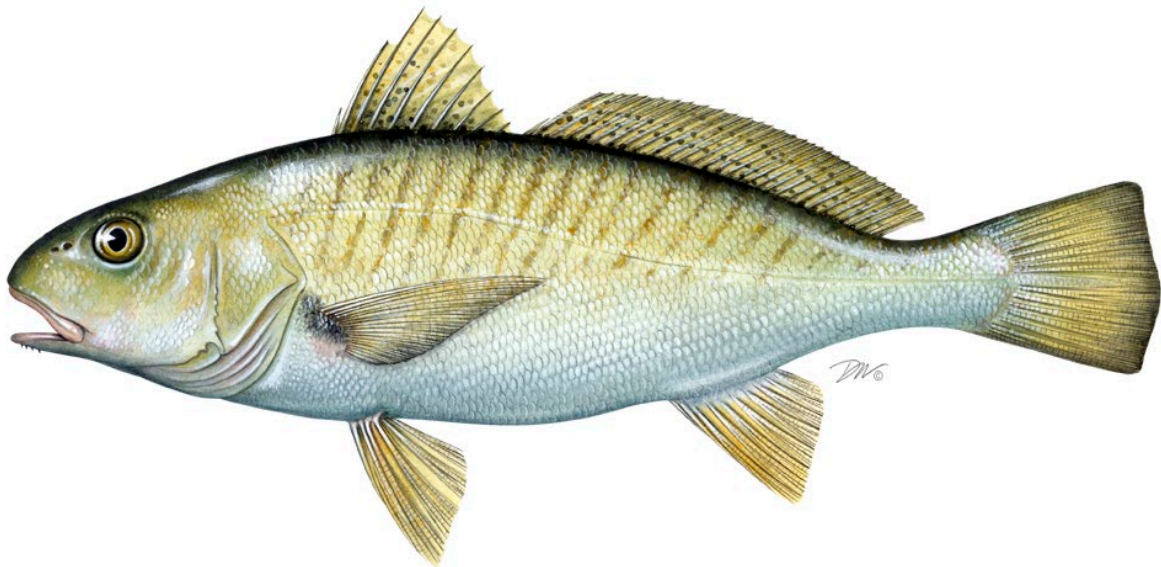


ATLANTIC STATES MARINE FISHERIES COMMISSION
REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR ATLANTIC CROAKER
(Micropogonias undulatus)

2021 FISHING YEAR



Prepared by the Plan Review Team
Approved August 2022



Sustainable and Cooperative Management of Atlantic Coastal Fisheries

Table of Contents

I.	Status of the Fishery Management Plan.....	1
II.	Status of the Stock	3
III.	Status of the Fishery	4
IV.	Status of Assessment Advice	5
V.	Status of Research and Monitoring	5
VI.	Status of Management Measures and Issues.....	6
VII.	Implementation of FMP Compliance Requirements for 2021	9
VIII.	Recommendations	10
IX.	References	10
X.	Figures.....	11

I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	Original FMP – October 1987
<u>Amendments:</u>	Amendment 1 – November 2005 (implemented January 2006) Addendum I – March 2011 Addendum II – August 2014 Addendum III – February 2020
<u>Management Areas:</u>	The Atlantic coast distribution of the resource from New Jersey through Florida
<u>Active Boards/Committees:</u>	South Atlantic State/Federal Fisheries Management Board; Atlantic Croaker Technical Committee, Stock Assessment Subcommittee, and Plan Review Team; South Atlantic Species Advisory Panel

[The Fishery Management Plan \(FMP\) for Atlantic Croaker](#) was adopted in 1987 and included the states from Maryland through Florida (ASMFC 1987). In 2004, the South Atlantic State/Federal Fisheries Management Board (Board) found the recommendations in the FMP to be vague, and recommended that an amendment be prepared to define management measures necessary to achieve the goals of the FMP. The Interstate Fisheries Management Program Policy Board also adopted the finding that the original FMP did not contain any management measures that states were required to implement.

In 2002, the Board directed the Atlantic Croaker Technical Committee (TC) to conduct the first coastwide stock assessment of the species to prepare for developing an amendment. The Atlantic Croaker Stock Assessment Subcommittee developed a stock assessment in 2003, which was approved by a Southeast Data Assessment Review (SEDAR) panel for use in management in June 2004 (ASMFC 2005a). The Board quickly initiated development of an amendment and, in November 2005, approved [Amendment 1 to the Atlantic Croaker FMP](#) (ASMFC 2005b). The amendment was fully implemented by January 1, 2006.

The goal of Amendment 1 was to utilize interstate management to perpetuate the self-sustainable Atlantic croaker resource throughout its range and generate the greatest economic and social benefits from its commercial and recreational harvest and utilization over time. Amendment 1 contains four objectives:

- 1) Manage the fishing mortality rate for Atlantic croaker to provide adequate spawning potential to sustain long-term abundance of the Atlantic croaker population.
- 2) Manage the Atlantic croaker stock to maintain the spawning stock biomass above the target biomass levels and restrict fishing mortality to rates below the threshold.
- 3) Develop a management program for restoring and maintaining essential Atlantic croaker habitat.

- 4) Develop research priorities that will further refine the Atlantic croaker management program to maximize the biological, social, and economic benefits derived from the Atlantic croaker population.

Amendment 1 expanded the management area to include the states from New Jersey through Florida. Consistent with the stock assessment completed in 2004, the amendment defined two Atlantic coast management regions: the south-Atlantic region, from Florida through South Carolina; and the mid-Atlantic region, from North Carolina through New Jersey.

Amendment 1 established biological reference points (BRPs) to define an overfished and overfishing stock status for the mid-Atlantic region only. Reliable stock estimates and BRPs for the South Atlantic region could not be developed during the 2004 stock assessment due to a lack of data. The BRPs were based on maximum sustainable yield (MSY), and included threshold and target levels of fishing mortality (F) and spawning stock biomass (SSB): F threshold = F_{MSY} (estimated to be 0.39); F target = $0.75 \times F_{MSY}$ (estimated to be 0.29); SSB threshold = $0.7 \times SSB_{MSY}$ (estimated to be 44.65 million pounds); and SSB target = SSB_{MSY} (estimated to be 63.78 million pounds). An SSB estimate below the SSB threshold resulted in an overfished status determination, and an F estimate above the F threshold resulted in an overfishing status determination. The Amendment established that the Board would take action, including a stock rebuilding schedule if necessary, should the BRPs indicate the stock is overfished or overfishing is occurring.

