American Saltwater Guides Association

A Review of the Fishery, Biology, and Life History of the Atlantic Bonito (*Sarda sarda*) in the Northwest Atlantic

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DRAFT

Final to be submitted within 15 days of the ASMFC Meeting

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EXECUTIVE SUMMARY

In recent years, Atlantic bonito has become a popular target of recreational fisheries along the Atlantic coast of the United States. There is currently no management plan for this species in United States waters or internationally (ICCAT 2021). There is limited research on stock structure or status. However, in the Eastern Atlantic several studies have shown genetic differences amongst bonito from different locations (Vines et al. 2004; Turan 2015). Commercial landings over the past decade have been dominated by Rhode Island (43%). Commercial discards occur almost exclusively in gill net fisheries. Much of the recreational landings in the past decade are from Massachusetts, Rhode Island, New Jersey, and North Carolina. Approximately 30% of all recreationally caught bonito since 1981 were discarded, and survival of these fish is unknown. Recreational catch lengths and weights varied from 15 to 113 cm (Mean = 50.6 cm) and from <0.1 to 10.2 kg (Mean = 0.99 kg). There were no significant differences in length-frequencies amongst years or regions. Length weight equations were calculated by wave (two-month periods) and no significant differences were found.

There were no growth or maturity studies in United States waters, but growth and maturity parameters from the Mediterranean and East Atlantic are summarized in Tables 19 and 20. Atlantic bonito exhibit asynchronous oocyte development and multiple spawning events throughout the spring and summer with eggs being shed in several batches when water is the warmest (Majorova and Tkacheva 1959; Rey et al., 1984; Kahraman 2014). Spawning occurs near shore, and fecundity can vary from 304,000 and 1,150,000 oocytes (Macias et al 2005; Valerias and Abad 2006). Little is known about the natural mortality of Atlantic bonito but estimates in other areas of the Atlantic range from 0.46 to 0.869 (Baibbat et al. 2019; Petukhova 2020).

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BACKGROUND

Internationally, small tunas, including Atlantic bonito, support fisheries that are important both economically and as a source of food (Majkowski 2007; Isaac et al. 2012; Lucena-Fredou et al. 2021). The Atlantic bonito has become a popular target and welcomed bycatch in the United States recreational fisheries. Many are kept for food or utilized as bait for larger pelagic species and sharks. In recent years, there has been an abundance of juvenile bonito available to recreational anglers. This has resulted in many immature bonito being harvested, and there is concern as to what impact this will have on their population (McManus, C. Personal Communication).

The assessment and management of tunas in the Atlantic and Mediterranean is the responsibility of the International Commission for Conservation of Atlantic Tunas (ICCAT). There is no ICCAT assessment or management plan for Atlantic bonito, however the species was identified as a species for which more data should be collected in order to assess the stock (ICCAT 2019). In the United States, Atlantic bonito are not managed and, unlike other small tunas and mackerels, were not included under the Coastal Migratory Pelagics Fishery Management Plan (CMP FMP) (Federal Register 1982). The species included in the CMP FMP are managed jointly by the South Atlantic and Gulf of Mexico Fishery Management Councils. In federal waters, highly migratory species are managed by the National Oceanic and Atmospheric Administration Highly Migratory Species (NOAA HMS) Program. This program manages species that overlap multiple management council's jurisdictions. In addition, each state has its own marine fisheries management system for the fisheries occurring in their respective state waters (Appendix 1).

FISHERIES

Stock Structure and Status

There is little information available to determine the stock structure of many small tuna species, including Atlantic bonito (ICCAT 2019). There is currently no management structure in place for bonito but attempts to define stock structure and complete data-poor assessments are underway (ICCAT 2021). Currently, bonito in the Atlantic are divided into five stock regions, based on traditional ICCAT management areas (ICCAT 2021). These areas are as follows: Northwest Atlantic, Northeast Atlantic, Mediterranean, Southeast Atlantic, and Southwest Atlantic (Figure 1).

There are no available genetic or morphological stock structure studies from the Northwest Atlantic, and there are only a handful from the other stock areas. Vines et al. (2004) found genetic isolation between bonito in the Western and Eastern Mediterranean. Turan (2015) found genetic differences between fish from the Black, Mediterranean, and Aegean seas. There were also significant genetic differences found in Mediterranean and West African caught bonito (Vines et al. 2020). Despite being separate management units, bonito have been shown to migrate between the Mediterranean and Atlantic via the Strait of Gibraltar (Rey and Cort 1981). There is clearly a lack of knowledge on the true stock structure of bonito in the Atlantic and based on the results of studies in the Eastern Atlantic, it's possible there are different stocks within United States waters.

There is no official stock assessment for Atlantic bonito in any of the ICCAT management areas, but in 2017 they were identified by ICCAT as a priority to be evaluated (ICCAT, 2017). There have been several examinations of stock status and stock risk done recently, but much of it was focused outside of the Northwest Atlantic. Pons et al. (2019A) used

length based spawning potential ratio (LBSPR) and length based integrated mixed effects (LIME) models to assess the stock status of Northeast Atlantic and Mediterranean bonito. The other stock areas were excluded due to a lack of data (Pons et al. 2019A). There were conflicting results between the two models for both stock areas (Pons et al. 2019A). Catch based assessment models however, showed that biomass of bonito in the Northeast Atlantic was above B_{MSY}. Petukhova (2020) use LBSPR to assess bonito in the Northeast Atlantic and concluded that overfishing is occurring. There was a high level of uncertainty in the results of these studies (Pons et al 2019B; Lucena-Fredou et al. 2021).

Data Sources

For this review only non-confidential data was used. The commercial landings, recreational landings, and recreational discards data were provided by the Atlantic Coastal Cooperative Statistics Program (ACCSP). Commercial landings data dates back to 1951 and was limited to annual landings by state. Commercial discard data was provided by the Northeast (ME-NC) and Southeast Fisheries Science Centers (NC-TX) (NEFSC and SEFSC) and dates back to 1991. The observed discard data was aggregated by state, statistical area, and gear type. Estimating total discards was beyond the scope of this review, but the observed values were used to characterize the gear types used and states responsible for discarded bonito. The non-confidential portion of this data represented 81% of all observed Atlantic bonito discards by weight in the Northeast. Southeast observer data was limited to numbers of fish observed and coverage was minimal.

All recreational data came from the Marine Recreational Information Program (MRIP) and there were few problems with confidentiality. As data was aggregated by at more specific levels (i.e., state and fishing mode) estimation error became more significant. When examining

the mode of fishing and location of catch, we presented the data as percentages of the total rather than specific values, allowing for the characterization of the fishery. Recreational discards are only reported in numbers of fish.

Commercial Landings

Up until 1977, commercial bonito landings were highly variable, ranging from 35,000 and 288,200 lbs. (Mean = 123,640.7 lbs.). From 1976 until 2000, commercial landings were higher and more variable (Mean = 272,314.3 lbs.) (Figure 2). Landings in the early 2000s dropped dramatically and have remained relatively stable over the past decade, between 25,378 and 81,565 lbs. (Mean = 49,905.7 lbs.).

Prior to the 1970s the Mid-Atlantic was responsible for most of the landings (Figure 3). Over the entirety of the time-series the North Atlantic averaged the highest landings (26,738.3 lbs.), with the majority occurring from the 1970s to the 1990s (Table 2). Over the past decade the North Atlantic has been responsible for 46% of the landings (Figure 3).

Much of the early landings in the Mid-Atlantic came from a combination of New Jersey and New York (Figure 4). Over the past decade Rhode Island has been responsible for 43% of all commercial landings of bonito (Table 2). The rest of the landings occurred in predominantly in New York, New Jersey, and North Carolina (Figure 4). Individual state and region data can be seen in Appendix 2.

Commercial Discards

Over 99% of observed Atlantic bonito discards from the Northeast Fisheries Observer Program were caught by gill nets. There are three types of gillnets that make-up this 99%: fixed (38%), drift floating (44%), and drift sinking (17%). The annual breakdown of discards by gear can be seen in Figure 5. Only five states in the Northeast Fisheries Observer Program have

recorded bonito discards for the time series, and the majority of these discards come from New Jersey (53%) and Rhode Island (25%) (Figure 6). There is very little data on discarded Atlantic bonito from the Southeast Fisheries Observer Program.

Recreational Landings

Since 1981 recreational landings have ranged from 69,609 lbs. in 2016 to 11,527,512 lbs. in 1982 (Mean = 1,192,108.0 lbs.) (Table 3) (Figure 7). Landings have declined from the highs of the early 1980s and remained relatively stable since the 1990s. The Mid-Atlantic has been responsible for the majority of the landings (61%) over the entirety of the time series (Figure 8). Over the past decade, landings have been more evenly distributed between the North, South, and Mid-Atlantic (Table A2.3). Much of the landings in the past decade are from Massachusetts, Rhode Island, New Jersey, and North Carolina (Figure 9) (Table 4). Individual state plots and data can be seen in Appendix 2.

The mode of fishing responsible for the landings varied by region, state, and year. Across all regions there was a decrease in landings from for-hire vessels, with the exception of a spike in 2017 (Figure 10). Shore landings appear to vary by year, perhaps as a result of fish movement and availability to shore fishermen. Private boats represent the majority of landings in all regions, except the Mid-Atlantic where for-hire vessels are the most common mode (Figure 11) (Table 5). Shore fishing is most common in the North Atlantic (Figure 11) (Table 5). Individual region and state catch by mode can be seen in Figure 12, Table 6, Appendix 2.

The percentage of landings in state and federal waters also varied by region, state, and year. There did not seem to be an overall pattern in location of landings across the time-series, but more landings occurred in federal (78%) than state (22%) waters (Figure 13) (Table 7). The majority of the landings in the North Atlantic (55%) came from state waters (Figure 14) (Table

7). The Mid-Atlantic (93%) and South Atlantic (65%) catches were predominantly in federal waters (Figure 14) (Table 7). Individual state catch in state and federal waters can be seen in Figure 15, Table 8 Appendix 2.

Recreational Discards

With the popularity of catch and release recreational fishing, discards represent an important component of the fishery. Over the entire time-series 30% of bonito caught were discarded (Table 9) (Figure 16). Almost half the bonito caught in the North Atlantic (46%) and South Atlantic (46%) were discarded (Figure 17) (Table 9). Since 1981 recreational discards have ranged from 5,691 fish in 2009 to 826,667 fish in 1988 (Mean = 148,082 fish) (Table 10) (Figure 18). There is no obvious trend across the time-series, but there does appear to be periodic spikes in discards. The discards follow a similar pattern to landings across regions (Figure 19). The Mid-Atlantic was responsible for 68% of discards overall, but the North Atlantic was responsible for 47% over the past decade (Table A2.9). Florida has the most discards of any state, with much of that occurring early in the time series and very little in the past decade (Figure 20) (Table 11). Massachusetts and New Jersey have the most discards in the past decade (Figure 20) (Table 11). Individual state plots, and data can be seen in Appendix 2.

The mode of fishing responsible for the discards was dominated by private boats everywhere. Across all regions there appears to be a decrease in discards from for-hire vessels in recent years (Figure 21). Shore discards appear to vary by year and are more common in the North Atlantic (Figure 22) (Table 12). Rhode Island and Massachusetts have the highest percentage of shore released Bonito (Figure 23) (Table 13). Individual region and state catch by mode can be seen in Appendix 2.

The percentage of discards in state and federal waters also varied by region, state, and year. There did not seem to be an overall pattern in location of discards across the time-series (Figure 24). The majority of the discards in the North Atlantic (84%) came from state waters (Figure 25) (Table 14). The majority of Mid-Atlantic (68%) and South Atlantic (63%) discards occurred in federal waters (Figure 25) (Table 14). In the South Atlantic, Florida and North Carolina are the only states with a high percentage of discards in state waters (Figure 26) (Table 15).

Recreational Effort

The number of directed trips, trips where bonito were the primary or secondary target, has varied from 27,454 trips in 1983 to 335,900 trips in 2014 (Mean = 174,653.4 trip). There has been an increasing trend over the time-series (R^2=0.7), specifically starting in 1993 (Figure 27).

Release Mortality

Since 30% of all recreationally caught Atlantic bonito are released, post-release mortality plays an important role in determining the total removals of the fishery. There are currently no estimates of post-release mortality of Atlantic bonito, but a physiological response to the catch process has been recorded (Skomal 2006).

LENGTH AND WEIGHT

Data Sources

All length and weight data utilized in this section comes from MRIP survey dating back to 1981. Because this is a recreational fishery survey, all data is affected by the selectivity of hook and line gear, with the possibility that smaller size classes may be underrepresented. The data was downloaded from the online MRIP query system (NMFS FSD 2023), and analysis was completed in R Studio (RStudio Team 2020).

Comparisons of length frequency data were made using a series of Kolmogorov & Smirnov (K-S) tests with a modified version of the clus.lf function in the fishmethods package. The data did not have a sampling unit (i.e., interview or shift) variable to use, so a generic haul variable was assigned to each group, eliminating the among sampling unit variance and simplifying the comparison.

Length-weight observations were transformed using logarithms. Estimated weights were calculated from the relationships and compared to the observed weights to calculate 95% confidence intervals (Wigley et al. 2003). Length-weight relationships were compared across MRIP sample waves (two-month sampling bins starting as January and February). The predicted weights across all observed lengths from each wave's length-weight relationship were compared using an analysis of covariance (ANCOVA).

Recreational Size Structure

There were 6,874 length samples collected by MRIP from 1981 to 2022 ranging from 15 to 113 cm (Mean = 50.6 cm; SD = 12.11 cm) (Figure 28). Annual mean length ranged from 35.5 cm in 2006 to 69.4 cm in 2010 (Table 16) with no significant trend across the time-series (Figure

29). There were no significant differences in length distributions amongst years (K-S Tests; $p>0.05$), and all annual distributions can be seen in Figure A3.1.

The Caribbean sub-region was excluded from the spatial comparisons due to a lack of samples (n=43 across all years). Of the remaining sub-regions, the samples were relatively evenly distributed. Mean length across the sub-regions ranged from 47.1 cm in the Mid-Atlantic, to 53.0 cm in the North Atlantic (Table 17). There were no significant differences in length distributions amongst sub-regions (K-S Tests; $p>0.05$) (Figure 30), and all annual distributions for each sub-regions can be seen in Figures A3.2-9. There was also no significant difference in length frequency distributions when grouped by month. (K-S Tests; $p>0.05$) (Figure 31),

There were 6,864 weight samples collected by MRIP from 1981 to 2022 ranging from <0.1 to 10.2 kg (Mean = 0.99 kg; SD = 0.844 kg) (Table 16). Annual mean weight ranged from 0.34 kg in 2006 to 3.30 kg in 2007 (Table 16), with no significant trend across the time-series (Figure 29). Mean weight across the sub-regions ranged from 0.87 kg in the Mid-Atlantic, to 1.07 in the North Atlantic (Table 17).

Length-Weight Relationships

The overall log-transformed length-weight relationship (Equation 1) showed a good fit ($R^2 = 0.94$) (Figure 32). When separated by wave, the R^2 values ranged from 0.86 for wave six to 0.96 for waves two and five (Table 18). Individual logarithmic length-weight relationships can be seen in Figure 33. When predicted weights were plotted with their 95% confidence intervals there was good agreement amongst waves except for some deviation in the larger sizes of wave one (Figure 34). The ANCOVA showed no significant difference in predicted weights amongst waves ($p>0.05$).

Equation 1.

$$log\ (W)\ =\ log\ (3.7E^{-6})\ +3.15log\ (L)$$

LIFE HISTORY

Growth and Maturity

We were unable to find any growth studies on Atlantic Bonito from the United States Atlantic coast or Gulf of Mexico. There has been a significant amount of work done on this species in the Eastern Atlantic, Mediterranean, and Black Sea Franicevic et al. 2015; Pons et al. 2019). Combined sex maximum size (L_∞) ranged from 62.5 cm (24.6 in) in Western Mediterranean (Valeiras et al. 2008) to 103 cm (40.6 in) in the Black Sea (Zusser 1954) (Mean = 77.51 cm or 30.35 in) (Table 19). Growth rates estimates (k) varied from 0.13 (Zusser 1954) to 0.86 (Demire 1963; Turgan 1958) (Table 19). Age at length zero (t_0) varied from -2.74 (Hansen 1989) to -0.44 (Cengiz 2013) (Mean = -1.55) (Table 19). The two studies that separated sex both found that males grow slower and to larger sizes than females (Cengiz 2013; Kahraman et al. 2018).

Similar to growth, there were no available papers from the United States Atlantic coast or Gulf of Mexico that examined maturity of bonito. There were maturity studies located in the Eastern Atlantic, Mediterranean, and Black Sea (Table 20). Male length at first maturity (L_{50}) ranged from 35.8 cm (14.1 in) in the Mediterranean (Cengiz 2013) to 41 cm (16.1 in) off the coast of Morocco (Baibbat et al. 2016) (Table 20). Female L_{50} ranged from 37 cm (14.6 in) (Postel 1954) to 45 cm (17.7 in) off the coast of Morocco (Dardignac 1962) (Table 20).

Distribution and Movements

Atlantic bonito are distributed throughout coastal waters of the Eastern Atlantic, Mediterranean, and in Western Atlantic, from the Nova Scotia to Uruguay (Valerias and Abad 2006). Larvae are pelagic and limited to the warmest part of the water column, above the thermocline (Reglero et al. 2018). These larvae range from 4 mm at hatching to 2 cm when they

are considered juveniles (Valerias and Abad 2006). Other small tuna larvae off Florida have been shown to feed almost exclusively on appendicularians (Llopiz et al. 2010), but there has been no work specific to Atlantic bonito larvae.

Adult Atlantic bonito remain within the waters of the continental shelf and may move into estuaries (Valerias and Abad 2006). They school by size with other Scombrids but can scatter during certain times of the year (Collette and Nauen 1983). In the Western Atlantic, bonito feed mainly on *clupeids*, *Peprilus paru*, *Leiosomus xanthurus*, *Anchoa sp*, *Scomberomorus sp*., *Prionotus sp*., *Loligo sp*., *Penaeus sp*., and squid (Bigelow and Schroeder 1953; Boschung 1966). Along the East Coast of the United States, adults most likely move as far North as Canada during the summer and early fall, before migrating back to the South for the winter, but there is a lack of official documentation of these migrations. Bonito can tolerate temperatures from 12° to 27°C and salinities 14 to 39 (Bianchi et al. 1999).

