreational trips harvesting mullet by harvest bin, 2002-2021.

| Number Harvested | Frequency | Percent |
|------------------|-----------|---------|
| 1-25 | 2,644 | 85 |
| 26-50 | 386 | 12 |
| 51-75 | 34 | 1 |
| 56-100 | 19 | 1 |
| 101-150 | 8 | <0.1 |
| 151-200 | 5 | <0.1 |
| 200+ | 7 | <0.1 |
| Total | 3,103 | 100 |

Status Quo

- + No new regulations
- + Allows continuation of fishery that mostly harvests white mullet
- Does not reduce harvest of striped mullet
- No preferential protection for largest fish

Reduce Recreational Bag Limit – 150 fish, 100 fish, 50 fish, 75 fish, 25 fish

- + Provides some reduction in striped mullet harvest
- + Allows continuation of fishery that mostly harvests white mullet
- No preferential protection for largest fish
- Discarding could occur

Reduce Recreational Bag Limit and Implement Vessel Limit – 150 fish, 100 fish, 50 fish, 75 fish, 25 fish

- + Provides some reduction in striped mullet harvest
- + Allows continuation of fishery that mostly harvests white mullet
- No preferential protection for largest fish
- Discarding could occur

Bag Limit (10, 15, 20, 25, etc.) for Fish Over 8-Inches

- + Provides some reduction in striped mullet harvest
- + Allows continuation of fishery that mostly harvests white mullet
- + Directs harvest to finger mullet which may experience high natural mortality
- + Provides preferential protection for largest fish
- + Allow larger mullet to be harvested for personal consumption or cut bait
- Limits use of larger mullet for personal consumption and cut bait
- Discarding could occur

Seasonal (October-December) Bag Limit (10, 15, 20, 25, etc.) for Fish Over 8-Inches

- + Provides some reduction in striped mullet harvest
- + Allows continuation of fishery that mostly harvests white mullet
- + Directs harvest to finger mullet which may experience high natural mortality
- + Provides preferential protection for largest fish
- + Allow larger mullet to be harvested for personal consumption or cut bait
- + Limits harvest during spawning season
- Limits use of larger mullet for personal consumption and cut bait
- Discarding could occur

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Mutilated Finfish Rule

The MFC originally adopted the mutilated finfish rule 15A NCAC 03M .0101 in 1991 with the intent of providing added resource protection for finfish species subject to a size or bag limit. In response to the 200 fish bag limit for mullet, in July 2006, the rule was amended to add mullet as an exception, otherwise the use of mullet as cut bait would not have been allowed. At that time overfishing of the striped mullet stock was not occurring and the 200 fish bag limit was high enough there was little concern about enforceability.

However, the rule did not provide flexibility to manage variable conditions for species commonly used as cut bait, particularly when new regulations implemented to meet sustainability objectives (i.e., size or bag limits) make species subject to this rule. The rule was amended in 2023 to read:

15A NCAC 03M .0101 MUTILATED FINFISH

It shall be unlawful to possess aboard a vessel or while engaged in fishing any species of finfish that is subject to a possession limit, including size limit, recreational bag limit, commercial trip limit, or season, without having head and tail attached, unless otherwise specified in a rule of the Marine Fisheries Commission or a proclamation issued pursuant to a rule of the Marine Fisheries Commission.

The use of mullet as cut bait is not a conservation issue but given the updated stock status for striped mullet and the need to implement conservation measures to rebuild the striped mullet stock, removing the exception is justified to support enforcement of sustainability measures like bag or size limits. The use of mullet as cut bait should continue to allow for traditional use and to meet stakeholder preferences. The revised mutilated finfish rule provides the Fisheries Director proclamation authority to allow for the use of any species, subject to the rule, as cut bait if it is deemed appropriate.

Adaptive Management

See Appendix 2: Achieving Sustainable Harvest in the North Carolina Striped Mullet Fishery. If adaptive management is adopted as part of Amendment 2, the specifications would apply to the commercial and recreational fisheries for mullet. Specifically, any of the following could be adjusted as part of a revision to Amendment 2:

1. Fishing year and/or seasons
2. Catch controls, including bag and trip limits
3. Size limits
4. Effort controls, including fishing days and fishing times
5. Gear limitations, including minimum and maximum gill net mesh size, maximum yardage of gill nets, and specifications for any other gear used to harvest striped mullet
6. Reporting requirements
7. Measures to reduce or monitor bycatch
8. Measures to reduce or monitor user group conflict
9. Area closures
10. Any other management measures currently included in Amendment 2

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PROPOSED RULE(S)

No rule changes are necessary because NCMFC rule 15A NCAC 03M .0502(b) gives the Fisheries Director proclamation authority to impose any of the following restrictions on the taking of mullet:

- (1) specify time;
- (2) specify area;
- (3) specify means and methods;
- (4) specify season;
- (5) specify size; and
- (6) specify quantity, except as provided in Paragraph (a) of this Rule.

However, given current stock status the mullet rule (15A NCAC 03M .0502) will likely be amended in the second round of the periodic review of rules (G.S. 150B-21.3A) in the late 2020s, to remove the recreational bag limit of 200 mullet. Currently, if changes to the bag limit are needed, parts of the current rule need to be suspended. Amending the rule streamlines the process for making necessary management changes that already exist in proclamation authority.

PROPOSED MANAGEMENT OPTIONS

RECOMMENDATION

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June 26, 2023