Amendment 1 did not require any specific measures restricting recreational or commercial harvest of Atlantic croaker. States that already had more conservative measures were encouraged to maintain those regulations (Table 1). The Board was able to revise Amendment 1 through adaptive management, including any regulatory and/or monitoring requirements in subsequent addenda, along with procedures for implementing alternative management programs via conservation equivalency.

The Board initiated [Addendum I to Amendment I](#) at its August 2010 meeting, following the updated stock assessment, in order to address the proposed reference points and management unit. The stock assessment evaluated the stock as a coastwide unit, rather than the two management units established within Amendment I. In approving Addendum I, the Board endorsed consolidating the stock into one management unit, as proposed by the stock assessment. In addition, Addendum I established a procedure, similar to other species, by which the Board may approve peer-reviewed BRPs without a full administrative process, such as an amendment or addendum.

In August 2014, the Board approved [Addendum II to the Atlantic Croaker FMP](#). The Addendum established the Traffic Light Approach (TLA) as the new precautionary management framework to evaluate fishery trends and develop management actions. The TLA was originally developed as a management tool for data poor fisheries. The name comes from assigning a color (red, yellow, or green) to categorize relative levels of population indicators. When a population characteristic improves, the proportion of green in the given year increases. Harvest and abundance thresholds of 30% and 60% were established in Addendum II, representing

moderate and significant concern for the fishery. If thresholds for both population characteristics achieve or exceed a threshold for a three year period, then management action is enacted.

The TLA framework replaces the management triggers stipulated in Addendum I, which dictated that action should be taken if recreational and commercial landings dropped below 70% of the previous two year average. Those triggers were limited in their ability to illustrate long-term declines or increases in stock abundance. In contrast, the TLA approach is capable of better illustrating trends in the fishery through changes in the proportion of green, yellow, and red coloring. A 2018 TC report recommended several updates to the current TLA approach (ASMFC 2018). The Board initiated an Addendum III to incorporate these updates.

In February 2020 the Board approved [Addendum III to Amendment 1](#) of the Atlantic Croaker FMP. This addenda adjusted the TLA to incorporate additional fishery-independent indices, age information, use of regional characteristics, and changes to the management triggering mechanisms. Management triggers and responses include bag limits for the recreational fishery and percentage harvest reductions from a 10 year average for the commercial fishery. The response will be defined by which percent threshold (30% or 60%) that was exceeded in any of the 3 out of 4 terminal years.

Addenda III did not add or change any management measures or requirements, unless management-triggering mechanisms are tripped. The only pre-existing requirement is for states to submit an annual compliance report by July 1st of each year that contains commercial and recreational landings as well as results from any monitoring programs that intercept Atlantic croaker.

II. Status of the Stock

The most recent stock assessment, conducted in 2017, upon peer review was not recommended for management use. Therefore, current stock status is unknown. The Peer Review Panel did not indicate problems in the Atlantic croaker fishery that would require immediate management action but did recommend continued evaluation of the fishery using the annual TLA.

The conclusions of the 2010 stock assessment (ASMFC 2010), which is the most recent assessment that was recommended by peer review for management use, were that Atlantic croaker was not experiencing overfishing and biomass had increased and fishing mortality decreased since the late 1980s. The 2010 assessment was unable to confidently determine stock status, particularly with regards to biomass, due to an inability to adequately estimate removals from discards of the South Atlantic shrimp trawl fishery. Improvements on estimation of these discards were made in the 2017 assessment, allowing the potential for shrimp trawl discards to be included as supplemental information with the annual TLA. Annual monitoring of shrimp trawl fishery discards is important because these discards represent a considerable proportion of Atlantic croaker removals, ranging from 7% to 78% annually during 1988-2008, according to the 2010 assessment (ASMFC 2010).

One of the primary reasons that the 2017 stock assessment did not pass peer review was due to conflicting signals in harvest and abundance metrics. Theoretically, increases in adult abundance should result in more fish available to be caught by the fishery; thus, fishing would be more efficient (greater catch per unit effort) and harvest would increase in a pattern similar to adult abundance. However, several recent abundance indices have shown increases while harvest has declined to some of the lowest levels on record. One factor thought to contribute to overestimates of adult abundance is an increase in the number of juveniles misclassified as adults in surveys that historically have typically caught adults.

In response, the Atlantic Croaker TC recommended several changes to the annual TLA through [Addendum III](#). The addendum added indices from the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAAP) and the South Carolina Department of Natural Resources (SCDNR) Trammel Net Survey into the adult composite characteristic index. In addition, all surveys used revised adult abundance indices and not have an established reference period of 2002-2012. Regional metrics were also used to characterize the fisheries north and south of the Virginia-North Carolina state line. The ChesMMAAP and the NEFSC surveys will be used to characterize abundance north of the state line, and SCDNR Trammel Net and SEAMAP surveys will be used to characterize abundance south of the state line.

III. Status of the Fishery

This report includes updated recreational estimates from the Marine Recreational Information Program's transition to the mail-based Fishing Effort Survey (FES) on July 1, 2018. Past recreational estimates have been calibrated to the FES and, therefore, are different from those shown in FMP Reviews and state compliance reports prior to 2018.

Total Atlantic croaker harvest (recreational and commercial) from New Jersey through the east coast of Florida in 2021 is estimated at 3.0 million pounds (Tables 2 and 3, Figure 1). This represents a 39% decrease in total harvest from 2020 (5.0 million pounds). The commercial and recreational fisheries harvested 32% and 68% of the 2021 total, respectively, which was similar to 2020 when the recreational fishery also harvested a majority (84%) of the total Atlantic croaker harvest. This represents a large shift from the previous 10 year average split, of 52% and 47%, respectively, from 2010 to 2019. Many states had to have some data for 2020 recreational harvest data imputed from prior years due to interruptions in sampling from COVID-19 (Table 4).

Atlantic coast commercial landings of Atlantic croaker exhibit a cyclical pattern, with low harvests in the 1960s to early 1970s and the 1980s to early 1990s, and high harvests in the mid-to-late 1970s and the mid-1990s to early 2000s (Figure 1). Commercial landings increased from a low of 3.7 million pounds in 1991 to 28.6 million pounds in 2001; however, landings have declined every year from 2010 to 806,781 pounds in 2020, the lowest of the time series (1950-2021). Landings increased by 21% in 2021, to 972,121 pounds, the second lowest value in the time series. Within the management unit, the majority of 2021 commercial landings came from North Carolina (56%) and Virginia (30%).