Spawning

Atlantic bonito exhibit asynchronous oocyte development and multiple spawning events throughout the spring and summer, with eggs being shed in several batches (Majorova and Tkacheva 1959; Rey et al., 1984; Kahraman 2014). Spawning has also been shown to be affected by the North Atlantic Oscillation (Baez et al. 2019). Spawning typically occurs near the coast (Valerias and Abad 2006). In the Northwest Atlantic, spawning occurs in three to four batches during the summer, with a peak in June and July. A similar spawning season is seen in the Mediterranean and Eastern Atlantic (Valerias and Abad 2006; Kahraman et al. 2014). There is limited information on the fecundity of bonito. Bonito exhibit indeterminate fecundity with estimates ranging from 304,000 and 1,150,000 oocytes (Macias et al 2005; Valerias and Abad 2006).

Natural Mortality

There is little published information about Atlantic bonito natural mortality. Various methods of estimation using life history traits have been published, some of which have been summarized by Vetter (1988). Along the southern Atlantic coast of Morocco, natural mortality was estimated to be 0.46, using a method based on fish longevity (Baibbat et al. 2019). In the northeastern region of the Atlantic Ocean, four methods were used to calculate Atlantic bonito natural mortality, with estimates ranging from 0.509 to 0.869 and a mean value of 0.695 (Petukhova 2020). Potential sources of Atlantic Bonito natural mortality include predation, disease, and environmental stress. Primary predators of Atlantic Bonito are wahoo, mahi mahi, and both adult and juvenile Atlantic bonito (Collette and Nauen 1983; Valerias and Abad 2006).

RESEARCH RECOMMENDATIONS

Fisheries Data

A more exhaustive review of fisheries catch data should be undertaken in order to estimate the total removals of the fishery and examine the uncertainty in these estimates. If possible, length data from commercial landings should be applied to the total landings to estimate catch at length. Fleet wide commercial discards need to be estimated using the appropriate methodology. With the majority of commercial discards occurring in gill net fisheries, survival of these fish is most likely low. For recreational landings, there is length data that could be applied to get catch at length. However, research will need to examine the effects of location and season on the groupings when applying length frequencies to landings. A more thorough investigation into recreational discards, including an examination of the uncertainty surrounding the estimate will better describe the number of fish discarded annually. Due to the harvest of immature bonito occurring recently, efforts should be made to estimate these removals specifically.

Biosampling

There have been minimal studies on the life history of Atlantic bonito in United States waters. Life history parameters such as growth, maturity, and fecundity play a large role in stock assessment modeling. Effort should be put forth to take biological samples from harvested bonito along the Atlantic coast. These samples could include otoliths to estimate growth, gonads to estimate length at first maturity and fecundity, and tissue samples for genetic testing to evaluate stock structure.

Tagging

With more than 34% of recreationally caught Atlantic bonito being released, post-release mortality and the factors effecting it will be crucial in determining total removals by the fishery. Tagging projects can help refine the estimate of mortality and provide advice as to minimizing mortality. Tagging studies can also estimate natural mortality and population size, important components of any future assessment.

Fishery CPUE

Fisheries independent surveys are used to track population trends for many species. Since Atlantic bonito do not show up in any fisheries independent surveys, some measure of recreational catch per unit effort (CPUE) could be used to standardize catch through the years and track fluctuations in the population. This should be done by isolating trips that targeted bonito. For-hire vessels would most likely have the best catch rates and consistent methods, making them best suited for a CPUE study.

Economics

An analysis that examines the economic impact of the recreational bonito fishery will help to justify precautionary approaches to management of the stock. Since the majority of this fishery is recreational and 30% is released, the economic value is harder to elucidate than just putting a dollar value on landings. In recreational fisheries revenue is generated through charters, tackle shops, marinas, and general tourism to areas where the fishery is occurring. Including these factors in an analysis that can estimate the impact bonito has on local economies may help justify the need for management.

REFERENCES

Ateş, C., Deval, C.M., Bök, T. 2008. Age and growth of Atlantic bonito (*Sarda sarda* Bloch, 1793) in the Sea of Marmara and Black Sea, Turkey. J. Appl. Ichthyol. 24: 546–550.

Baez, J.C., Munoz-Exposito, P., Gomez-Vives, M.J., Fodoy-Garrido, D. 2019. The NAO affects the reproductive potential of small tuna migrating from the Mediterranean Sea. Fish. Res. 216: 41-46.

Baibbat, S., Malouli, I., Abid, N. and Benazzouz, B. 2016. Study of the reproduction of Atlantic bonito (*Sarda sarda*) in South Atlantic Ocean of Morocco. Aquaculture, Aquarium, Conservation & Legislation – Int. J. Bioflux Soc. 9:954–964.

Bianchi, G., Carpenter, K.E., Roux, J.P., Mollow, F.J., Boyer, D., Boyer, H.J. 1999. Field Guide to the Living Marine Resources of Namibia. FAO species identification guide for fishery purposes. Rome, FAO. 265 pp.

Bigelow, H.B., Schroeder, W.C. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv. 53: 577 pp.

Boschung, H.T. 1966. The occurrence of common bonito, *Sarda sarda,* in the Northern Gulf of Mexico. Trans. Am. Fish. Soc. 95: 227-228.

Cayré, P., Amon Kothias, J.B., Diouf, T., Stretta, J.M. 1993. Biology of tuna. In: Resources, fishing and biology of the tropical tunas of the Eastern Central Atlantic. FAO Fisheries Technical Paper. A. Fonteneau and J. Marcille (eds.) FAO, Rome, Italy, p 354.

Cengiz, 0. 2013. Some biological characteristics of Atlantic bonito (*Sarda sarda* Bloch, 1793) from Gallipoli Peninsula and Dardanelles (northeastern Mediterranean, Turkey). Turk. J. Zool., 37(1): 78-83.

Collette, B., Nauen, C.E. 1983. FAO Species Catalogue, Vol. 2: Scombrids of the World. An Annotated and Illustrated Catalogue of Tunas, Mackerels, Bonitos and Related Species Known to Date. FAO Fisheries Synopsis 125(2): 129 pp.

Dardignac, J. 1962. La bonite du Maroc Atlantique (*Sarda sarda*, Bloch). Rev. Trav. Inst. Pêches Marit., 26(4): 399-406.

Demir, M. 1963. Synopsis of biological data on bonito *Sarda sarda* (Bloch) 1793. FAO Fish. Rep. 6(2):101-129.

Federal Register. 1982. Gulf of Mexico and South Atlantic coastal migratory pelagic resources. 48(25): 5270.

Franicevic, M., Sinovcic, G., Cikes Kec, V., Zorica, B. 2005. Biometry analysis of the Atlantic bonito, *Sarda sarda* (Bloch, 1793), in the Adriatic Sea. Acta. Adriat. 46(2):213-222.

Hansen, J.E. 1987. Aspectos biológicos y pesqueros del bonito del Mar Argentino (Pisces, Scombridae, *Sarda sarda*). Collective Volume of Scientific Papers, ICCAT 26, 441–442.

ICCAT. 2016. Geographical Definitions. Version 2016.02 EN.

ICCAT. 2017. Report of the 2017 Small tunas species group intersessional meeting, Miami, United States, 24–28 April 2017. Collect. Vol. Sci. Pap. ICCAT., 74: 1–75.

ICCAT. 2019. Report for biennial period, 2018-2019 English version SCRS. Section 9.12 SMT – Small Tunas, pp 194-214. Madrid, Spain.

ICCAT. 2021. Report of the 2021 ICCAT Small Tunas Species Group Intersessional Meeting. Online. May 17-20 2021. 34 pp.

Isaac, V., Santo, R.E., Bentes, B., Mourao, K.R.M., Lucena-Fredou, F. 2012. The *Scomberomorus brasiliensis* gill-net production system in Northern Brazil; an Invisible and Mismanaged Small-scale Fishery. In: Moksness, E., Dahl, E., Stottrup, J. (eds) Global challenges in integrated coastal zone management. Wiley, Oxford, pp 49–60

Kahraman, A.E., Göktürk, D., Yildiz, T., Uzer, U. 2014. Age, growth, and reproductive biology of Atlantic bonito (*Sarda sarda* Bloch, 1793) from the Turkish coasts of the Black Sea and the Sea of Marmara. Tur. J. of Zoo. 38:614–621.

Kotsiri, M., Batjakas, I.E., Megalofonou, P. 2018. Age, growth and otolith morphometry of Atlantic bonito (Sarda sarda Block, 1793) from the eastern Mediterranean Sea. Acta. Adriat., 59(1): 97-110.

Kutaygil, N. 1967. Preliminary age analysis of *Mullus barbatus L.* and *Merlucius merlucius L.* in the Sea of Marmara and some pelagic fish of Turkey. FAO Proc. Tech. Pap. Gen. Fish. Counc. Medit. 8: 361–383.

Llopiz, J.K., Richardson, D.E., Shiroza, A., Smith, S.L., Cowen, R.K. 2010. Distinctions in the diets and distributions of larval tunas and the important role of appendicularians. Limnol. Oceanogr. 55(3): 983-996

Lucena-Fredou, F., Mourato, B., Fredou, T., Lino, P.G., Munoz-Lechuga, R., Palma, C., Soares, A., Pons, M. 2021. Review of the life history, fisheries, and stock assessment for small tunas in the Atlantic Ocean. Rev. Fish. Biol. Fisheries., 31: 709–736.

Macias, D., Lema, L., Gómez-Vives, M. J., Ortiz de Urbina, J. M. de la Serna, J. M., 2006. Some biological aspects of small tunas (*Euthynnus alletteratus*, *Sarda sarda* & *Auxis rochei*) from the Southwestern Spanish Mediterranean traps. Collect. Vol. Sci. Pap. ICCAT. 59(2): 579-589.

Majkowski, J. 2007 Global fishery resources of tuna and tuna-like species. FAO Fisheries Technical Paper, vol 483, 54p

Majorova, A., Tkacheva, K.S. (959. Distribution and conditions of reproduction of pelamid, *Sarda sarda* (Bloch), in the Black Sea according to data for the period 1956–1957. Proc. Tech. Pap. GFCM. 5: 509–514.

Mayorova, A., Tkacheva K.S. 1959. Distribution and conditions of reproduction of pelamid, *Sarda sarda* (Bloch), in the Black Sea according to data for the period 1956-1957. Proc. Tech. Pap. GFCM, 5: 509-514.

Nikolov, D.K. 1960. Biology of the bonito *Sarda sarda* (Bloch) from the Black Sea. Trud. Nauch.-issled. Inst. Rib. Prom. Varna. 3: 91–115 (in Bulgarian).

Nikolsky, G.W. 1957. Spezielle Fischkunde, VEB Deutscher Verlag der Wissenschaften, Berlin.

NMFS FSD, 2023.Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division

Numann, W., 1954. Growth and migration of short-finned tuna (Sarda sarda) in Turkish waters. Document technique, 42: 377-379.

Petukhova, N.G. 2020. Preliminary Assessment of the Stock Status of Atlantic Bonito (*Sarda sarda*) in the Northeastern Part of the Atlantic Ocean. J. Ich., 60(5): 732–741.

Postel, E. 1954. Contribution à l'étude des thonidés de l'Atlantique tropical. J. Cons. CIEM 19: 356–362.

Pons, M. 2018. Stock Status and Management in Tuna Fisheries: from data-rich to data-poor. PhD Dissertation. University of Washington, School of Aquatics and Fishery Science.

Pons, M., Kell, L., Rudd, M.B., Cope, J.M., Lucena-Fre´dou, F. 2019A. Performance of length-based data-limited methods in a multifleet context: application to small tunas, mackerels, and bonitos in the Atlantic Ocean. ICES. J. Mar. Sci., 76(4): 960–973.

Pons, M., Lucena-Fredou, F., Fredou, T., Mourato, B. 2019B. Implementation of length-based and catch-based data limited methods for small tunas. SCRS/2019/063

Reglero, P., Blanco1, E., Alemany1, F., Ferrá1, C., Alvarez-Berastegui, D., Ortega, A., de la Gándara, F., Aparicio-González1, A., Folkvord, A. 2018. Vertical distribution of Atlantic bluefin tuna *Thunnus thynnus* and bonito *Sarda sarda* larvae is related to temperature preference. Mar. Ecol. Prog. Ser. 594: 231-243.

Rey, J.C., Cort, J.L. 1981. Migration de bonitos (*Sarda sarda*) y bacoreta (*Euthynnus alletteratus*) entre el Mediterraneo y el Atlantico. Collect. Vol. Sci. Pap. ICCAT, 15(2): 346-347.

Rey, J.C., Alot, E., Ramos, A. 1984. Sinopsis biológica del bonito, *Sarda sarda* (Bloch), del Mediterráneo y Atlántico Este (Biology Synopsis of bonito, *Sarda sarda* (Bloch) from Mediterranean and eastern Atlantic). ICCAT, Coll. Sci. Pap., 20 (2): 469-502.

RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL http://www.rstudio.com/.

Saber, S., Ortiz de Urbina, J., Lino, P.G., Gómez-Vives, M.J., Coelho, R., Lechuga, R., Macias, D. 2017. Biological samples collection for growth and maturity studies EU Portugal and Spain: Northeastern Atlantic and Western Mediterranean. 41 pp. ICCAT, Madrid.

Santamaria, N., Deflorio, M., De Metrio, G. 2005. Preliminary study on age and growth of juveniles of *Sarda sarda*, Bloch and *Euthynnus alletteratus*, Rafinesque, caught by clupeoids purse seine in the Southern Italian Seas. Collect. Vol. Sci. Pap. ICCAT, 58(2): 630-643.

Skomal, G.B. 2006. The Physiological Effects of Capture Stress on Post-Release Survivorship of Sharks, Tuna, and Marlin. PhD Dissertation. Boston University Graduate School of Arts and Sciences.

Tkacheva, K.C. 1958. Conditions of pelamids stocks in the Blacksea and fishery prospectives. Rybn. Khoz., 34: 10-13.

Turan, C. 2015. Microsatellite DNA reveals genetically different populations of Atlantic bonito *Sarda sarda* in the Mediterranean Basin. Biochem. Syst. Ecol. 63: 174–182.

Türgan, G. 1958. The age determination of bonitos and pelamids. Balık ve Balıkçılık 6(3): 18–20.

Valeiras, J., Abad, E. 2006. Manual de ICCAT, Descripción de la bacoreta. Publicaciones ICCAT; Comisión Internacional para la Conservación del Atún Atlántico. 199-207.

Valeiras, X., Macías, D., Gómez, M.J., Lema, L., Alot, E., Ortiz de Urbina, J.M., De la Serna, J.M. 2008. Age and growth of Atlantic bonito (*Sarda sarda*) in western Mediteranean Sea. Collect. Vol. Sci. Pap. ICCAT 62(5): 1649–1658.

Vetter, E.F. 1988. Estimation of natural mortality in fish stocks: a review. Fishery Bulletin. 86(1): 25-43.

Vinas, J., Alvarado Bremer, J.R., Pla, C. 2004. Phylogeography of the Atlantic bonito (*Sarda sarda*) in the Northern Mediterranean: the combined effects of historical vicariance, population expansion, secondary invasion, and isolation by distance. Mol. Phylogen. Evol. 33(1): 32–42.

Vinas, J. et al. 2020. Population genetic of Atlantic Bonito in The Northeast Atlantic and Mediterranean. Collect. Vol. Sci. Pap. ICCAT, 77(9): 6–12.

Wigley S.E., H.M. McBride, N.J. McHugh. 2003. Length-weight relationships for 74 fish species collected during NEFSC research vessel bottom trawl surveys, 1992-9. NOAA Tech Memo NMFS NE 171; 26 p.

Zaboukas, N., Megalofonou, P. 2007. Age estimation of the Atlantic bonito in the eastern Mediterranean Sea using dorsal spines and validation of the method. Sci. Mar. 71(4): 691–698.

Zusser, S.G. 1954. Biology and fishery for bonito in the Black Sea. Tr. VNIRO 28:160-174.

TABLES

Table 1. A summary of commercial landings (lbs.) from 1950-2021 by region.

	Mid-Atlantic	North Atlantic	South Atlantic	Total
Min	3	5	100	25378
Max	205472	275500	148442	562005
Mean	21749.9	26739.3	16476.4	155040.6
SD	32527.27	41182.33	23235.10	119493.61

Table 2. A summary of commercial landings (lbs.) from 1950-2021 by state.

State	Min	Max	Mean	SD
MAINE	-	-	-	-
NEW HAMPSHIRE	25	25	25.0	0.00
MASSACHUSETTS	100	138900	20459.4	30500.70
RHODE ISLAND	100	275500	44965.2	50513.08
CONNECTICUT	5	5000	480.0	944.34
NEW YORK	500	93274	21426.8	22618.07
NEW JERSEY	200	205472	39226.7	44758.86
DELAWARE	500	500	500.0	#DIV/0!
MARYLAND	13	105020	5907.1	19798.48
VIRGINIA	3	43700	6656.0	9831.85
NORTH CAROLINA	224	42372	13695.1	9554.28
SOUTH CAROLINA	473	5673	2656.5	1617.40
GEORGIA	-	-	-	-
FLORIDA	100	148442	23802.4	32342.04

Table 3. A summary of recreational landings (lbs.) from 1981-2021 by region.

	Mid-Atlantic	North Atlantic	South Atlantic	Total
Min	4	4	86	69609
Max	10119563	1707819	1911323	11527512
Mean	210507.4	80673.9	88941.8	960365.7
SD	1007861.60	190887.91	258164.69	1880829.84

Table 4. A summary of recreational landings (lbs.) from 1981-2021 by state.

State	Min	Max	Mean	SD
MAINE	0	27	27.0	0.00
NEW HAMPSHIRE	0	4	1.2	1.64
MASSACHUSETTS	1	219	42.3	46.84
RHODE ISLAND	0	775	50.0	131.27
CONNECTICUT	0	93	12.5	20.45
NEW YORK	0	352	42.4	71.64
NEW JERSEY	3	4590	240.1	784.94
DELAWARE	0	10	2.5	3.30
MARYLAND	0	368	28.5	79.77
VIRGINIA	0	95	12.7	24.41
NORTH CAROLINA	2	130	27.8	27.62
SOUTH CAROLINA	0	14	3.3	3.61
GEORGIA	0	6	1.8	1.93
FLORIDA	0	867	123.1	235.50

Table 5. Percentage of recreational landings by each mode of fishing from 1981-2021 by region.

Region	Shore	For Hire	Private
Mid-Atlantic	1%	71%	28%
North Atlantic	22%	35%	42%
South Atlantic	7%	12%	81%
Total	5%	42%	33%

Table 6. Percentage of recreational landings by each mode of fishing from 1981-2021 by state.