From 1981-2021, recreational landings of Atlantic croaker from New Jersey through Florida have varied by count between 5.2 million fish in 2021 and 36.2 million fish in 1986 and by weight between 1.8 million pounds in 2019 and 18.9 million pounds in 2003 (Tables 5 and 6, Figure 2). Landings generally increased from 1990 until 2003, after which they showed a declining trend through 2021. The 2021 landings are estimated at 5.2 million fish and 2.0 million pounds, a 51% decrease in number of fish and fish weight from 2020. Virginia was responsible for 36% of the 2021 recreational landings, in numbers of fish, followed by North Carolina (20%). It is important to note that due to the COVID-19 pandemic, some 2020 MRIP data was imputed to fill in missing data. The percent contribution of imputed data ranged from 0% for Maryland up to 70% for New Jersey (Table 4).

The number of recreational releases generally increased over the time series until 2013 when releases steadily declined until 2018, when a time series low of 18.1 million fish were released (Table 6 and Figure 2). From 2018 through 2021, releases have overall been increasing again. The percentage of released recreational catch has shown an increasing trend from the 1990s to 2021. In 2021, anglers released 27.5 million fish, a slight decrease from the 31.8 million fish released in 2020. However, anglers released a greater percentage of the total recreational catch in 2021, compared to 2020. An estimated 84% of the total recreational croaker catch was released in 2021, the highest percentage on record, compared to 75% in 2020 (Figure 2).

IV. Status of Assessment Advice

A statistical catch-at-age (SCA) model was used in the 2010 Atlantic croaker stock assessment (ASMFC 2010). This model combines catch-at-age data from the commercial and recreational fisheries with information from fishery-independent surveys and biological information such as growth rates and natural mortality rates to estimate the size of each age class and the exploitation rate of the population. The assessment was peer reviewed by a panel of experts in conjunction with the Southeast Data, Assessment, and Review (SEDAR) process.

The benchmark stock assessment conducted in 2017 was not recommended for management use due to uncertainty in biomass estimates resulting from conflicting signals among abundance indices and catch time series as well as sensitivity of model results to assumptions and model inputs. Specifically, model-estimated values of stock size, fishing mortality, and biological reference points are too uncertain for use; however, the trends in model-estimated parameters and ratio-based fishing F reference points are considered reliable. Currently, a Traffic Light Approach (TLA) is used to monitor the stock and make management decisions in lieu of an approved stock assessment. The TLAs can be found [here](#).

V. Status of Research and Monitoring

There are no research or monitoring programs required of the states except for the submission of an annual compliance report. New Jersey, Delaware, Maryland, Potomac River Fisheries Commission (PRFC), Virginia, North Carolina, South Carolina, and Georgia conduct fishery-dependent (other than catch and effort data) monitoring programs. All states and jurisdictions

conduct fishery-independent monitoring programs along the Atlantic coast from New Jersey to Florida.

The Northeast Fishery Science Center (NEFSC) performs a randomly stratified groundfish survey from Cape Hatteras, North Carolina to Maine. Atlantic croaker are one of the main species caught throughout much of the survey area and, since the surveys started in 1972, it provides a long term data set. Since 1994, there has been an increase in annual catch variability. The NEFSC survey was not carried out in 2020 due to the COVID-19 pandemic, but was active again in 2021.

VI. Status of Management Measures and Issues

Fishery Management Plan

Amendment 1 was fully implemented by January 1, 2006, and provided the management plan for the 2009 fishing year. There are no interstate regulatory requirements for Atlantic croaker. Should regulatory requirements be implemented in the future, all state programs must include law enforcement capabilities adequate for successfully implementing the regulations. Addendum I to Amendment 1 was initiated in August 2010 and approved in March 2011, in order to 1) revise the biological reference points to be ratio-based, and 2) remove the distinction of two regions within the management unit, based on the results of the 2010 stock assessment. Addendum II was approved August 2014 and established the TLA management framework for Atlantic croaker in order to better illustrate long-term trends in the fishery. Addendum III was approved February 2020 and adjusted management through the TLA by incorporating additional fishery-independent indices, age information, use of regional characteristics, and changes to the management-triggering mechanisms.

Traffic Light Approach

2021 Harvest Metrics

The Mid-Atlantic harvest metric exceeded the 60% red threshold in all four terminal years (2018-2021; Figure 3) and the South Atlantic harvest metric has exceeded the 30% red threshold in all four terminal years (2018-2021; Figure 4). This is the second consecutive year the harvest metric in both regions has triggered at least at the 30% threshold, although the harvest metrics in 2021 cannot be used as a trigger mechanism since they represent a year with catch restrictions in place.

2021 Abundance Metrics

The Mid-Atlantic metric could not be updated due to missing ChesMMAAP data from 2019-2021 (Figure 5). The NEFSC index, an index used in the Mid-Atlantic metric, was available in 2021 and while it was below average, it showed an increase from 2019. The South Atlantic metric could also not be updated past 2019 due to missing SEAMAP data in 2020 and spring 2021 (Figure 6). The SC Trammel Net Survey, an index used in the South Atlantic metric, increased 24% in 2021 compared to 2020. When the South Atlantic metric was calculated including P195 instead of SEAMAP, all four terminal years (2018-2021) did not exceed any threshold.

Conclusions

The harvest metric triggered in both the Mid-Atlantic (60% threshold) and South Atlantic (30% threshold) from 2018 to 2020 indicating continued concern. Harvest restrictions were in place in 2021 and the harvest metric cannot be used as a trigger mechanism in that year. The abundance composite metrics are unknown for the Mid-Atlantic and South Atlantic due to missing data, and so it could not be determined if further management would be triggered. Addendum III requires management action taken in 2021 to remain in place for a minimum of three years (through and including the 2023 season). The TC recommends maintaining management enacted in 2021.

De Minimis Requests

States are permitted to request *de minimis* status if, for the preceding three years for which data are available, their average commercial landings or recreational landings (by weight) constitute less than 1% of the coastwide commercial or recreational landings for the same three year period. A state may qualify for *de minimis* in either its recreational or commercial sector, or both, but will only qualify for exemptions in the sector(s) that it qualifies for as *de minimis*. Amendment 1 does not include any compliance requirements other than annual state reporting, which is still required of *de minimis* states. Addendum III, depending on the level of management action triggered, has exemptions for *de minimis* states when measures are triggered at the 30% level (see above for the TLA description). If the TLA triggers at the 60% level, then all states, including *de minimis*, must implement management measures.

In the annual compliance reports, the following states requested *de minimis* status: New Jersey (commercial and recreational fisheries), Delaware (recreational and commercial fisheries), South Carolina (commercial fishery), and Georgia (commercial fishery). The commercial and recreational *de minimis* criteria for 2022 are based on 1% of the average coastwide 2019-2021 landings in each fishery. New Jersey, Delaware, South Carolina, and Georgia commercial fisheries all qualify for *de minimis* status, but landings are confidential. New Jersey and Delaware recreational fisheries both qualify for *de minimis* status, but landings are also confidential.

Changes to State Regulations

In 2020, the TLA triggered management measures at the 30% level, or moderate concern. Non *de minimis* states were required to implement management measures that instituted a 50 fish recreational bag limit and reduce the commercial harvest by 1% of the average state commercial harvest from the previous 10 years. If the state had more restrictive measures in place, they did not need to make any changes. All proposed management changes were reviewed by the Technical Committee and approved by the Board. Below is a list of states that who implemented measures in 2021:

- Virginia: 50 fish bag limit, charter allowance, and commercial fishery season closure from January 1 to January 15. Approved on March 23, 2021.
- North Carolina: 50 fish bag limit and a commercial fishery season closure from December 16 to December 31. Proclamation authority published on April 15, 2021.

- Florida: 50 fish bag limit and a commercial vessel limit of 1,200 pounds in state waters. Rule published December 1, 2021.

Atlantic Croaker Habitat

In winter of 2017, the ASMFC Habitat Committee released *Atlantic Sciaenid Habitats: A Review of Utilization, Threats, and Recommendations for Conservation, Management, and Research*, which outlines the habitat needs of Atlantic croaker at different life stages (egg, larval, juvenile, adult). This report also highlights threats and uncertainties facing these ecological areas and identifies Habitat Areas of Particular Concern. It can be found online at:

http://www.asafc.org/files/Habitat/HMS14_AtlanticSciaenidHabitats_Winter2017.pdf.

Bycatch Reduction

Atlantic croaker is subject to both direct and indirect fishing mortality. Historically, croaker ranked as one of the most abundant bycatch species of the south Atlantic shrimp trawl fishery, resulting in the original FMP's recommendation that bycatch reduction devices (BRDs) be developed and required in the shrimp trawl fishery. Since then, the states of North Carolina through Florida have all enacted requirements for the use of BRDs in shrimp trawl nets in state waters, reducing croaker bycatch from this fishery (ASMFC 2010). However, bycatch and discard monitoring from the shrimp trawl fishery have historically been inadequate, resulting in a major source of uncertainty for assessing this stock, as well as other important Mid- and South Atlantic species. Most of the discarded croaker are age-0 and thus likely have not yet reached maturity (ASMFC 2010). The North Carolina Division of Marine Fisheries conducted a two-year study, published in 2015, to collect bycatch data from state shrimp trawlers. It found that Atlantic croaker represent between 34-49% of the total observed finfish bycatch by weight in estuarine waters and between 20-42% in ocean waters. The at-net mortality for Atlantic croaker was found to be 23% (Brown 2015). These data will be valuable for incorporating estimates of removals in future stock assessments.

Discard estimates of Atlantic croaker in the South Atlantic Shrimp Trawl Fishery are informed by catch rates observed during the SEAMAP survey and South Atlantic Shrimp Trawl Fishery Observer Program, and total effort of the South Atlantic Shrimp Trawl Fishery. Increases in discards could be an indicator of higher abundance of juveniles in the region, an increase in effort by the fishery, or a combination of both. Total effort (net hours) in the South Atlantic Shrimp Trawl Fishery declined from a time series high in 1991 to a time series low in 2005 (Figure 7). Effort then varied around an increasing trend through 2017 and was variable and lower through 2020. Effort declined slightly from 786,172 net hours in 2020 to 780,515 net hours in 2021. Total discards of Atlantic croaker in the South Atlantic Shrimp Trawl Fishery were high during the late 1980s and early 1990s, declined to relatively low levels in the early to mid-2000s, and then increased to levels similar to the beginning of the time series during the 2010s (Figure 7). Discards declined from some of the highest levels of the time series in 2018-2020 to the lowest level since 2009 in 2021. For additional information on the South Atlantic Shrimp Trawl Fishery discard estimation, see Appendix 1 of the [2020 TLA Update Report](#).

Atlantic croaker are also discarded from other commercial fishing gears, primarily due to market pressures and few restrictions on croaker harvest at the state level. The National Oceanic and Atmospheric Administration (NOAA) Fisheries Pelagic Observer Program provides data to estimate these discards for use in assessments; however, the time series is limited and only discards from gill nets and otter trawls could be estimated for the 2010 assessment based on the available data. Since 1988, estimated discards have fluctuated between 94 and 15,176 mt without trend, averaging 2,503 mt (ASMFC 2010).

Atlantic croaker is also a major component of the scrap/bait fishery. Landings from this fishery are not reported at the species level, except in North Carolina, which has a continuous program in place to sample these landings and enable estimation of croaker scrap landings for use in the stock assessment. As part of the 2010 stock assessment, North Carolina estimated the scrap/bait landings, which have declined in recent years, from a high of 1,569 mt in 1989 to a low of 84 mt in 2008, primarily due to restrictions placed on fisheries producing the highest scrap/bait landings (ASMFC 2010). Regulations instituted by North Carolina include a ban on flynet fishing south of Cape Hatteras, incidental finfish limits for shrimp and crab trawls in inside waters, minimum mesh size restrictions in trawls, and culling panels in long haul seines.

South Carolina has also begun a state monitoring program to account for bait landings. The state initiated a bait harvester trip ticket program for all commercial bait harvesters licensed in South Carolina. The impetus for this program is to track bait usage of small sciaenid species (croaker, spot, and whiting) as well as other important bait species.

Several states have implemented other commercial gear requirements that further reduce bycatch and bycatch mortality, while others continue to encourage the use of the BRD devices. NOAA Fisheries published a notice on June 24, 2011 for public scoping in the Federal Register to expand the methods for reducing bycatch interactions with sea turtles, which may have additional effects on the bycatch of finfish like Atlantic croaker in trawls (76 FR 37050). Continuing to reduce the quantity of sub-adult croaker harvested should increase spawning stock biomass and yield per recruit.