State	Shore	For Hire	Private
MAINE	0%	0%	100%
NEW HAMPSHIRE	70%	4%	26%
MASSACHUSETTS	40%	4%	56%
RHODE ISLAND	11%	65%	24%
CONNECTICUT	2%	9%	89%
NEW YORK	5%	23%	72%
NEW JERSEY	1%	77%	22%
DELAWARE	7%	76%	17%
MARYLAND	0%	76%	24%
VIRGINIA	0%	57%	43%
NORTH CAROLINA	6%	16%	78%
SOUTH CAROLINA	0%	63%	37%
GEORGIA	0%	44%	56%
FLORIDA	8%	7%	85%

Table 7. Percentage of recreational landings in federal and state waters from 1981-2021 by region.

Region	Federal	State
Mid-Atlantic	93%	7%
North Atlantic	45%	55%
South Atlantic	65%	35%
Total	78%	22%

Table 8. Percentage of recreational landings in federal and state waters from 1981-2021 by state.

State	Federal	State
MAINE	100%	0%
NEW HAMPSHIRE	13%	87%
MASSACHUSETTS	12%	88%
RHODE ISLAND	76%	24%
CONNECTICUT	7%	93%
NEW YORK	57%	43%
NEW JERSEY	97%	3%
DELAWARE	93%	7%
MARYLAND	100%	0%
VIRGINIA	94%	6%
NORTH CAROLINA	49%	51%
SOUTH CAROLINA	95%	5%
GEORGIA	92%	8%
FLORIDA	72%	28%

Table 9. The percentage of catch landed vs discarded from 1981-2021 by region.

Region	Landings	Discards
Mid-Atlantic	80%	20%
North Atlantic	54%	46%
South Atlantic	54%	46%
Total	70%	30%

Table 10. A summary of recreational discards (individuals) from 1981-2021 by region.

	Mid-Atlantic	North Atlantic	South Atlantic	Total
Min	2	12	0.9	5691
Max	499606	378413	59925	826667
Mean	38691.5	15599.7	8646.3	148082.2
SD	82182.82	43601.01	12091.12	164562.46

Table 11. A summary of recreational discards (individuals) from 1981-2021 by state.

State	Min	Max	Mean	SD
MAINE	97	97	97.0	0.00
NEW HAMPSHIRE	408	8933	3686.75	3902.149
MASSACHUSETTS	223	378413	27835.3	67226.93
RHODE ISLAND	12	43964	8397.1	10505.91
CONNECTICUT	25	36055	7681.8	10453.02
NEW YORK	109	68779	9084.5	14581.08
NEW JERSEY	66	289811	60140.0	90331.35
DELAWARE	2	3375	900.4	1183.18
MARYLAND	139	10700	3821.4	3444.39
VIRGINIA	59	9361	2736.9	2824.90
NORTH CAROLINA	368	59925	14277.4	13964.09
SOUTH CAROLINA	34	45664	5006.2	9132.64
GEORGIA	0.9	15362	2247.6	3983.87
FLORIDA	22	499606	94555.5	122963.48

Table 12. Percentage of recreational discards by each mode of fishing from 1981-2021 by region.

Region	Shore	For Hire	Private
Mid-Atlantic	23%	16%	61%
North Atlantic	25%	1%	74%
South Atlantic	6%	7%	87%
Total	19%	9%	72%

Table 13. Percentage of recreational discards by each mode of fishing from 1981-2021 by state.

State	Shore	For Hire	Private
MAINE	0%	100%	0%
NEW HAMPSHIRE	0%	0%	100%
MASSACHUSETTS	28%	1%	70%
RHODE ISLAND	25%	2%	73%
CONNECTICUT	0%	0%	100%
NEW YORK	11%	2%	87%
NEW JERSEY	26%	18%	56%
DELAWARE	20%	6%	74%
MARYLAND	0%	20%	80%
VIRGINIA	0%	27%	73%
NORTH CAROLINA	11%	5%	84%
SOUTH CAROLINA	0%	24%	76%
GEORGIA	0%	2%	98%
FLORIDA	3%	6%	92%

Table 14. Percentage of recreational discards in federal and state waters from 1981-2021 by region.

Region	Federal	State
Mid-Atlantic	68%	32%
North Atlantic	16%	84%
South Atlantic	63%	37%
Total	51%	49%

Table 15. Percentage of recreational discards in federal and state waters from 1981-2021 by state.

State	Federal	State
MAINE	0%	100%
NEW HAMPSHIRE	3%	97%
MASSACHUSETTS	10%	90%
RHODE ISLAND	40%	60%
CONNECTICUT	9%	91%
NEW YORK	49%	51%
NEW JERSEY	70%	30%
DELAWARE	38%	62%
MARYLAND	99%	1%
VIRGINIA	61%	39%
NORTH CAROLINA	50%	50%
SOUTH CAROLINA	63%	37%
GEORGIA	95%	5%
FLORIDA	73%	27%

Table 16. A summary of length and weight data for each year of the MRIP survey from 1981-2022.

Year	Count	Length				Weight			
		Min	Max	Mean	SD	Min	Max	Mean	SD
1981	154	21	85	50.6	10.93	0.1	3.1	0.87	0.597
1982	155	15	77	53.3	12.11	0.0	4.0	1.18	0.766
1983	53	26	78	57.1	12.04	0.3	2.6	1.41	0.575
1984	81	23	78	55.7	11.10	0.2	2.6	1.34	0.640
1985	98	33	88	52.9	8.68	0.3	5.6	1.14	0.665
1986	285	26	88	54.7	7.23	0.1	3.4	1.21	0.475
1987	259	27	75	53.4	10.07	0.1	3.2	1.15	0.625
1988	596	23	79	47.4	14.25	0.0	2.2	1.01	0.553
1989	515	25	80	51.6	8.46	0.0	3.7	1.10	0.534
1990	244	20	74	52.4	9.25	0.0	2.5	1.04	0.434
1991	345	24	88	54.2	7.88	0.1	5.0	1.16	0.642
1992	234	30	74	54.6	7.29	0.2	3.1	1.24	0.411
1993	192	17	71	51.0	10.61	0.0	2.8	1.08	0.535
1994	214	23	81	41.1	13.71	0.1	3.6	0.64	0.664
1995	104	28	77	47.6	10.65	0.2	2.3	0.83	0.545
1996	72	22	77	46.3	12.64	0.1	3.0	0.88	0.660
1997	221	19	75	54.0	7.44	0.0	3.6	1.22	0.549
1998	165	17	77	53.3	8.63	0.0	3.3	1.16	0.745
1999	103	17	75	48.8	14.40	0.0	2.6	0.99	0.623
2000	162	17	73	48.2	13.60	0.0	3.2	1.03	0.760
2001	197	29	74	54.6	10.49	0.1	3.1	1.21	0.599
2002	265	33	77	54.9	7.85	0.2	3.5	1.21	0.448
2003	85	31	86	51.8	12.10	0.2	3.5	1.15	0.743
2004	103	36	72	55.1	7.08	0.2	3.0	1.20	0.454
2005	32	30	72	53.8	9.94	0.2	3.0	1.19	0.615
2006	72	30	58	35.5	8.45	0.2	1.5	0.34	0.327
2007	69	32	113	67.1	27.84	0.2	10.2	3.30	4.005
2008	30	51	72	61.0	6.55	0.9	3.0	1.87	0.693
2009	22	38	84	53.2	10.58	0.4	4.8	1.22	1.047
2010	29	31	84	69.4	12.84	0.3	4.8	2.84	1.326
2011	65	30	83	65.1	13.56	0.2	4.6	2.28	1.184
2012	89	19	83	62.2	12.25	0.0	4.6	1.91	1.085
2013	43	40	61	53.1	5.53	0.4	1.2	0.88	0.222
2014	140	28	79	43.5	8.50	0.2	4.0	0.61	0.450
2015	59	20	73	51.9	9.87	0.0	3.2	1.11	0.746
2016	52	29	76	50.6	10.18	0.2	3.6	1.01	0.699
2017	91	25	79	46.0	12.41	0.1	3.6	0.81	0.790
2018	204	19	72	43.7	12.31	0.0	3.0	0.70	0.554
2019	362	20	73	43.4	10.08	0.0	3.2	0.63	0.535
2020	352	22	80	46.1	10.41	0.0	3.4	0.76	0.580
2021	111	24	64	50.6	7.74	0.1	1.8	0.95	0.405
2022	140	15	87	41.7	15.91	0.0	4.5	0.75	0.897
Total	**6864**	**15**	**113**	**50.6**	**12.11**	**0.0**	**10.2**	**1.06**	**0.828**

Table 17. A summary of length and weight data for each region of the MRIP survey.

Values	Carribean	Gulf of Mexico	Mid-Atlantic	North Atlantic	South Atlantic	Grand Total
Count of Length	43	1025	1598	2054	2144	6864
Min of Length	40	21	20	15	15	15
Max of Length	61	88	85	113	88	113
Average of Length	53.1	50.9	47.1	53.0	50.7	50.6
StdDev of Length	5.53	12.61	10.05	11.14	13.58	12.11
Min of Weight	0.4	0.1	0.0	0.0	0.0	0.0
Max of Weight	1.2	3.5	5.6	10.2	5.0	10.2
Average of Weight	0.88	0.89	0.87	1.07	1.05	0.99
StdDev of Weight	0.222	0.708	0.572	0.975	0.927	0.844

Table 18. A summary of length-weight parameters for waves 1-6.

Wave	a	b	log(a)	SE	R^2
1	1.6E-05	2.79	-11.07	0.021	0.93
2	1.8E-06	3.34	-13.25	0.005	0.96
3	4.9E-06	3.08	-12.24	0.006	0.93
4	5.7E-06	3.05	-12.08	0.003	0.91
5	2.7E-06	3.24	-12.84	0.003	0.96
6	2.6E-06	3.23	-12.84	0.007	0.86
Total	**3.7E-06**	**3.1543**	**-12.508**	**0.003**	**0.94**

Table 19. A summary of von Bertalanffy growth parameters from various studies on Atlantic bonito around the world.

Original Citation	Area/Region	Sex	n	Method	L_{inf} (cm)	L_{inf} (in)	k	t_0	Max Age	Min L_{obs} (cm)	Min L_{obs} (in)	Max L_{obs} (cm)	Max L_{obs} (in)
Baibbat et al. (2016)	Morocco	Combined	2688		73.0	28.7	0.31	-2.45	5	31	12.2	74	29.1
		Combined	238	Otoliths	69.8	27.5	0.76	-0.44	-	23.8	9.4	72	28.3
Cengiz (2013)	Medditeranean	Male	82	Otoliths	72.2	28.4	0.69	-0.52	-	26.6	10.5	69.5	27.4
		Female	100	Otoliths	68.5	27.0	0.78	-0.34	-	28	11.0	72	28.3
Dardignac (1962)	Morocco	Combined	878	Spiues	64.0	25.2	0.69	-1.42	-	19	7.5	72	28.3
Rey et al. (1984)	Gibraltar, Spain	Combined	878	-	80.8	31.8	0.35	-1.7	-	19	7.5	71.5	28.1
Zusser (1954)	Black Sea, Russia	Combined	-	-	103.0	40.6	0.13	-1.8	-	-	-	-	-
Numann (1955)	Black Sea, Turkey	Combined	-	-	67.8	26.7	0.79	-	-	-	-	-	-
Nikolsky (1957)	Black Sea, Turkey	Combined	-	-	81.5	32.1	0.52	-	-	-	-	-	-
Turgan (1958)	Black Sea, Turkey	Combined	-	-	64.0	25.2	0.86	-	-	-	-	-	-
Niklov (1960)	Black Sea, Bulgaria	Combined	-	-	95.6	37.6	0.24	-1.24	-	-	-	-	-
Hansen (1989)	Argentina	Combined	-	-	74.6	29.4	0.22	-2.74	-	-	-	-	-
Cayre et al. (1993)	NE Atlantic	Combined	-	-	80.8	31.8	0.35	-1.7	5	-	-	-	-
Santamaria et al. (1998)	Ionian Sea, Italy	Combined	-	-	80.6	31.7	0.36	-1.37	-	-	-	-	-
Kahraman et al. (2014)	Black Sea and Sea of Maramara	Combined	212	Spine and Otolith	67.9	26.7	0.463	-1.22	-	17.7	7.0	63	24.8
		Male	89		74.6	29.4	0.364	-1.518	-	23	9.1	56.5	22.2
		Female	100		69.6	27.4	0.439	-1.327	-	25.5	10.0	63	24.8
Kotsiri et al. (2018)	Eastern Mediterranean Sea	Combined	502	Otolith	79.9	31.5	0.261	-1.23	7	7.2	2.8	70.4	27.7
Petukhova (2020)	Russia, Northeastern Atlantic Ocean	Combined	5634	-	75.6	29.8	0.41	-	-	22.3	8.8	72.5	28.5
Valeiras et al. (2008)	Western Mediterranean	Combined	136	Spines	62.5	24.6	0.719	-1.21	3	40	15.7	61	24.0
Tkacheva (1958)	Black Sea and Eastern Mediterranean	Combined	-	-	67.8	26.7	0.795	-	-	-	-	-	-
Mayorova and Tkacheva (1959)	Black Sea and Eastern Mediterranean	Combined	-	-	81.5	32.1	0.525	-	-	-	-	-	-
Demir (1963)	Black Sea and Eastern Mediterranean	Combined	-	-	64.0	25.2	0.86	-	-	-	-	-	-
Kutaygil (1967)	Black Sea and Eastern Mediterranean	Combined	-	-	95.6	37.6	0.237	-1.24	-	-	-	-	-
Zaboukas and Megalofonou (2007)	Eastern Mediterranean	Combined	397	Spines	83.0	32.7	0.24	-0.77	7	2.2	0.9	72.5	28.5

Table 20. A summary of maturity estimates from various studies on Atlantic bonito around the world.

Original Citation	Area/Region	Sex	n	L_{50} (cm)	L_{50} (in)
Baibbat et al. (2016)	Morocco	Combined	2688	42.6	16.8
		Male	83	41	16.1
		Female	75	40	15.7
Cenzig (2013)	Mediterranean	Male	82	35.8	14.1
		Female	100	41.9	16.5
Dardignac (1962)	Morocco	Male	-	40	15.7
		Female	-	45	17.7
Rey et al. (1984)	Gibraltar Spain	Male	242	38	15.0
		Female	229	39	15.4
Ates et al. (2008)	Black Sea and Marmara Sea, Turkey	Combined	694	36.9	14.5
Postel (1954)	East Atlantic	Male	-	39.2	15.4
		Female	-	37	14.6
Kahraman et al. (2014)	Black Sea and Marmara Sea, Turkey	Male	89	36.8	14.5
		Female	100	42.5	16.7
Petukhova (2020)	Russia, Northeastern Atlantic Ocean	Combined	5634	44.7	17.6
Saber et al. (2017)	Mediterranean	Combined		39.9	15.7

FIGURES

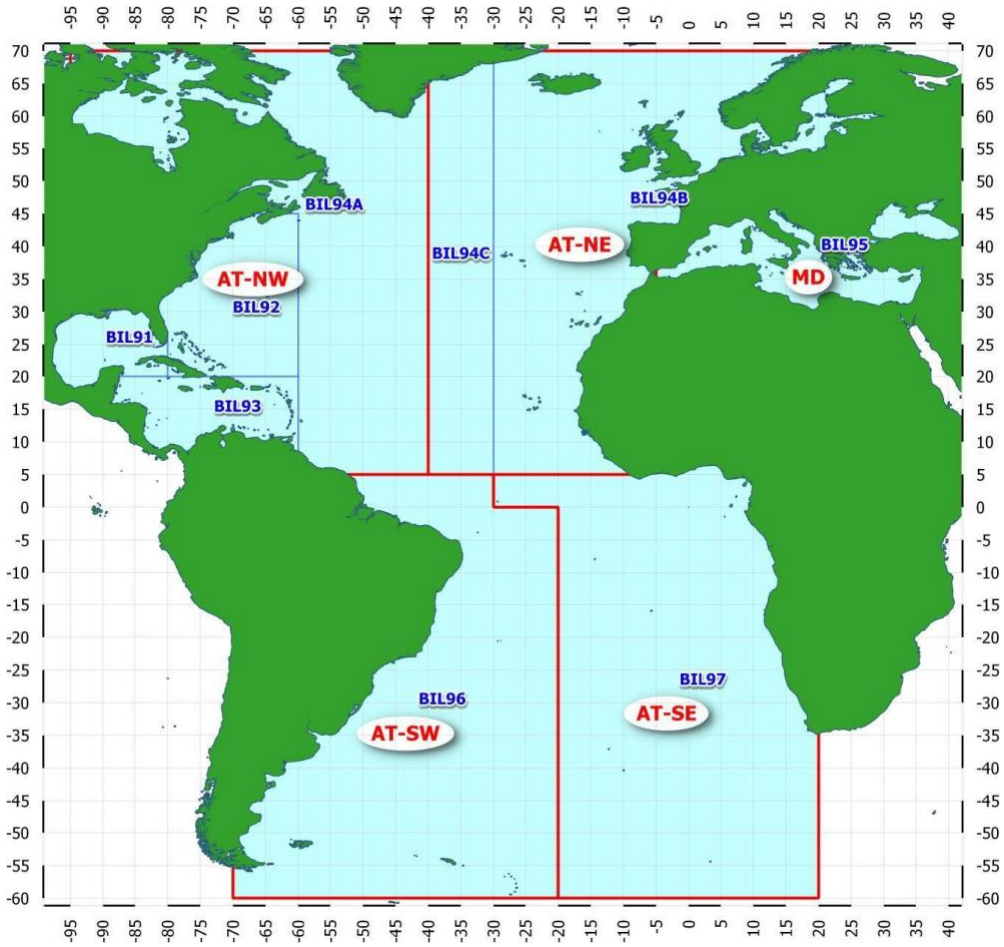

Figure 1. The five management units used by ICCAT for small tunas (ICCAT 2016).