Atlantic croaker are also subject to recreational discarding. The percentage of Atlantic croaker released alive by recreational anglers has generally increased over time. Discard mortality was estimated to be 10% for the 2010 stock assessment (ASMFC 2010). The use of circle hooks and appropriate handling techniques can help reduce mortality of released fish.

VII. Implementation of FMP Compliance Requirements for 2022

The PRT found no inconsistencies among states with regard to the requirements of Amendment 1 and Addendum III.

VIII. Recommendations

Management and Regulatory Recommendations

- Consider approval of the *de minimis* requests from New Jersey, Delaware, South Carolina, and Georgia for their commercial fisheries.
- Consider approval of the *de minimis* requests from New Jersey and Delaware for their recreational fisheries.
- Research into the impacts of climate change on the range of the species.
- Research into Atlantic croaker juvenile discard mortality for recreational and commercial fisheries by each gear type in regions where removals are highest.

Research and Monitoring Recommendations

Additional research and monitoring recommendations can be found in the 2016 Atlantic Croaker Stock Assessment Peer Review Report [here](#) under Term of Reference 8.

IX. References

- Atlantic States Marine Fisheries Commission (ASMFC). 1987. Fishery Management Plan for Atlantic Croaker. Washington (DC): ASMFC. Fishery Management Report No. 10. 90 p.
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- Kevin Brown. 2015. Characterization of the commercial shrimp otter trawl fishery in the estuarine and ocean (0-3 miles) waters of North Carolina. Morehead City (NC): NCDEQ, Division of Marine Fisheries. Abstract.

X. Figures

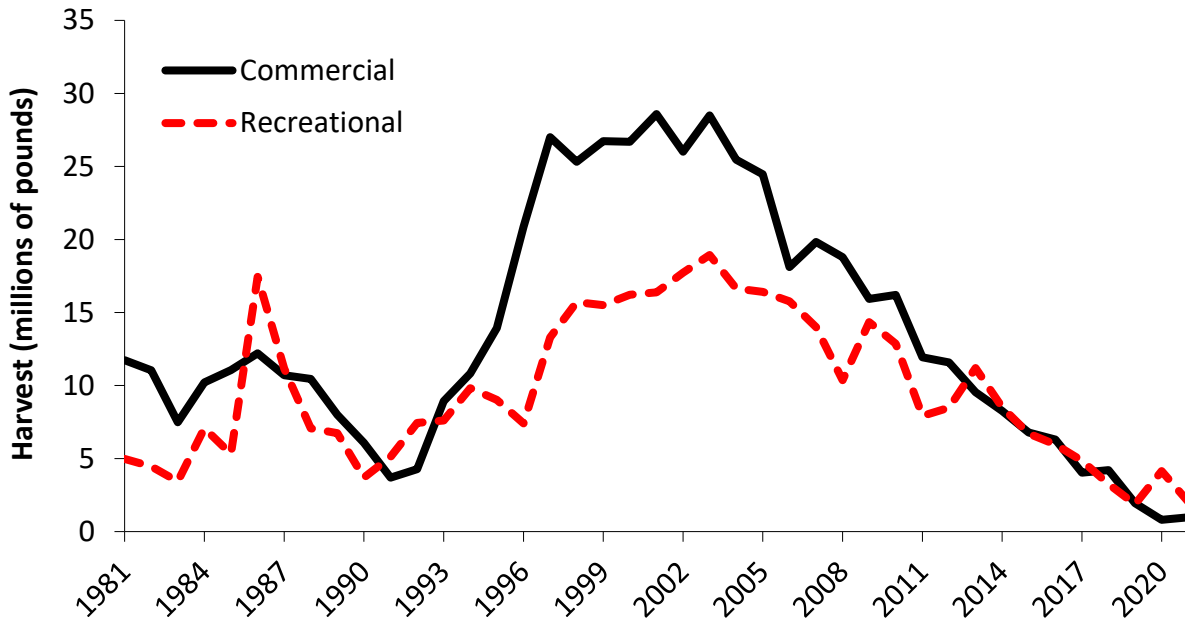


Figure 1. Atlantic croaker commercial and recreational landings (millions of pounds) from 1981-2021. (See Tables 2 and 3 for source information. Commercial landings estimate for 2021 is preliminary. Reliable recreational landings estimates are not available prior to 1981. Recreational landings estimates are based on the mail-based Fishing Effort Survey.)

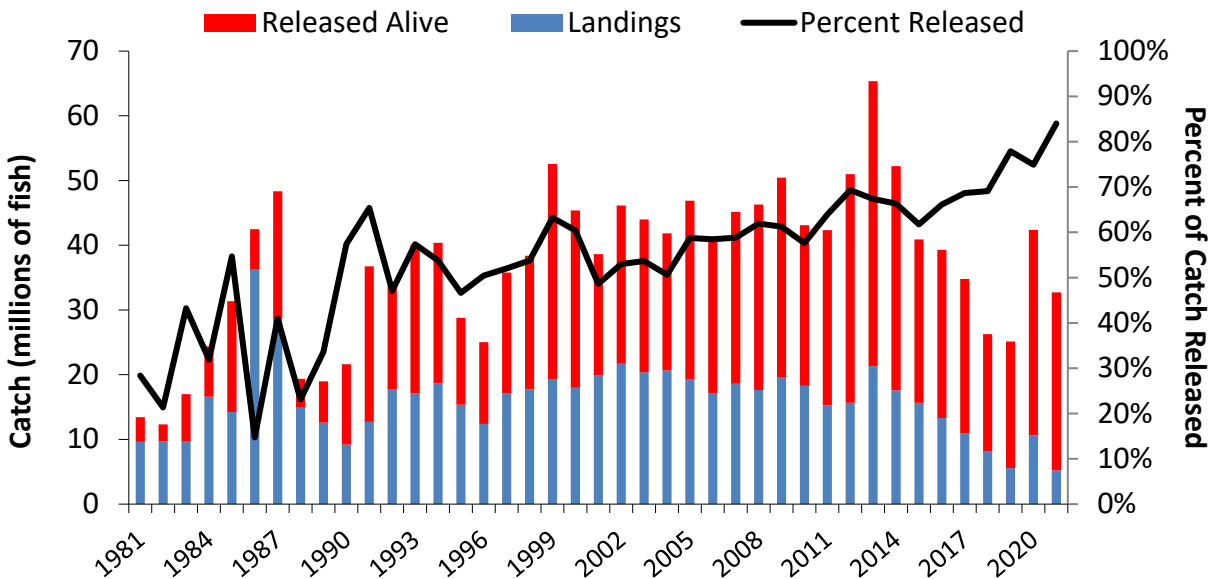


Figure 2. Recreational catch (landings and alive releases, in millions of fish) and the percent of catch that is released, 1981-2021, based on the mail-based Fishing Effort Survey calibration. (See Tables 4 and 5 for values and source information.)