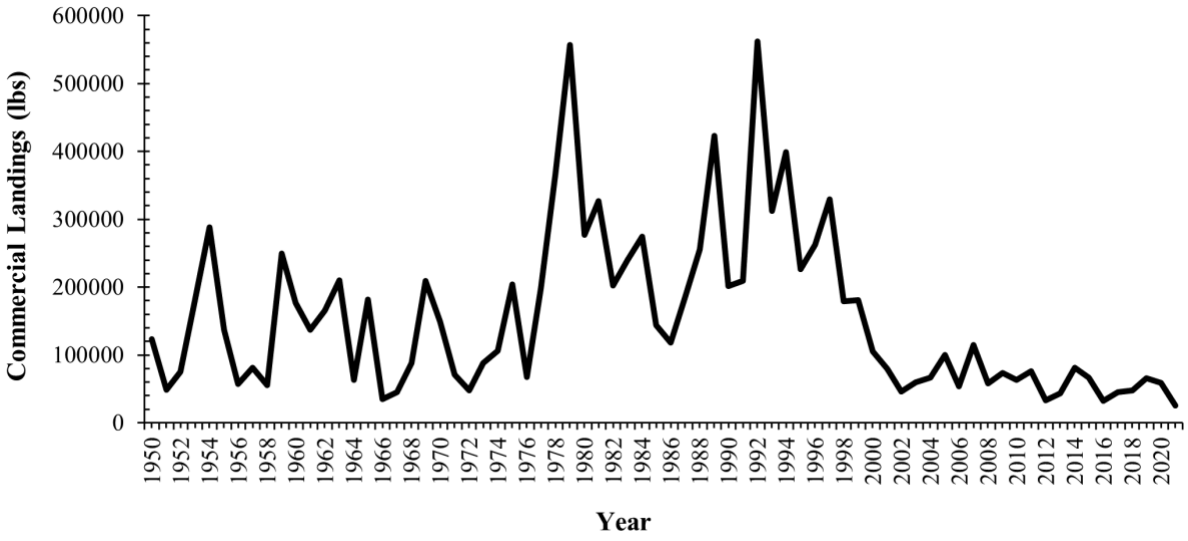

Figure 2. Total commercial landings (lbs.) from 1950 to 2021.

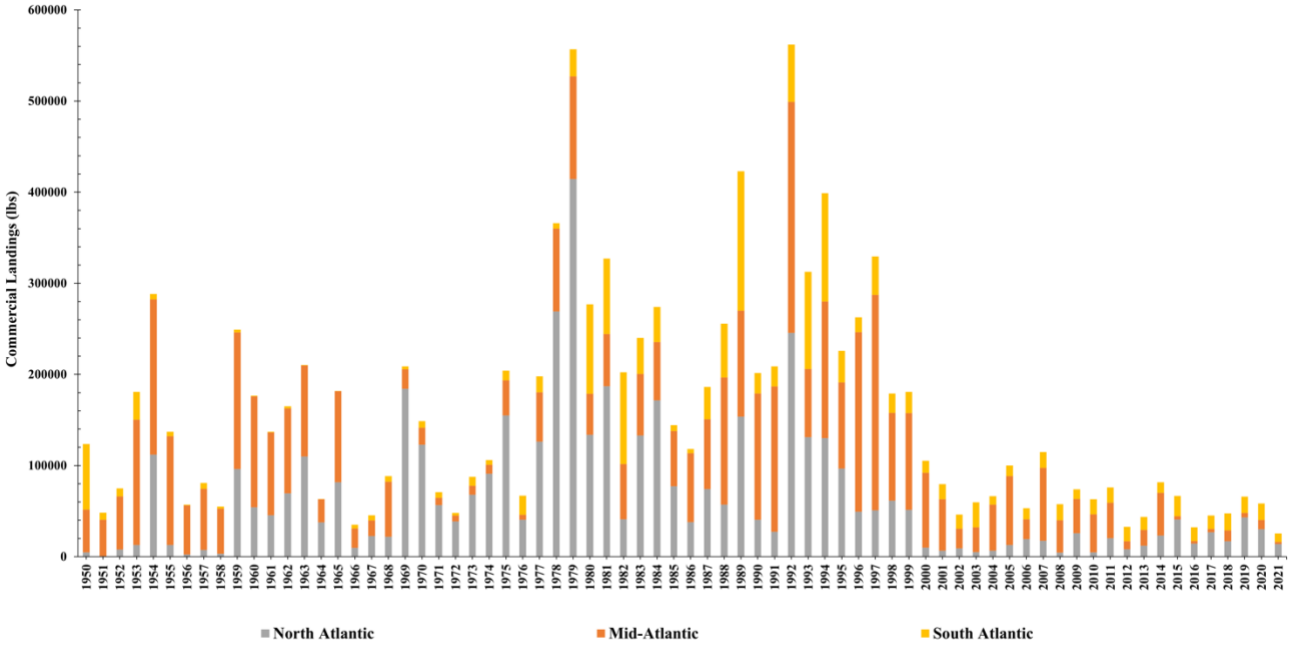

Figure 3. Total commercial landings (lbs.) from 1950 to 2021 by region.

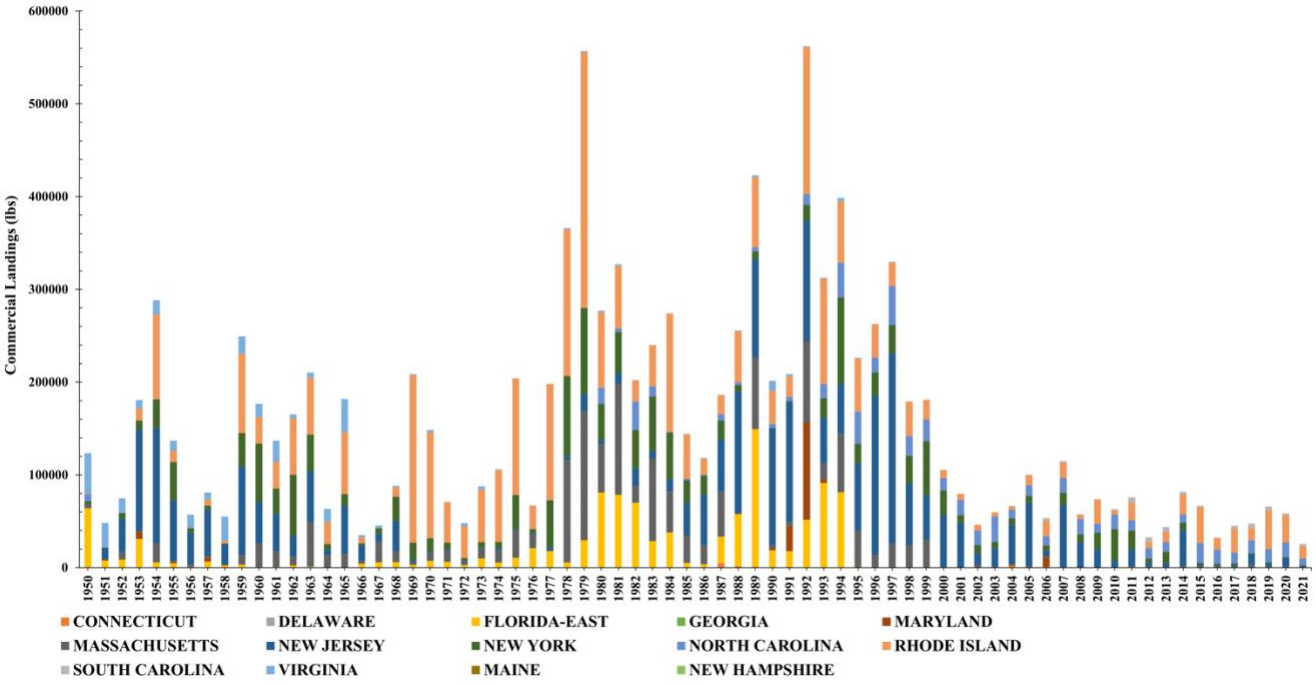

Figure 4. Total commercial landings (lbs.) from 1950 to 2021 by state.

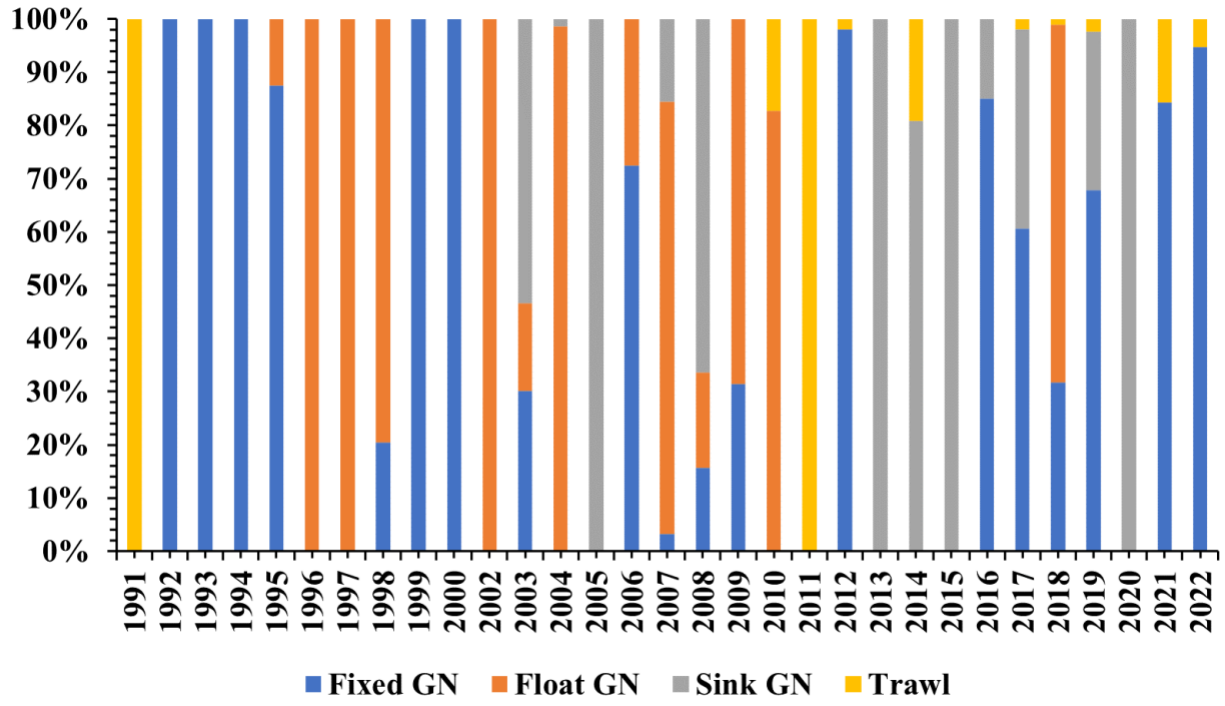

Figure 5. Percentage of commercial discards by type of gill net from 1993-2020

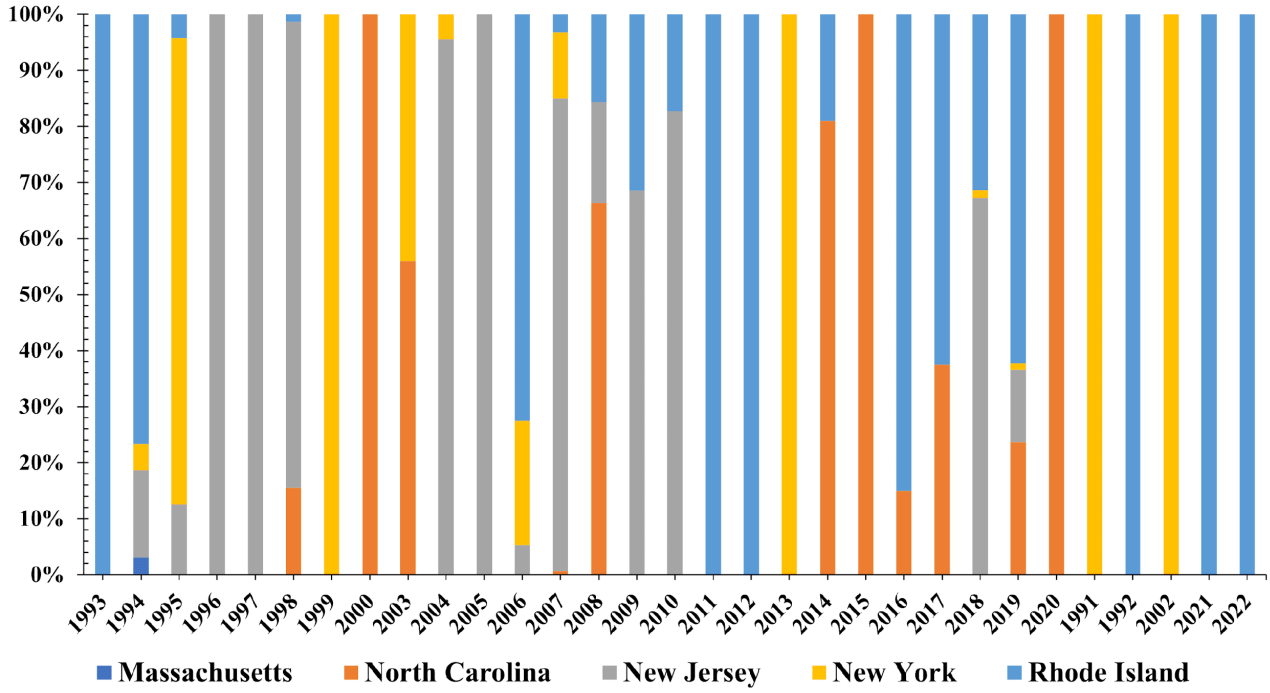

Figure 6. Percentage of commercial discards by state from 1993-2020

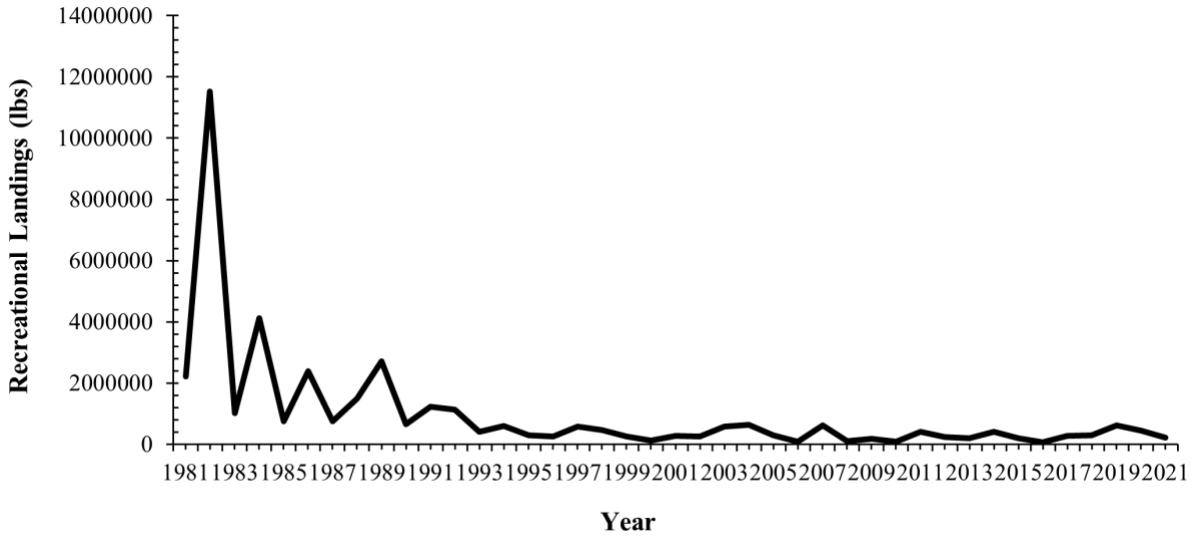

Figure 7. Total recreational landings (lbs.) from 1981 to 2021.

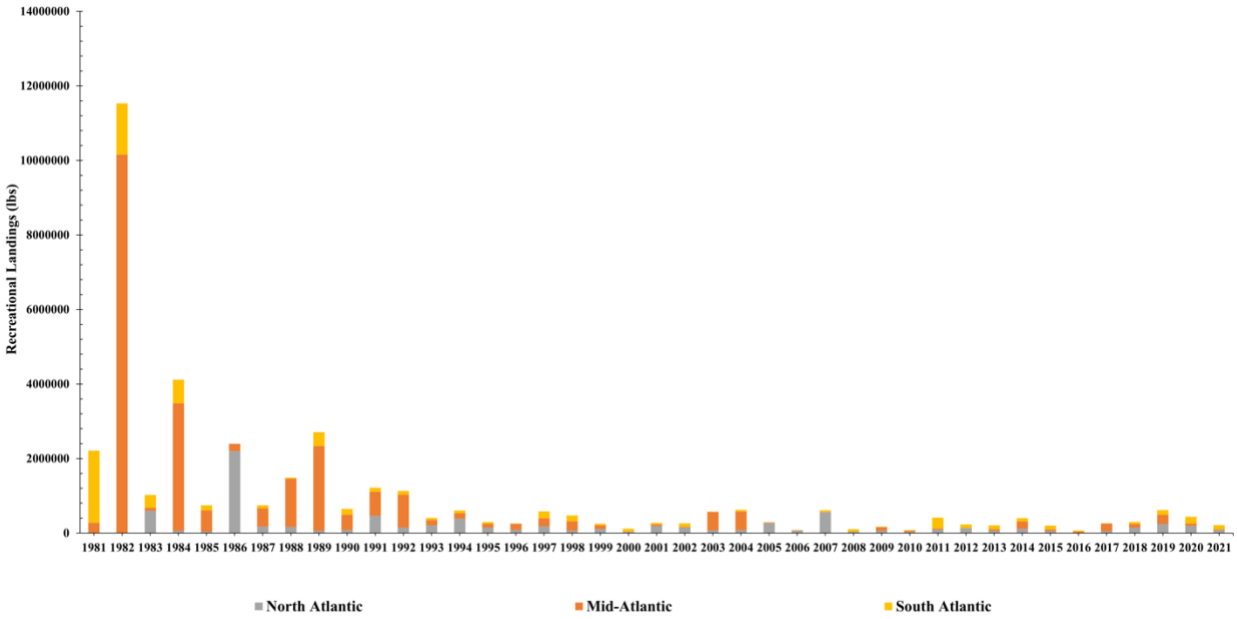

Figure 8. Total recreational landings (lbs.) from 1981 to 2021 by region.

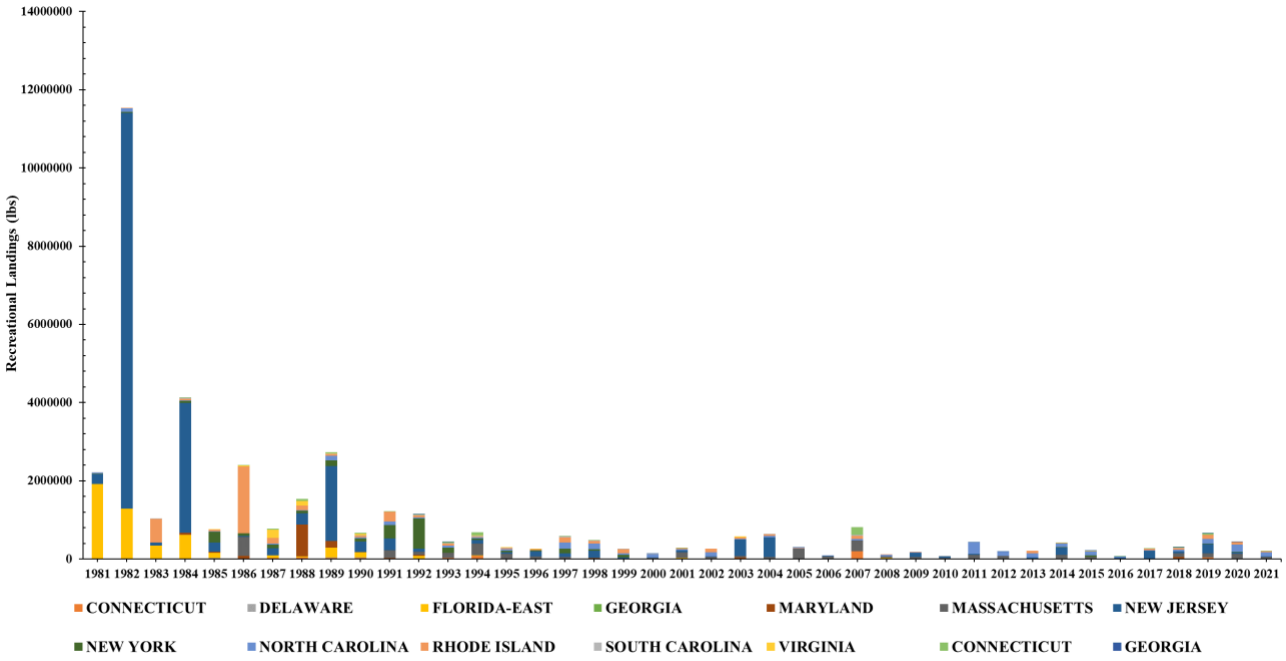

Figure 9. Total recreational landings (lbs.) from 1981 to 2021 by state.

Figure 10. Percentage of recreational landings by mode of fishing from 1981-2022.

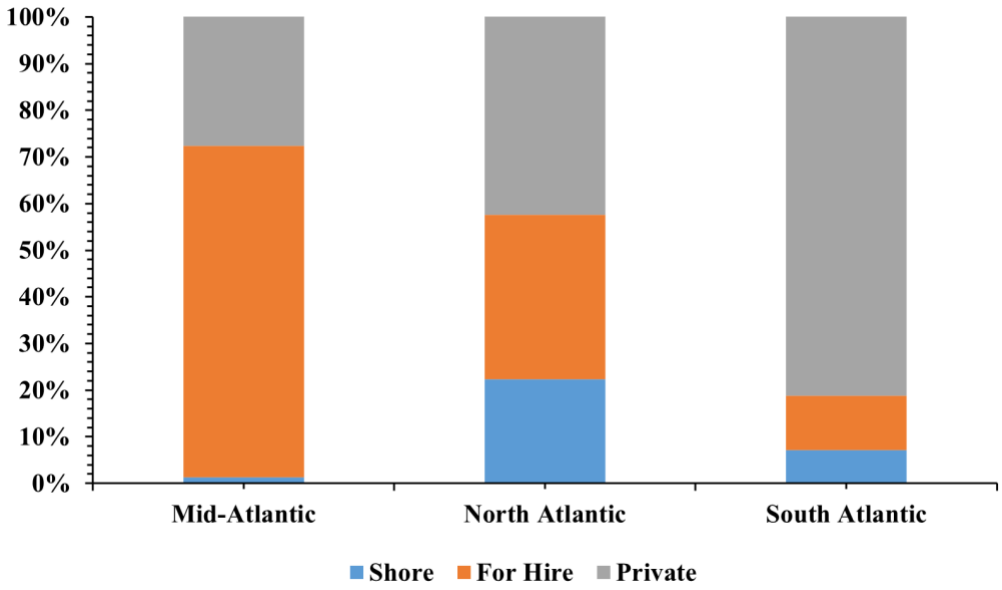

Figure 11. Percentage of recreational landings by mode of fishing for each region.

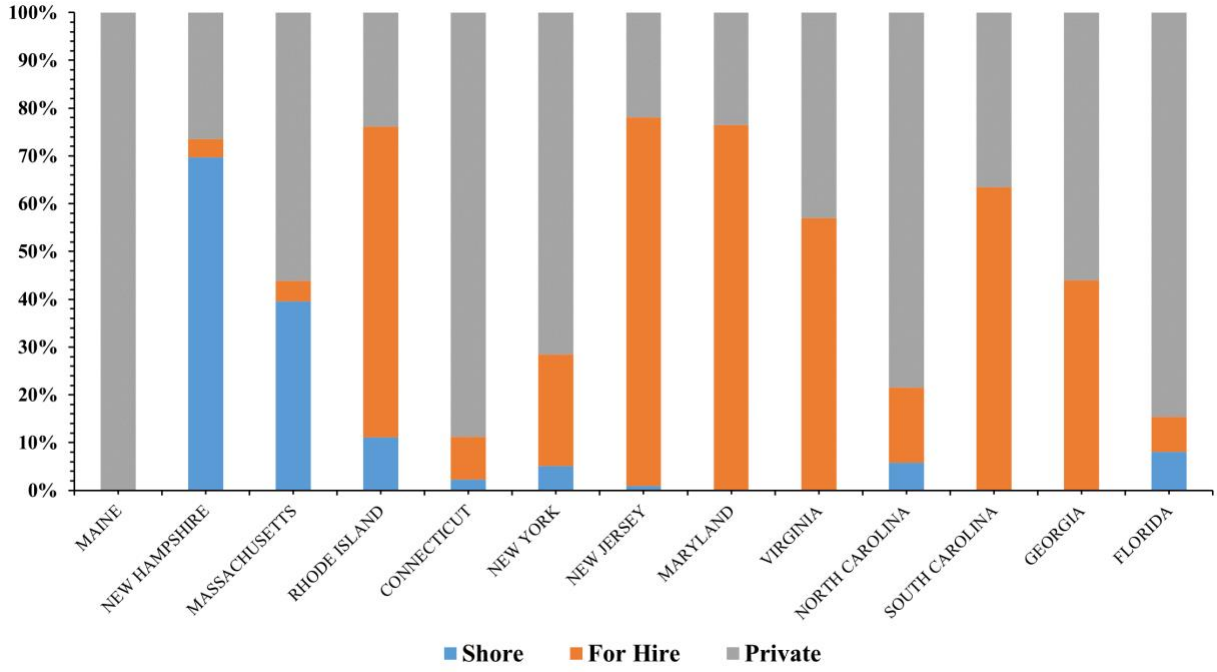

Figure 12. Percentage of recreational landings by mode of fishing for each state.

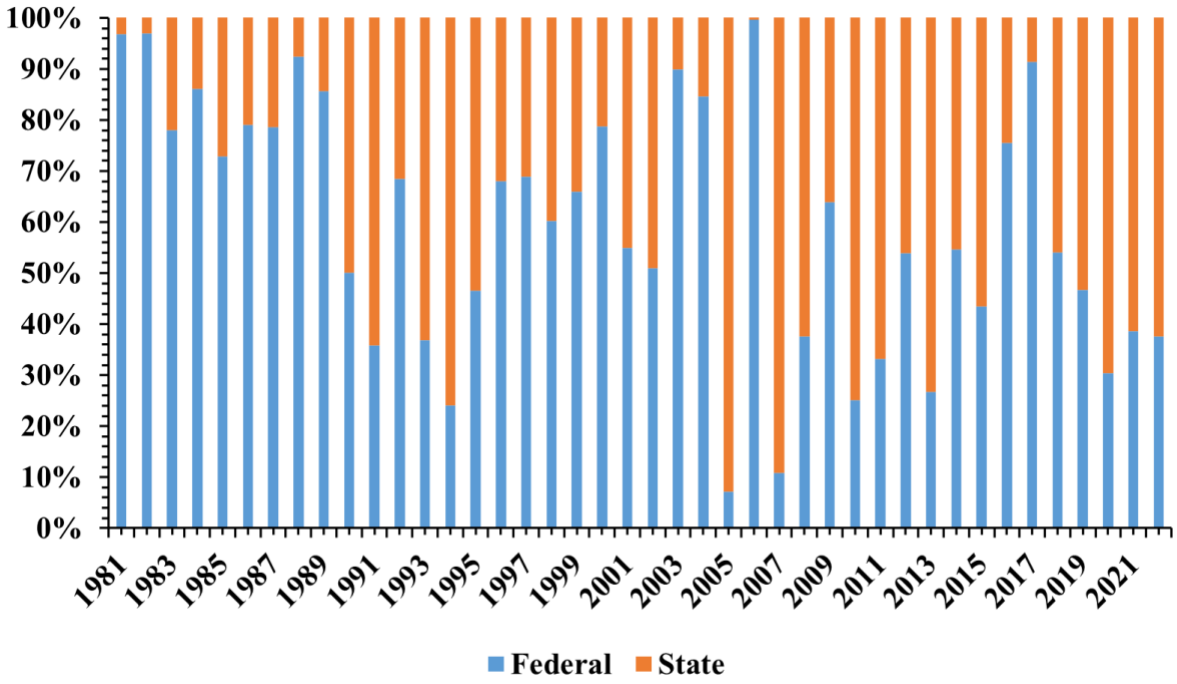

Figure 13. Percentage of recreational landings in federal and state waters from 1981-2022.

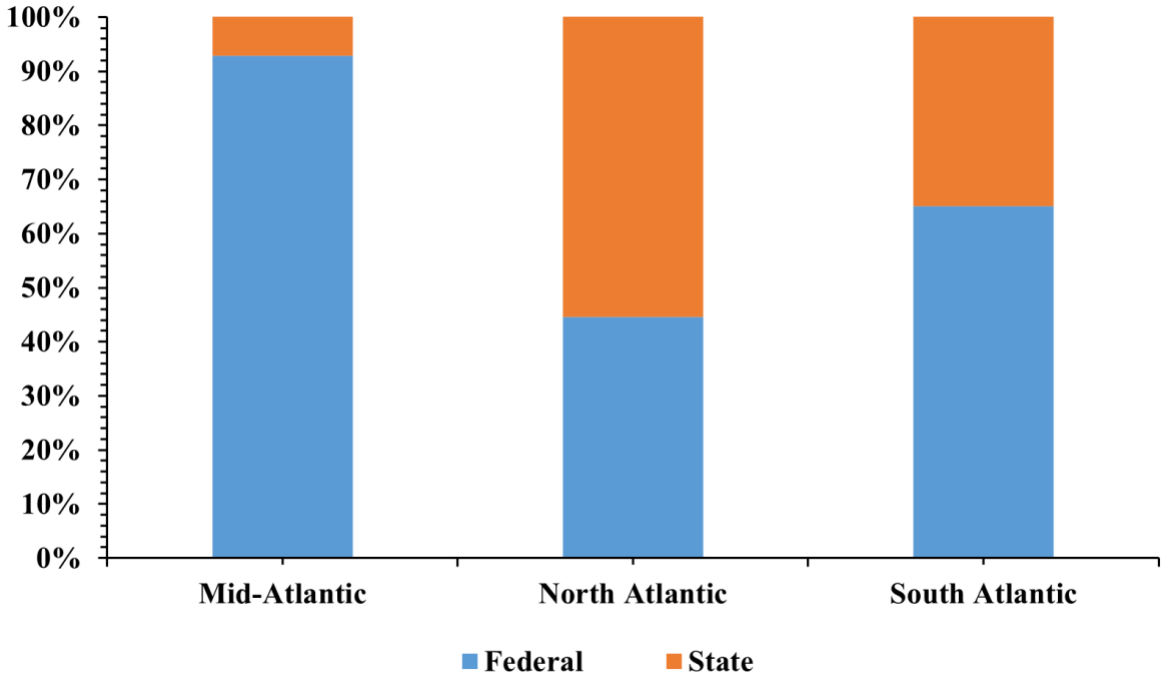

Figure 14. Percentage of recreational landings in federal and state waters for each region.

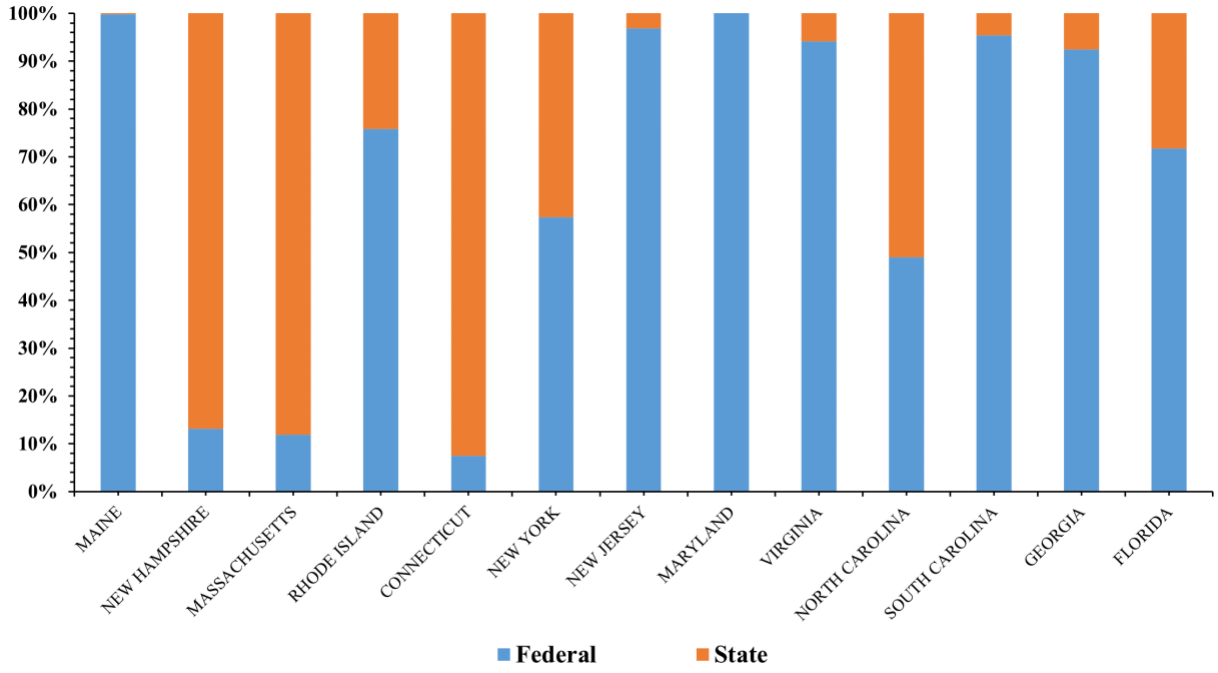

Figure 15. Percentage of recreational landings in federal and state waters for each state.

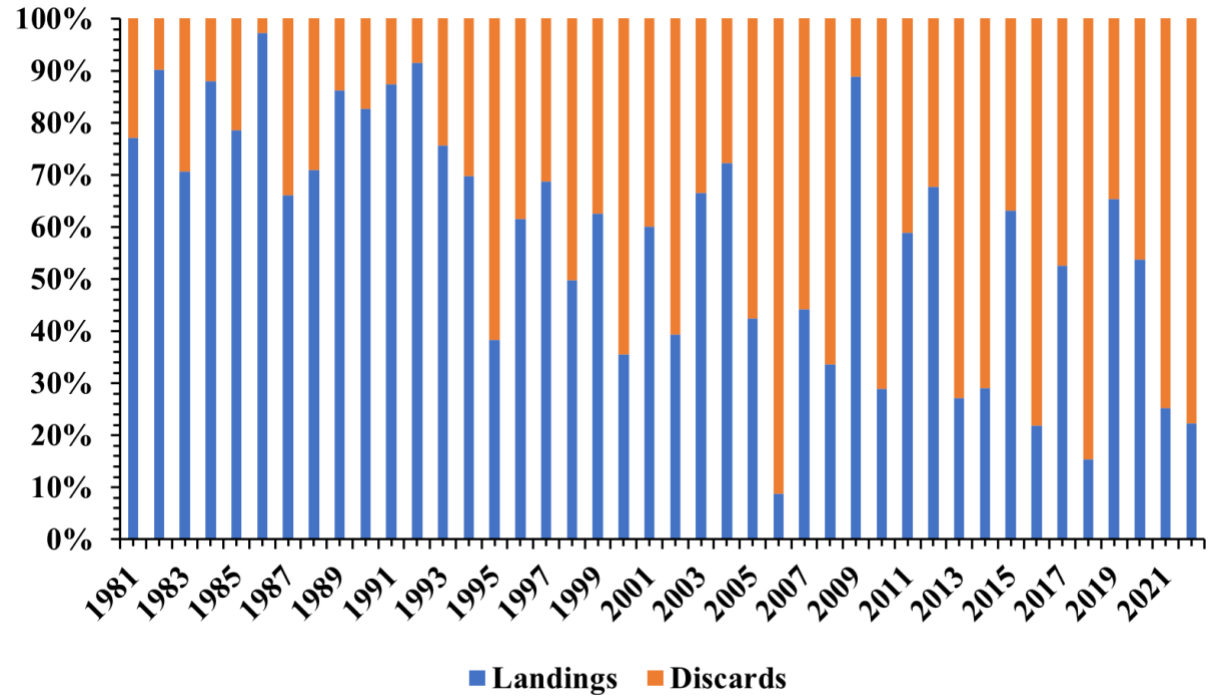

Figure 16. Percentage of fish landed vs discarded from 1981 to 2022.