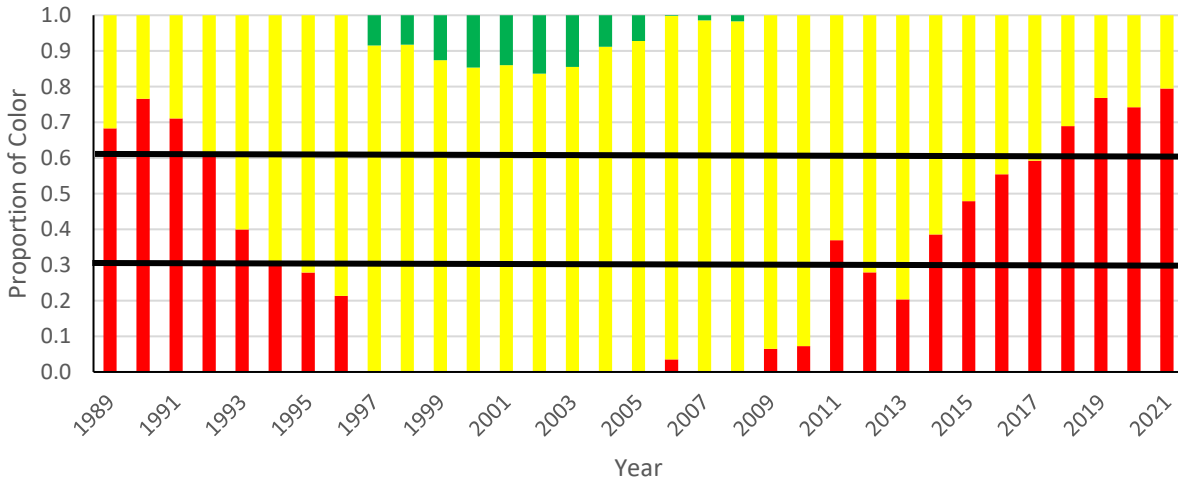


Figure 3. Annual color proportions for harvest composite TLA of Mid-Atlantic region (NJ-VA) for Atlantic croaker recreational and commercial landings from 1989-2021 using a 2002-2012 reference period.

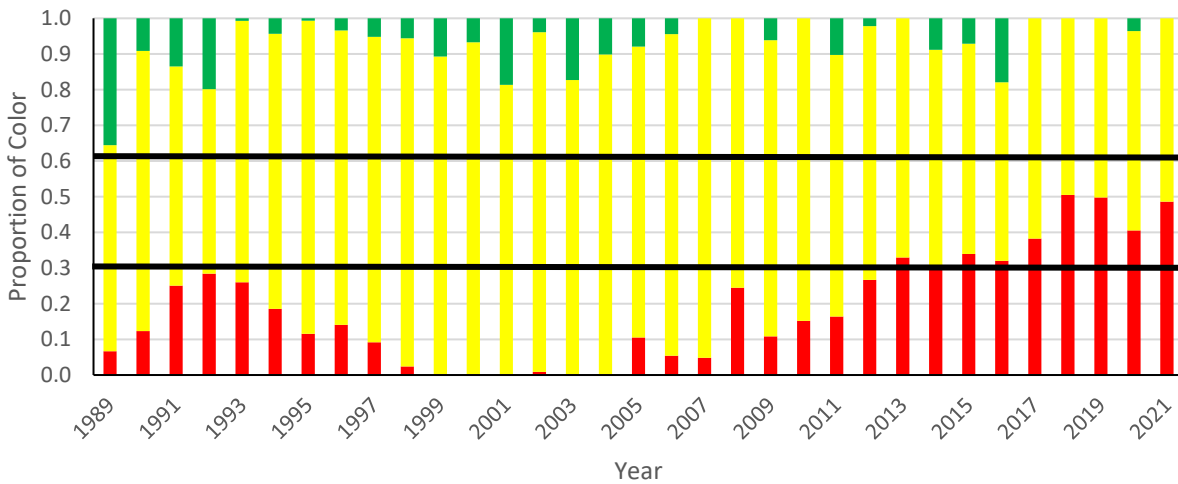


Figure 4. Annual color proportions for harvest composite TLA of South Atlantic region (NC-FL) for Atlantic croaker recreational and commercial landings from 1989-2021 using a 2002-2012 reference period.

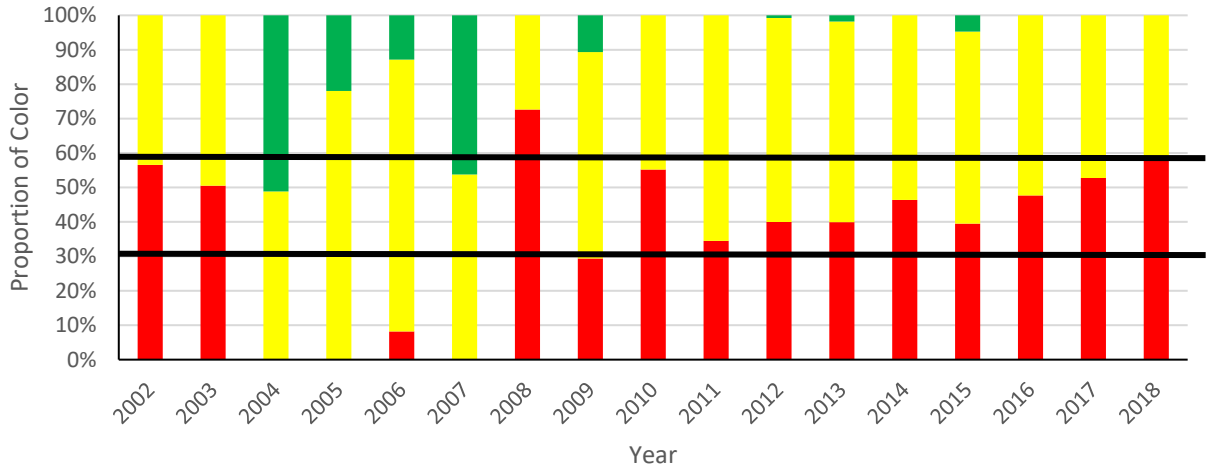


Figure 5. Adult (age 2+) Atlantic croaker TLA composite characteristic index for the Mid-Atlantic (NJ-VA; NEFSC and ChesMMAAP surveys) from 2002-2018. This figure is unchanged from the previous three years due to the recalibration effort of ChesMMAAP.