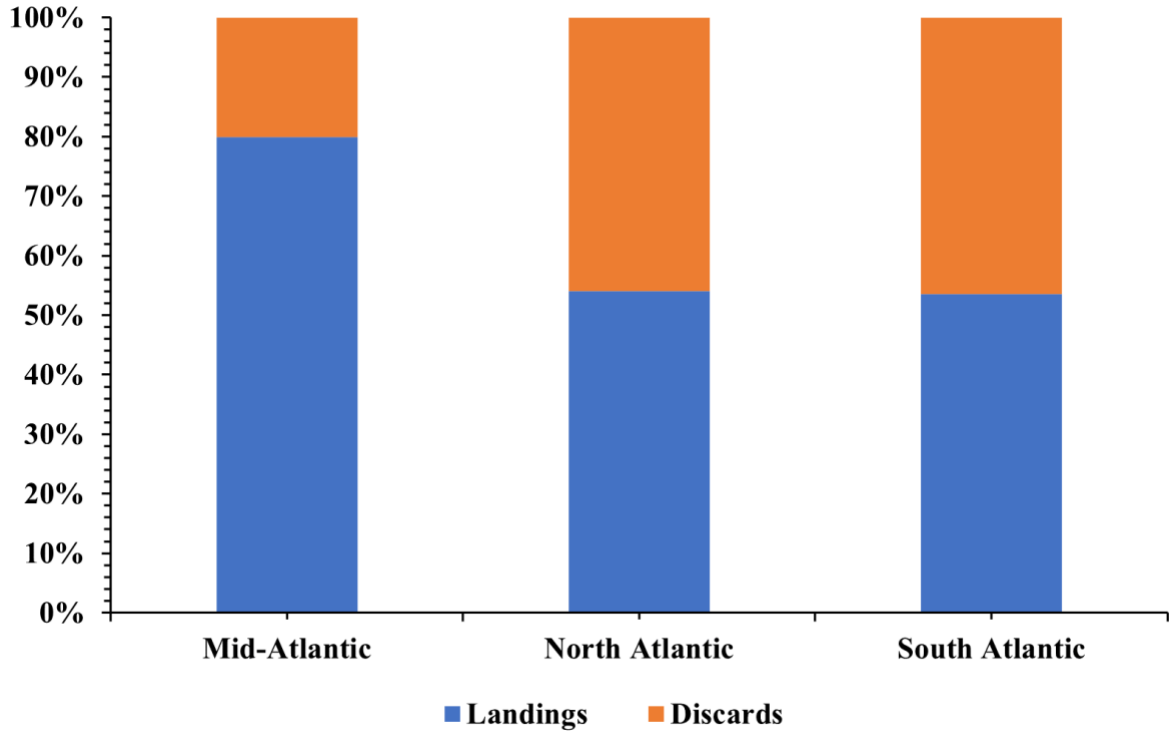

Figure 17. Percentage of fish landed vs discarded by region from 1981 to 2022.

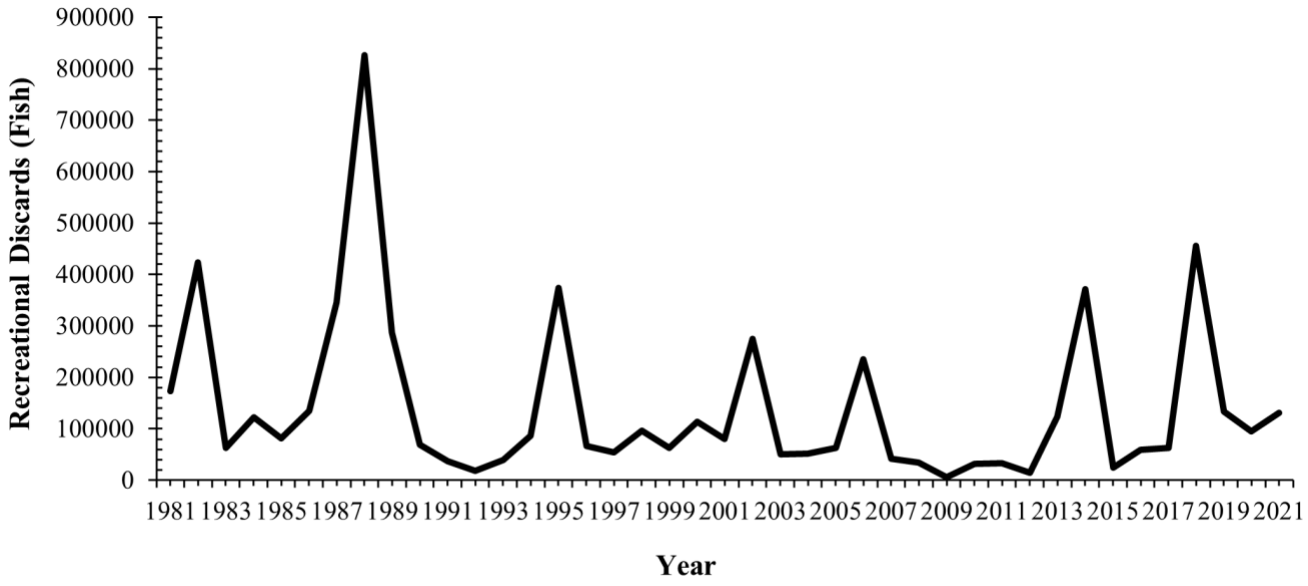

Figure 18. Total recreational discards (individuals) from 1981 to 2021.

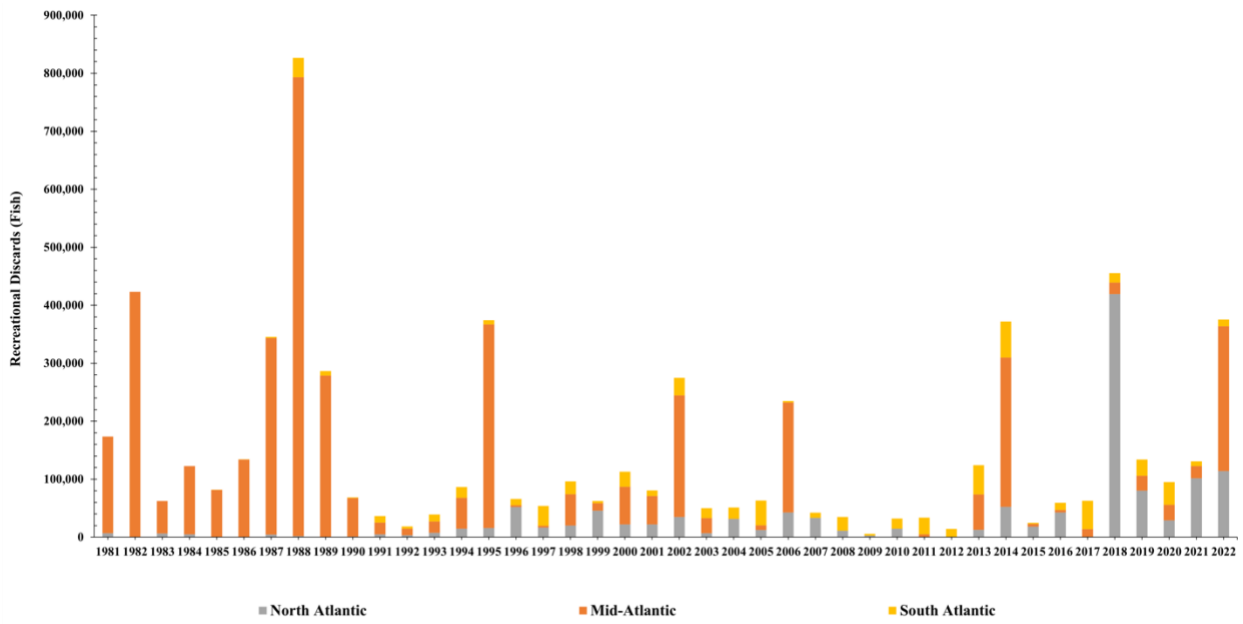

Figure 19. Total recreational discards (individuals) from 1981 to 2021 by region.

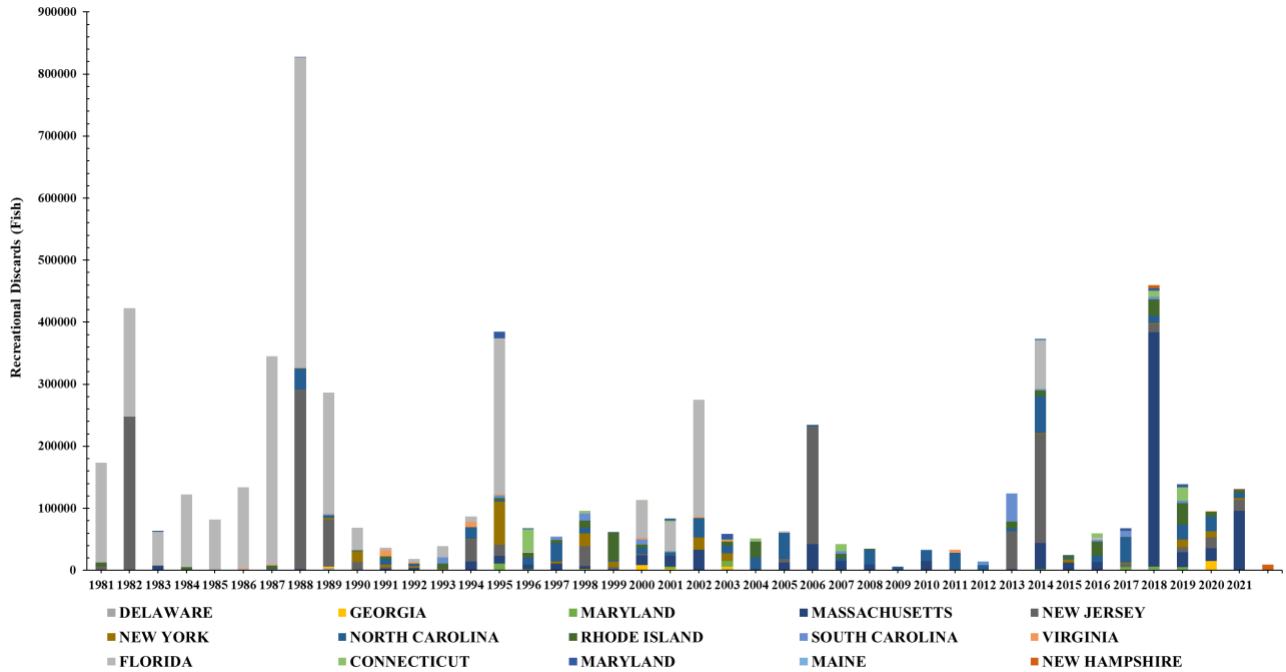

Figure 20. Total recreational discards (individuals) from 1981 to 2021 by state.

Figure 21. Percentage of recreational discards by mode of fishing from 1981-2022.

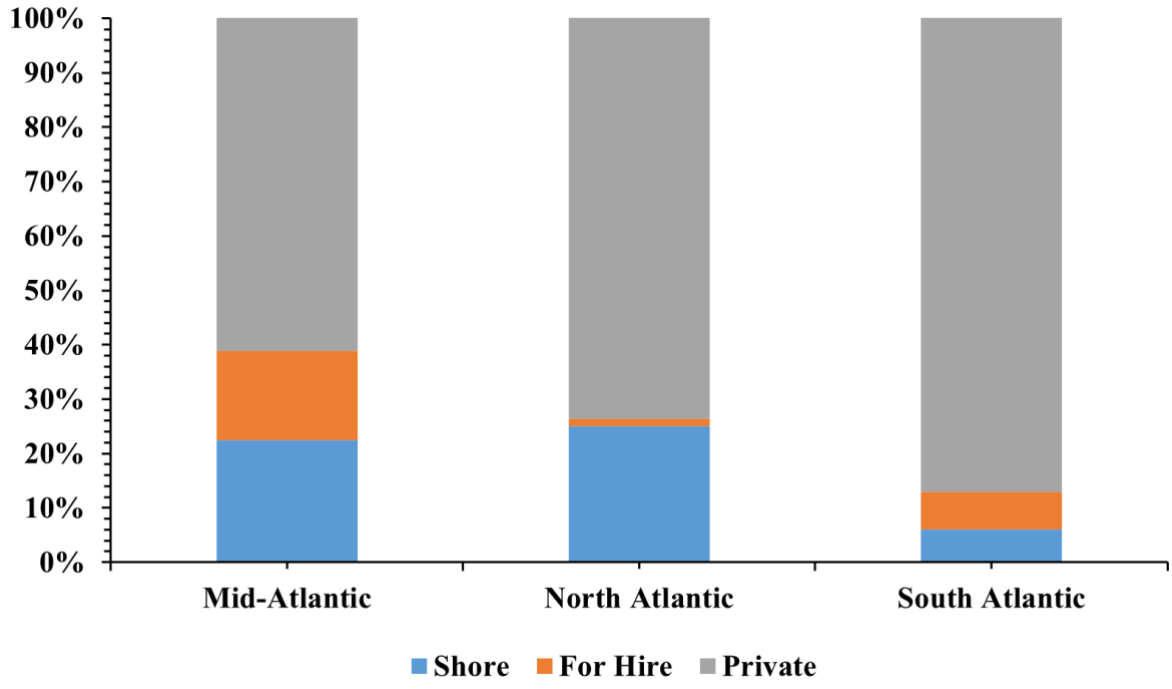

Figure 22. Percentage of recreational discards by mode of fishing for each region.

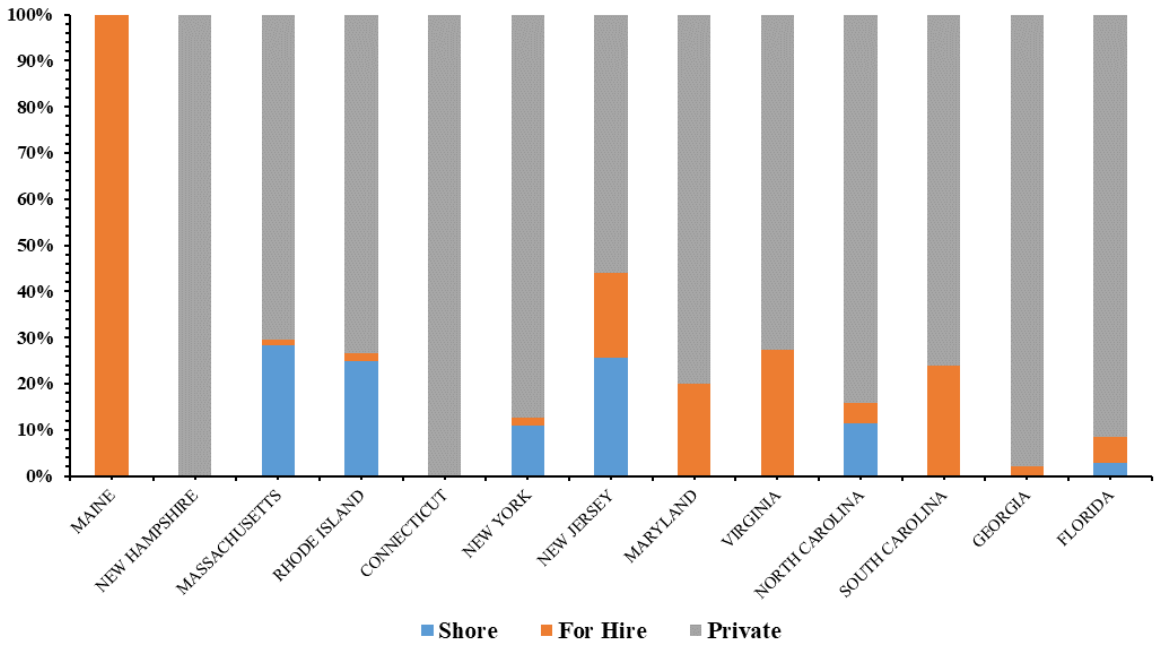

Figure 23. Percentage of recreational discards by mode of fishing for each state.

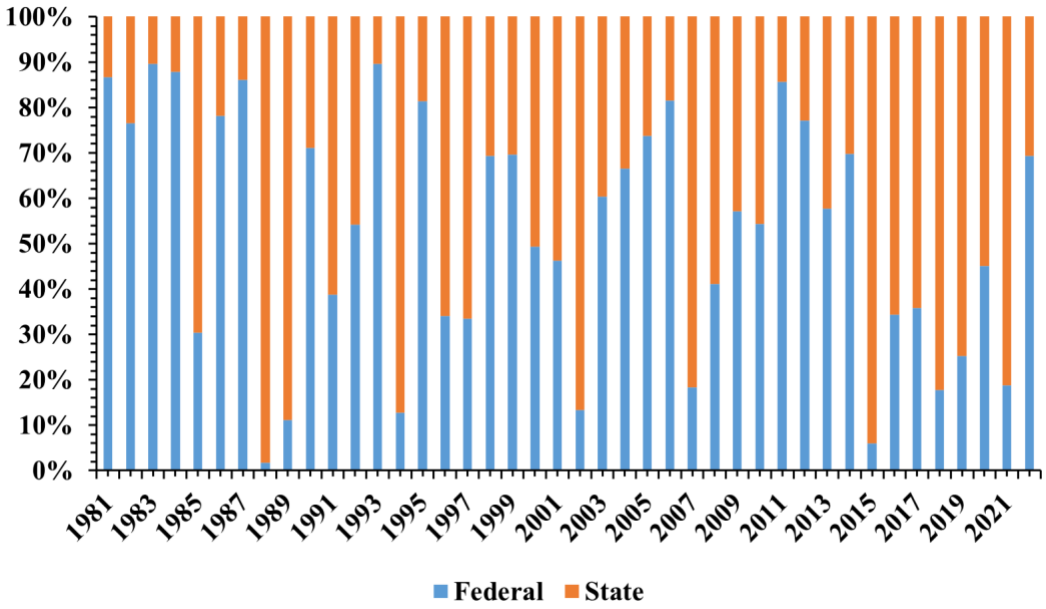

Figure 24. Percentage of recreational discards in federal and state waters from 1981-2022.

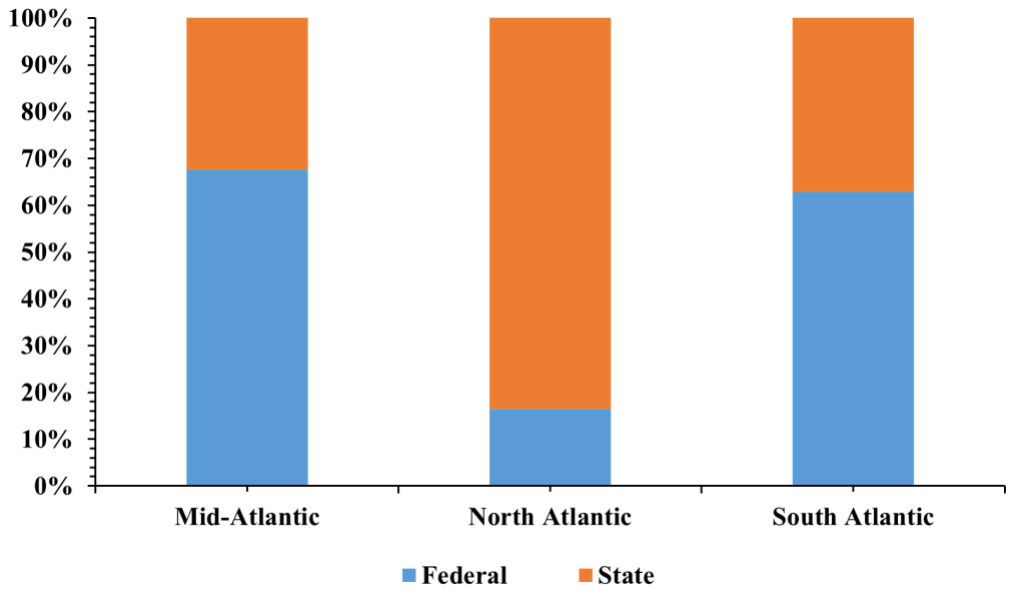

Figure 25. Percentage of recreational discards in federal and state waters for each region.