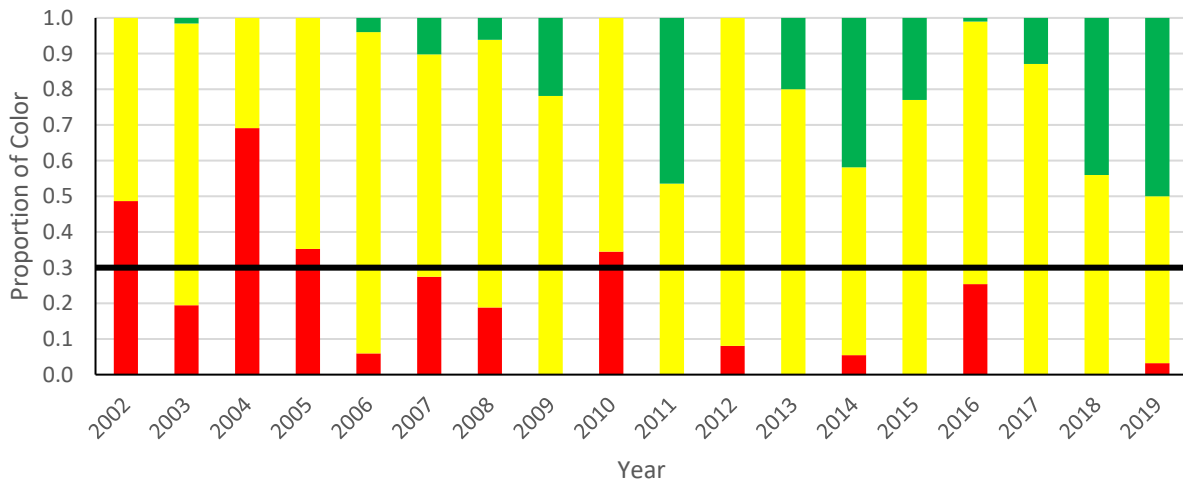


Figure 6. Adult (age 2+) Atlantic croaker TLA composite characteristic index for the South Atlantic (NC-FL; SEAMAP and SCDNR trammel survey) from 2002-2019. This figure is unchanged from the previous two years due to missing data from SEAMAP.

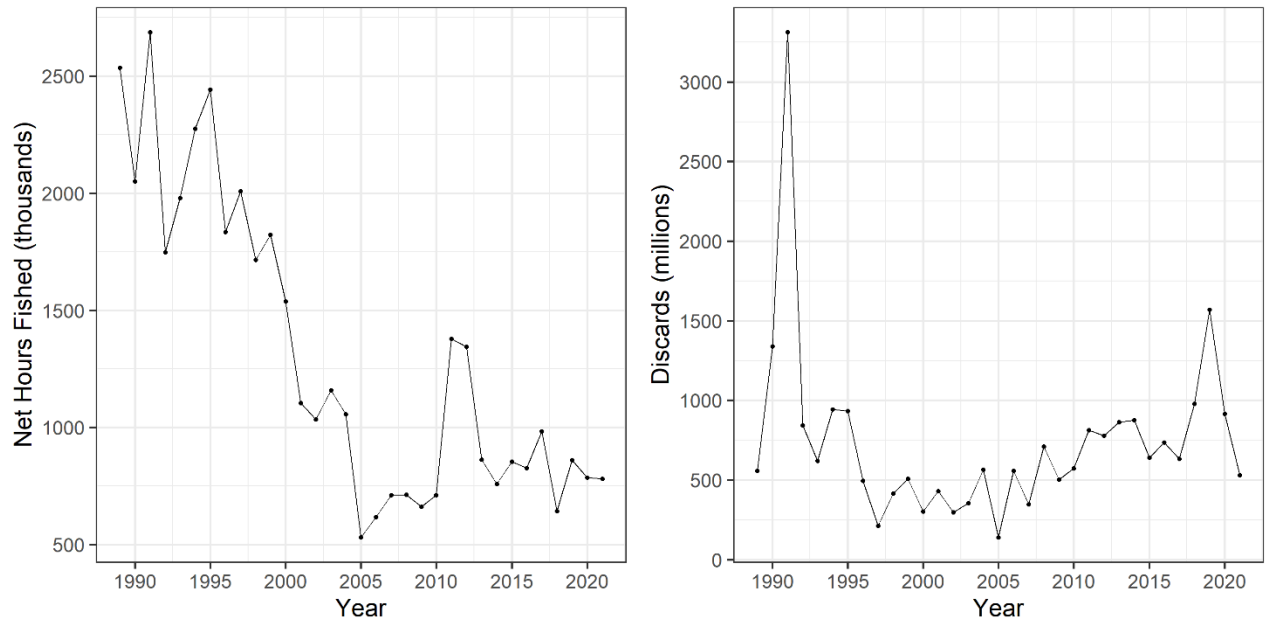


Figure 7. Total net hours fished (left) and discards of Atlantic croaker (right) in the South Atlantic Shrimp Trawl Fishery from 1989-2021.

**XI.
Tables**

Table 1. Summary of state regulations for Atlantic croaker in 2021.

State	Recreational	Commercial
NJ	None	Otter/beam trawl mesh restriction for directed croaker harvest (>100 lbs in possession)
DE	8" minimum; recreational gill nets (up to 200 ft.) with license	8" minimum
MD	9" min, 25 fish/day, charter boat logbooks	9" minimum; open 3/16 to 12/31
PRFC	25 fish/day	Pound net season: 2/15 to 12/15
VA	50 fish/day, with additional charter live bait allowance (effective 3/23/21)	Open 1/15 to 12/31 (effective 3/23/21)
NC	50 fish/day (effective 4/15/21), recreational use of commercial gears with license and gear restrictions	Open 1/1 to 12/15 (effective 4/15/21)
SC	Mandatory for-hire logbooks, small Sciaenidae species aggregate bag limit of 50 fish/day	None
GA	25 fish/day	25 fish/day limit except for trawlers harvesting shrimp for human consumption (no limit)
FL	50 fish/day (effective 12/1/21)	1,200 commercial vessel limit (effective 12/1/21)

* A commercial fishing license is required to sell croaker in all states with fisheries. For all states, general gear restrictions affect commercial croaker harvest.

Table 2. Commercial harvest (pounds) of Atlantic croaker by state, 2012-2021.

(Estimates for 2021 are preliminary. Sources: 2022 state compliance reports for 2021 fishing year and for years prior to 2021, personal communication with ACCSP, Arlington, VA, except PRFC [compliance reports only].) Note that Georgia does not have a commercial fishery for Atlantic croaker.

Year	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
2012	C	C	915,432	273,849	6,842,005	3,106,616	C		74,527	11,582,978
2013	C	C	820,777	130,285	6,237,602	1,927,938	C		76,463	9,538,901
2014	265,166	C	443,661	177,777	4,697,381	2,629,908	C		45,587	C
2015	C	C	294,038	118,996	4,426,957	1,819,007	C		39,096	6,784,146
2016	C	C	101,949	168,889	3,825,737	2,092,287	C		57,538	6,302,799
2017	C	C	42,958	114,319	2,822,005	1,008,015	C		43,033	4,032,993
2018	C	C	44,306	16,561	2,450,984	1,643,646	C		54,409	4,210,715
2019	C	463	2,865	C	595,434	1,278,340	C		68,179	1,945,723
2020	C	C	1,857	601	147,026	570,453	C		84,906	806,781
2021	C	C	4,584	11,430	287,898	540,622	C		124,642	972,121

C: Confidential data

Table 3. Recreational harvest (pounds) of Atlantic croaker by state, 2012-2021. (Sources: 2022 state compliance reports for 2021 fishing year and for years prior to 2021, personal communication with MRIP)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
2012	259,645	147,737	1,980,417	4,664,264	307,338	30,149	29,815	1,063,337	8,482,702
2013	1,637,516	253,447	1,581,384	6,442,166	453,881	84,248	89,781	642,887	11,200,818
2014	750,580	427,615	1,265,217	4,354,046	758,751	104,434	138,423	712,090	8,511,554
2015	263,749	189,320	871,596	3,514,410	557,735	181,909	248,431	881,185	6,708,335
2016	7,133	10,959	407,010	2,998,022	443,728	81,896	116,313	1,893,203	5,958,264
2017	0	26,441	238,659	3,383,057	237,160	310,621	100,565	555,389	4,851,892
2018	34,125	5,859	191,854	2,245,518	164,644	81,251	83,258	445,663	3,252,172
2019	973	23,973	38,895	995,491	224,337	133,227	97,791	358,941	1,873,628
2020	16,358	21,870	91,047	2,410,612	223,685	230,205	77,876	1,072,714	4,144,367
2021	7,079	35,746	69,744	823,319	376,121	173,526	95,031	461,048	2,041,614

Table 4. Contribution of imputed harvest rate data from 2018 and 2019 for 2020 MRIP harvest estimates of Atlantic croaker.

State	2020 Harvest (A+B1) Total Weight (lb)	PSE	Contribution of Imputed Data to Total Harvest Rate
NEW JERSEY	16,358	60.6	70%
DELAWARE	21,870	26.8	33%
MARYLAND	91,047	36.9	0%
VIRGINIA	2,410,612	20.2	50%
NORTH CAROLINA	223,685	20.6	21%
SOUTH CAROLINA	230,205	19.1	2%
GEORGIA	77,876	41.4	13%
FLORIDA	1,072,714	27.5	3%

Table 5. Recreational harvest (numbers) of Atlantic croaker by state, 2012-2021. (Sources: 2022 state compliance reports for 2021 fishing year and for years prior to 2021, personal communication with MRIP)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
2012	830,891	202,283	2,565,599	8,786,350	848,495	132,264	104,944	2,190,268	15,661,094
2013	2,707,410	530,236	2,308,987	12,517,286	1,300,804	336,140	264,984	1,332,465	21,328,324
2014	852,733	806,256	2,197,125	9,533,829	1,935,961	600,482	289,781	1,359,207	17,576,096
2015	339,021	334,676	1,738,576	8,024,381	1,437,019	555,263	790,014	2,429,723	15,648,673
2016	8,236	24,546	659,318	7,276,719	1,109,570	268,470	402,254	3,553,777	13,302,890
2017	0	65,606	423,790	7,644,516	666,930	765,227	371,301	969,146	10,906,516
2018	104,321	12,370	305,469	5,472,329	472,917	335,833	241,382	1,176,999	8,121,620
2019	3,031	53,048	69,771	3,055,510	651,268	593,475	332,073	801,751	5,559,927
2020	58,097	54,193	244,788	6,529,494	673,377	827,904	232,535	2,010,168	10,630,556
2021	22,722	71,237	174,056	1,862,543	1,066,533	707,924	371,257	952,581	5,228,853

Table 6. Recreational releases (number) of Atlantic croaker by state, 2012-2021. (Sources: 2022 state compliance reports for 2021 fishing year and for years prior to 2021, personal communication with MRIP)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
2012	3,336,964	1,036,383	7,090,976	15,140,369	3,878,710	1,070,703	781,302	2,999,225	35,334,824
2013	2,980,744	1,811,661	7,557,223	18,480,099	6,729,556	3,754,143	1,361,943	1,265,571	44,025,744
2014	703,031	1,396,970	2,806,693	10,314,405	10,347,332	4,742,718	2,057,898	2,265,961	34,635,008
2015	240,840	309,389	1,236,293	6,815,343	9,632,560	3,236,774	1,320,939	2,451,253	25,243,391
2016	139,085	390,655	726,662	6,993,470	7,254,382	5,233,835	1,178,630	4,073,001	25,989,720
2017	152,540	230,455	2,829,255	8,464,305	4,631,445	4,755,853	1,059,539	1,770,846	23,894,238
2018	144,637	85,424	203,081	5,359,179	4,311,368	5,568,892	1,403,560	1,072,381	18,148,522
2019	33,333	101,523	1,243,785	6,642,685	3,634,211	3,768,288	1,893,287	2,259,705	19,576,817
2020	147,494	286,780	2,870,268	6,223,025	5,560,605	12,921,019	1,696,852	2,057,158	31,763,201
2021	116,606	353,743	1,909,466	4,306,221	9,539,047	8,207,074	1,687,801	1,363,075	27,483,033