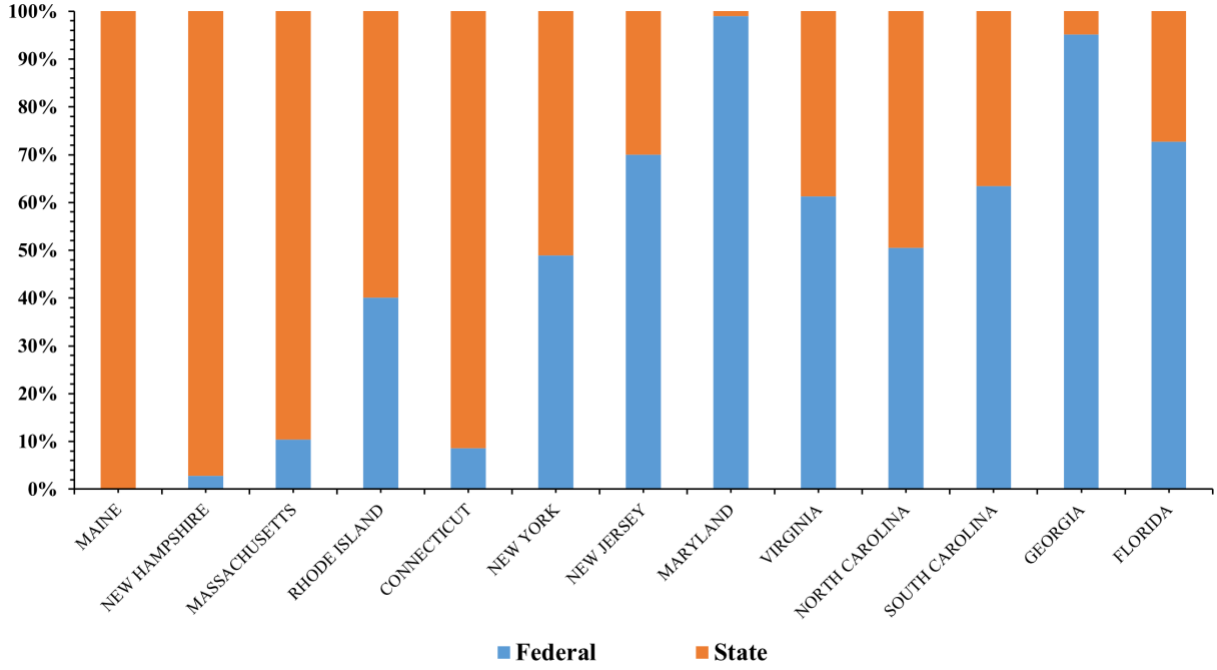

Figure 26. Percentage of recreational discards in federal and state waters for each state.

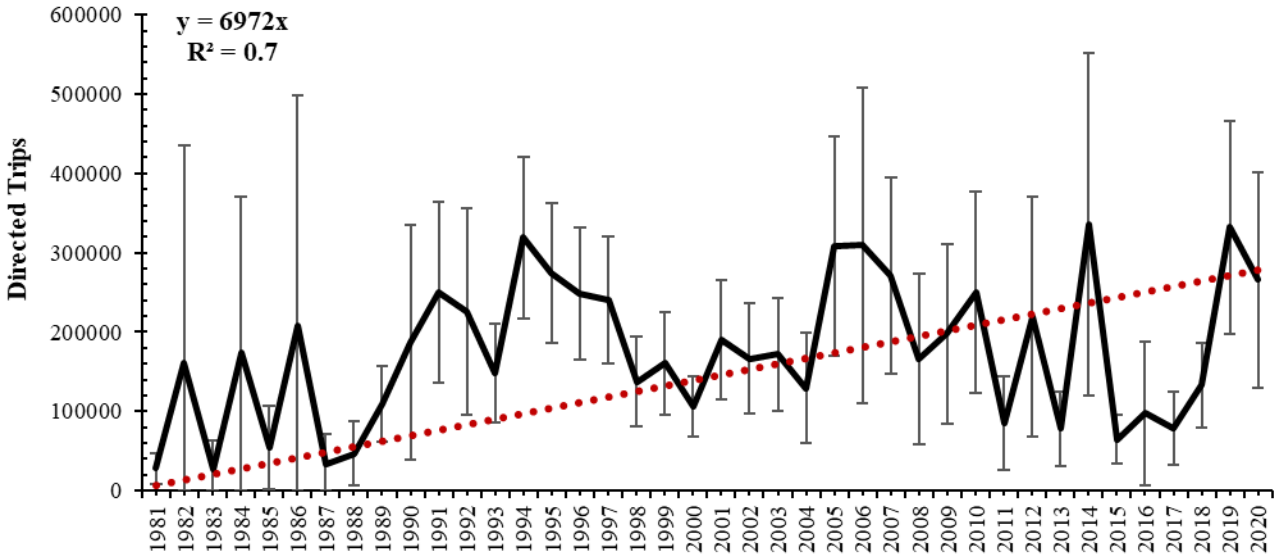

Figure 27. Directed trips for bonito with 95% confidence intervals from 1981-2022.

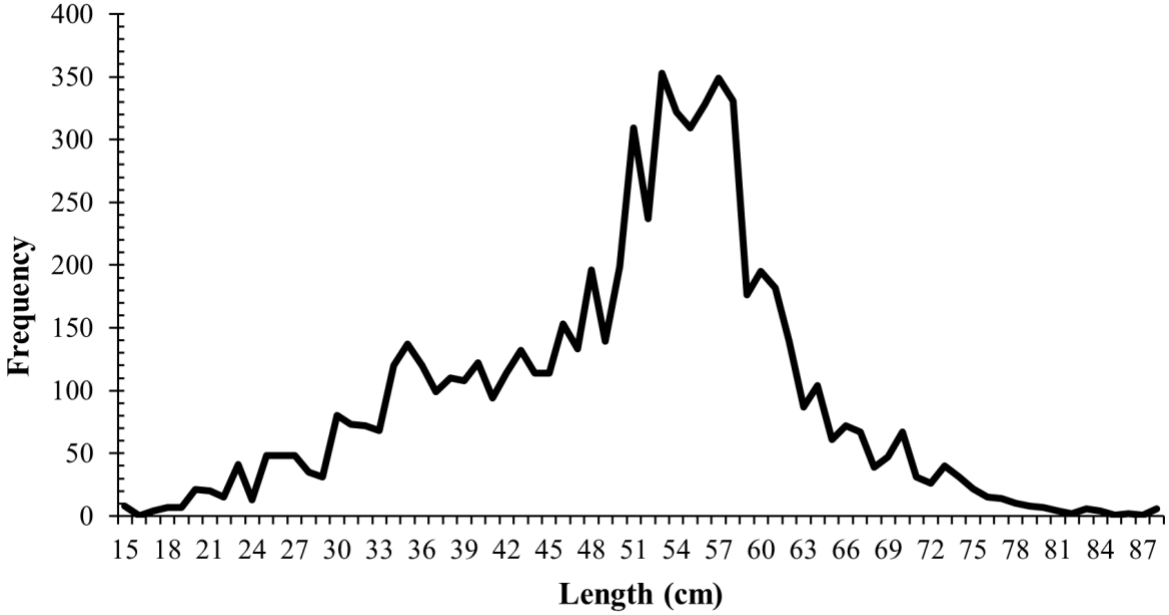

Figure 28. The aggregated length-frequency of the entire MRIP data set.

Figure 29. The mean length (Black) and mean weight (Gray) of MRIP sampled fish from 1981 to 2022, error bars based on standard deviation.

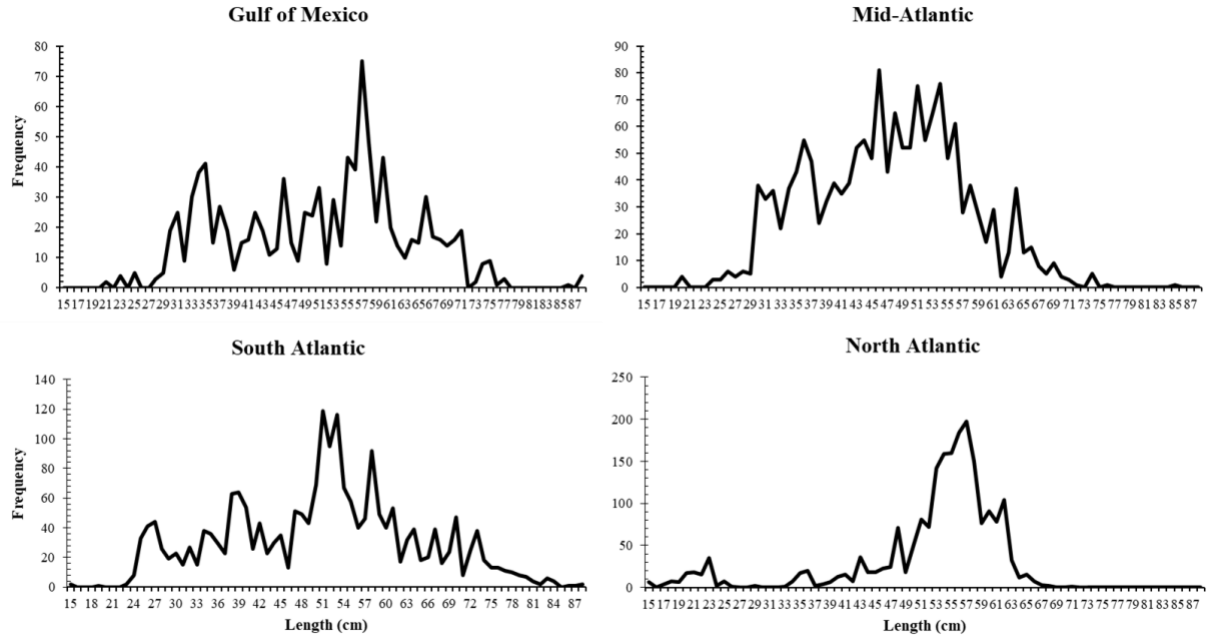

Figure 30. The length frequency distributions for the four regions with data from 1981-2022.

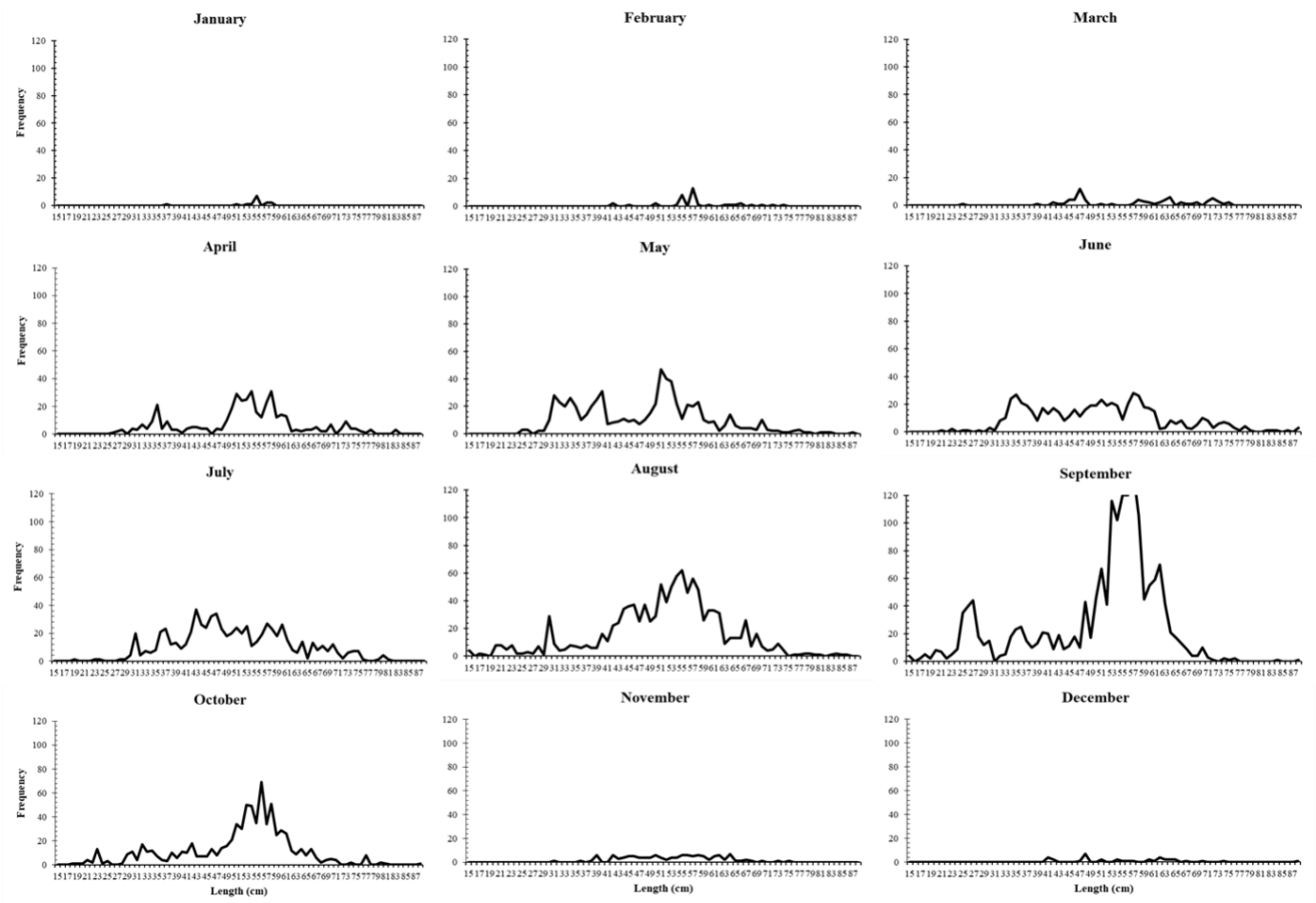

Figure 31. The length frequency distributions for by month from 1981-2022.

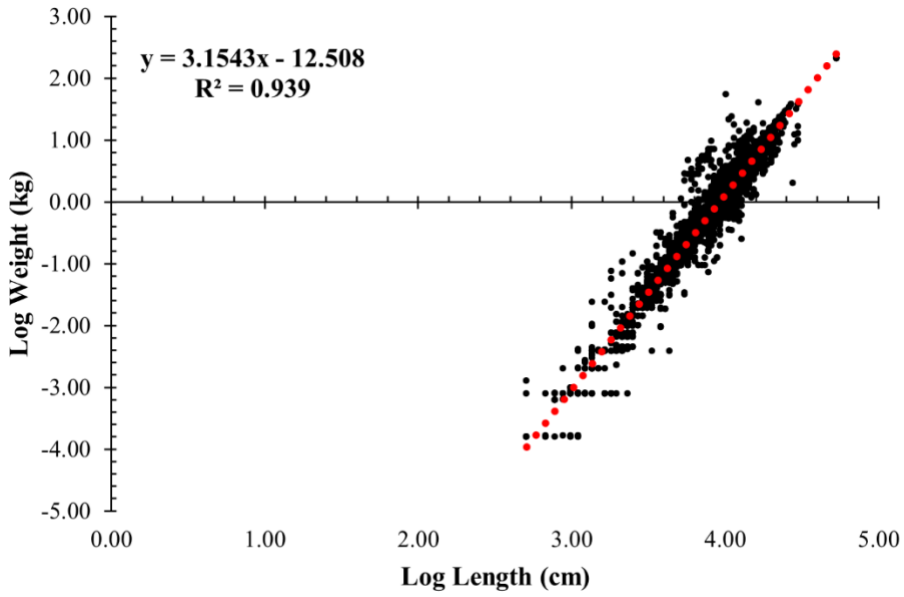

Figure 32. The logarithmic length-weight relationship on all data from 1981-2022.

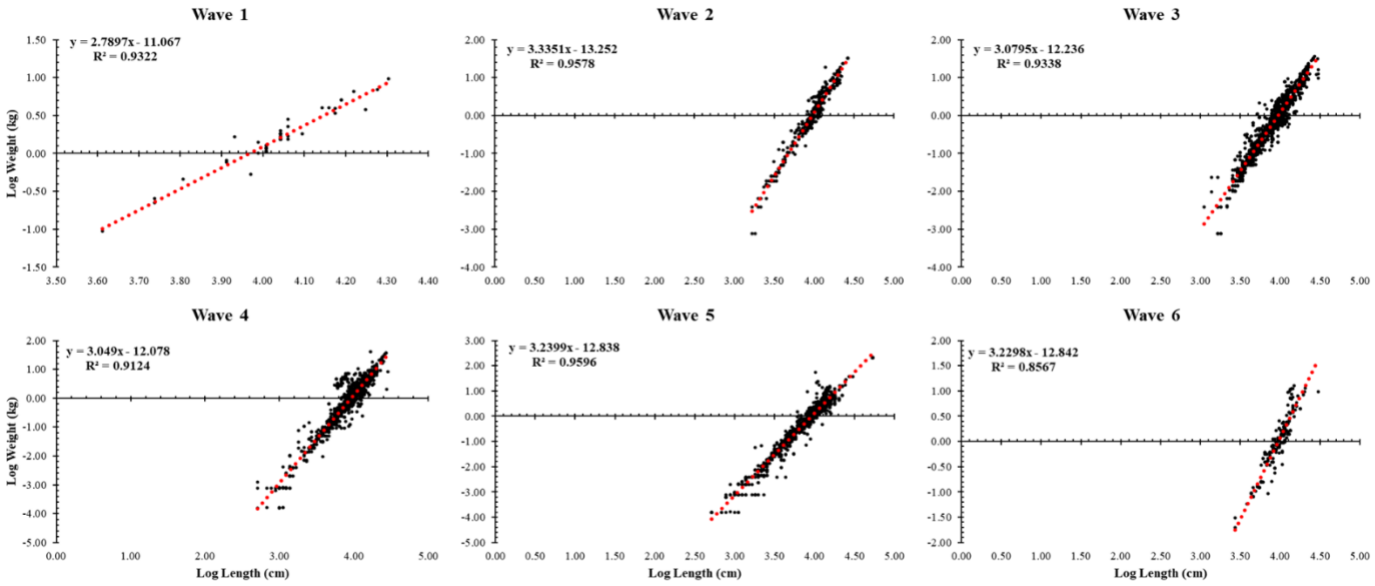

Figure 33. The logarithmic length-weight relationship for waves 1-6 using all data from 1981-2022.

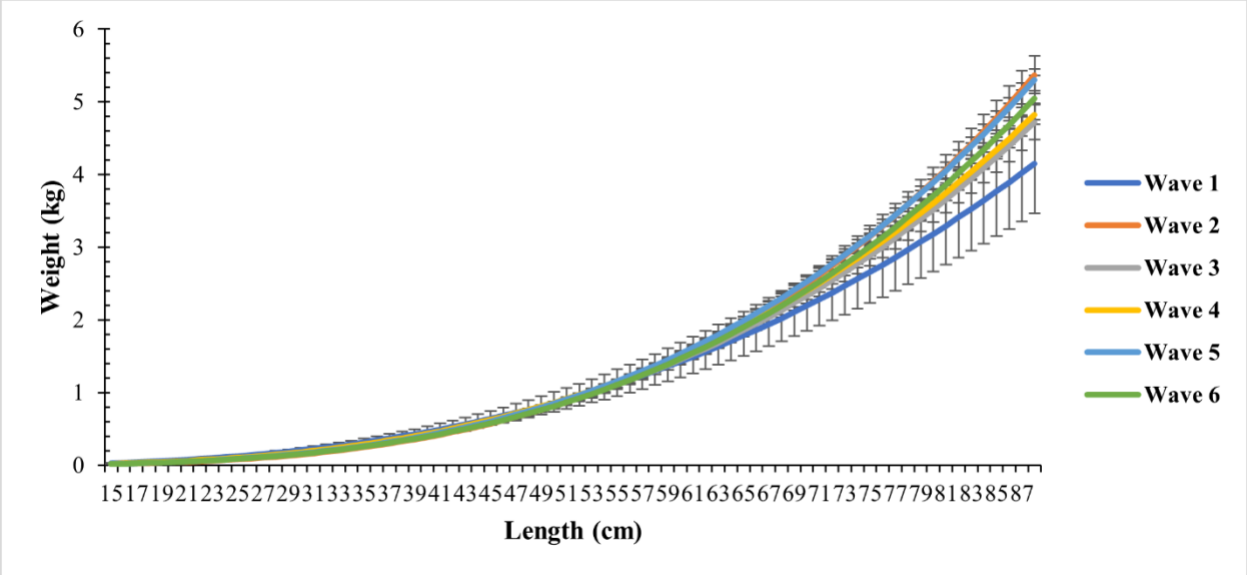

Figure 34. The predicted weights at length for waves 1-6 with 95% confidence intervals.

APPENDIX 1. MANAGEMENT AUTHORITY

Table 1. The marine fisheries management authority for each state along the Atlantic and Gulf coasts.

State	Management Authority
Maine	Department of Marine Resources
New Hampshire	Fish and Game
Massachusetts	Division of Marine Fisheries
Rhode Island	Department of Environmental Management
Connecticut	Department of Energy & Environmental Protection
New York	Department of Environmental Conservation
New Jersey	Department of Environmental Protection
Delaware	Fish and Wildlife
Maryland	Department of Natural Resources
Virginia	Marine Resources Commision
North Carolina	Division of Marine Fisheries
South Carolina	Department of Natural Resources
Georgia	Department of Natural Resources
Florida	Fish and Wildlife Conservation Commission

APPENDIX 2. FISHERIES DATA

Table A2.1. Commercial landings (lbs.) 1950-2021 by region.

Year	Mid-Atlantic	North Atlantic	South Atlantic	Total
1950	47000	4700	71800	123500
1951	40000	600	7700	48300
1952	58400	7800	8600	74800
1953	137500	12800	30500	180800
1954	170300	112000	5900	288200
1955	119300	12900	4800	137000
1956	54000	2300	700	57000
1957	66900	7400	6500	80800
1958	49400	3300	2300	55000
1959	149900	96100	3300	249300
1960	121800	54200	600	176600
1961	90900	45500	600	137000
1962	93400	69400	2300	165100
1963	99900	109900	500	210300
1964	25400	37700	100	63200
1965	100000	81700	100	181800
1966	21300	9600	4100	35000
1967	17000	22600	5700	45300
1968	60500	21800	6000	88300
1969	21700	184100	2900	208700
1970	18600	122800	7200	148600
1971	8000	56500	6300	70800
1972	6500	38600	2900	48000
1973	9700	68000	10000	87700
1974	9700	91000	5400	106100
1975	38400	155000	10700	204100
1976	5500	40400	21100	67000
1977	53900	126300	17800	198000
1978	91000	269100	5777	365877
1979	112600	414400	29930	556930
1980	45200	133600	98227	277027
1981	57300	187100	82645	327045
1982	60500	41100	100723	202323
1983	67800	132800	39533	240133

Table A2.2. Commercial landings (lbs.) 1950-2021 by region (Cont.).

Year	Mid-Atlantic	North Atlantic	South Atlantic	Total
1984	64000	171400	38725	274125
1985	60500	77300	6440	144240
1986	75600	38000	4664	118264
1987	76700	74200	35291	186191
1988	139600	57000	59086	255686
1989	116400	153600	152864	422864
1990	138558	40551	22438	201547
1991	159659	27248	21875	208782
1992	253286	245658	63061	562005
1993	74803	131025	106720	312548
1994	149876	130015	118854	398745
1995	94619	96606	34718	225943
1996	196957	49356	16268	262581
1997	236290	50901	42372	329563
1998	96332	61337	21353	179022
1999	106185	51388	23291	180864
2000	81956	9938	13343	105237
2001	56564	6501	16531	79596
2002	21617	9136	15456	46209
2003	27293	5027	27379	59699
2004	50456	6552	9303	66311
2005	75574	12684	11672	99930
2006	21873	19243	12137	53253
2007	80073	17395	17404	114872
2008	35555	4493	17515	57563
2009	37559	25821	10454	73834
2010	41823	4646	16454	62923
2011	38901	20224	16712	75837
2012	8635	8166	15896	32697
2013	17328	11910	14457	43695
2014	47004	23100	11461	81565
2015	3578	40740	22278	66596
2016	2634	14457	15183	32274
2017	3660	26764	14619	45043
2018	12090	16811	18691	47592
2019	4939	42989	17848	65776
2020	10055	30165	18221	58441
2021	2400	13706	9272	25378
Overall	44%	41%	15%	
10-Year	23%	46%	32%	

Table A2.2. Commercial landings (lbs.) 1950-2021 by state.

Year	CT	DE	FL EAST	GA	ME	MD	MA	NH	NJ	NY	NC	RI	SC	VA
1950	0	0	64000	0	0	0	4300	0	200	3100	7800	400	0	43700
1951	0	0	7700	0	0	1100	200	0	12400	500	0	400	0	26000
1952	0	0	8600	0	0	700	7800	0	36000	5900	0	0	0	15800
1953	0	500	30500	0	0	8000	100	0	109600	9900	0	12700	0	9500
1954	0	0	5900	0	0	0	20400	0	123700	31400	0	91600	0	15200
1955	0	0	4800	0	0	1700	700	0	65400	41300	0	12200	0	10900
1956	0	0	700	0	0	500	2200	0	34500	4700	0	100	0	14300
1957	0	0	6500	0	0	4400	1000	0	51200	3900	0	6400	0	7400
1958	0	0	2300	0	0	800	0	0	23000	0	0	3300	0	25600
1959	0	0	3300	0	0	0	10600	0	95500	35800	0	85500	0	18600
1960	0	0	600	0	0	100	25300	0	45000	62700	0	28900	0	14000
1961	0	0	600	0	0	300	16800	0	40600	27100	0	28700	0	22900
1962	0	0	2300	0	0	1100	8700	0	22600	65500	0	60700	0	4200
1963	500	0	500	0	0	0	48100	0	54800	39500	0	61300	0	5600
1964	0	0	100	0	0	0	13800	0	5900	5600	0	23900	0	13900
1965	0	0	100	0	0	100	14800	0	51400	13000	0	66900	0	35500
1966	0	0	4100	0	0	0	3200	0	17100	1800	0	6400	0	2400
1967	0	0	5700	0	0	300	22400	0	8500	5700	0	200	0	2500
1968	0	0	6000	0	0	0	11800	0	32900	25900	0	10000	0	1700
1969	0	0	2900	0	0	0	3300	0	2200	18500	0	180800	0	1000
1970	200	0	7200	0	0	0	8700	0	1100	14600	0	113900	0	2900
1971	0	0	6300	0	0	0	12700	0	1100	6900	0	43800	0	0
1972	0	0	2900	0	0	0	4500	0	800	2300	0	34100	0	3400
1973	0	0	10000	0	0	0	11500	0	800	5200	0	56500	0	3700
1974	0	0	5400	0	0	0	13800	0	2100	6400	0	77200	0	1200
1975	0	0	10700	0	0	0	29300	0	1400	37000	0	125700	0	0
1976	0	0	21100	0	0	0	15000	0	1200	4300	0	25400	0	0
1977	0	0	17800	0	0	0	900	0	3000	50900	0	125400	0	0
1978	0	0	5777	0	0	100	110600	0	3400	86600	0	158500	0	900
1979	0	0	29706	0	0	0	138900	0	18500	92900	224	275500	0	1200
1980	0	0	80941	0	0	0	52000	0	4500	39100	17286	81600	0	1600
1981	0	0	78706	0	0	0	119600	0	11300	44600	3939	67500	0	1400
1982	0	0	69974	0	0	0	18200	0	18700	41500	30749	22900	0	300
1983	0	0	28492	0	0	0	88600	0	8100	59300	11041	44200	0	400

Table A2.2. Commercial landings (lbs.) 1950-2021 by state (Cont.).

Year	CT	DE	FL EAST	GA	ME	MD	MA	NH	NJ	NY	NC	RI	SC	VA
1984	0	0	37832	0	0	400	43900	0	13100	50400	893	127500	0	100
1985	200	0	4991	0	0	0	29100	0	36100	24000	1449	48000	0	400
1986	0	0	3738	0	0	0	20700	0	54400	20500	926	17300	0	700
1987	5000	0	28568	0	0	0	48600	0	55800	20700	6723	20600	0	200
1988	1700	0	55973	0	0	600	300	0	131500	6700	3113	55000	0	800
1989	900	0	148442	0	0	0	77400	0	105800	8600	4422	75300	0	2000
1990	400	0	18376	0	0	1969	3734	0	125555	645	4062	36417	0	10389
1991	800	0	16972	0	0	27142	4285	0	129080	1247	4903	22163	0	2190
1992	300	0	51403	0	0	105020	87063	0	130370	17035	11658	158295	0	861
1993	185	0	91137	0	0	3750	17263	0	49168	20889	15583	113577	0	996
1994	0	0	81481	0	0	13	63547	0	52917	93274	37373	66468	0	3672
1995	146	0	0	0	0	875	39487	25	71433	21637	34718	56948	0	674
1996	0	0	0	0	0	0	13750	0	170963	25701	16268	35606	0	293
1997	0	0	0	0	0	0	25642	0	205472	30367	42372	25259	0	451
1998	0	0	0	0	0	0	24161	0	66764	29568	21353	37176	0	0
1999	413	0	0	0	0	0	29724	0	47360	58825	23291	21251	0	0
2000	235	0	0	0	0	0	996	0	55683	26273	13343	8707	0	0
2001	56	0	0	0	0	0	0	0	48151	8413	16531	6445	0	0
2002	0	0	0	0	0	0	2817	0	12794	8823	15456	6319	0	0
2003	0	0	0	0	0	121	522	0	20320	6852	27379	4505	0	0
2004	1943	0	0	0	0	1302	806	0	42194	6892	9303	3803	0	68
2005	96	0	0	0	0	0	1561	0	68716	6855	11672	11027	0	3
2006	724	0	0	0	0	10500	1328	0	5771	5579	9771	17191	2366	23
2007	97	0	0	0	0	0	493	0	67098	12975	16085	16805	1319	0
2008	5	0	0	0	0	0	247	0	27159	8396	16576	4241	939	0
2009	5	0	0	0	0	0	0	0	20084	17475	9981	25816	473	0
2010	20	0	0	0	0	0	0	0	7223	34292	15686	4626	768	308
2011	622	0	0	0	0	118	494	0	18730	20053	11039	19108	5673	0
2012	6	0	0	0	0	68	1201	0	4402	4165	11343	6959	4553	0
2013	151	0	0	0	0	0	530	0	3901	12585	10506	11229	3951	842
2014	46	0	0	0	0	0	1578	0	38823	8049	9081	21476	2380	132
2015	20	0	0	0	0	84	1761	0	1742	1752	20989	38959	1289	0
2016	32	0	0	0	0	104	1547	0	747	1783	15183	12878	0	0
2017	55	0	0	0	0	41	1038	0	1231	2388	11345	25671	3274	0
2018	99	0	0	0	0	0	3498	0	11037	1053	13848	13214	4843	0
2019	147	0	0	0	0	0	999	0	3095	1844	14045	41843	3803	0
2020	210	0	0	0	0	0	1198	0	9473	582	15926	28757	2295	0
2021	46	0	0	0	0	0	171	0	1664	736	7351	13489	1921	0
Overall	0%	0%	10%	0%	0%	2%	12%	0%	25%	14%	5%	29%	0%	3%
10-Year	0%	0%	0%	0%	0%	0%	3%	0%	15%	7%	26%	43%	6%	0%

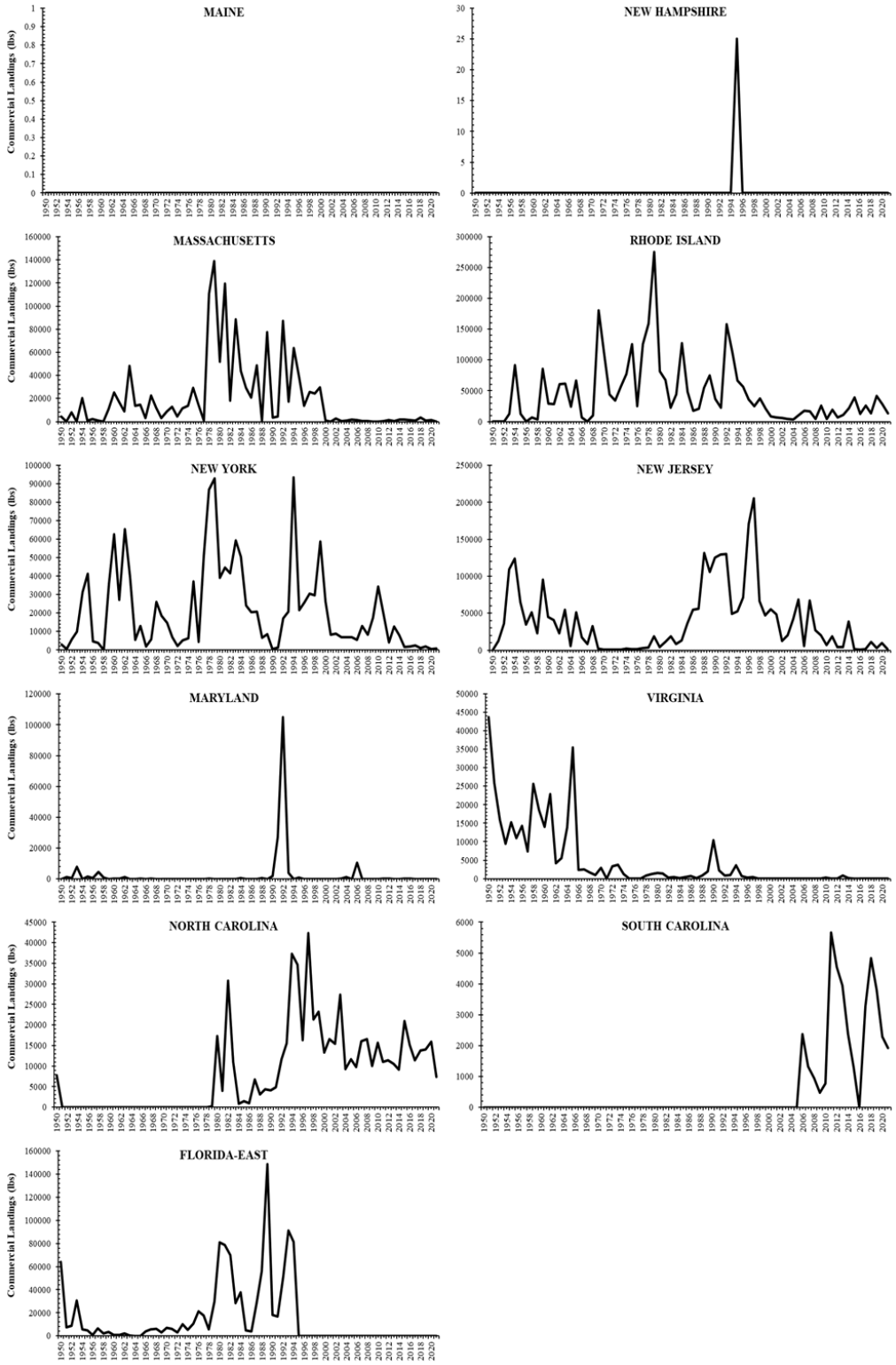

Figure A2.1. Commercial landings (lbs.) 1950-2021 by state.

Table A2.3. Recreational landings (lbs.) 1981-2021 by region.

Year	Mid-Atlantic	North Atlantic	South Atlantic	Total Landings
1981	274941	0	1938204	2213145
1982	10146854	5062	1375596	11527512
1983	79947	599581	343470	1022998
1984	3417905	62922	638573	4119400
1985	564986	38685	143248	746919
1986	194353	2199329	0	2393682
1987	488097	176015	81437	745549
1988	1291161	164711	34337	1490209
1989	2273506	62019	371569	2707094
1990	409385	79954	156947	646286
1991	641291	468851	105260	1215402
1992	885716	146126	101063	1132905
1993	140060	207281	60980	408321
1994	145355	389903	68461	603719
1995	104330	147020	45611	296961
1996	166987	85191	5395	257573
1997	211247	184146	184053	579446
1998	250598	65720	154317	470635
1999	96900	111305	44469	252674
2000	11096	29758	74702	115556
2001	46615	186485	41181	274281
2002	19556	145031	97116	261703
2003	489345	76968	6684	572997
2004	496395	81789	48476	626660
2005	8803	269866	10758	289427
2006	12686	62512	4458	79656
2007	6356	555329	52726	614411
2008	933	36883	65984	103800
2009	98082	60446	13799	172327
2010	38319	26983	17712	83014
2011	35420	89852	287461	412733
2012	0	137943	96059	234002
2013	44705	61165	99252	205122
2014	198443	113832	91230	403505
2015	47369	53927	102409	203705
2016	37463	6704	25442	69609
2017	201751	52898	9579	264228
2018	94509	146748	55059	296316
2019	247845	243009	125031	615885
2020	60177	195039	179891	435107
2021	18351	79058	113110	210519
Overall	61%	20%	19%	
10-Year	32%	37%	31%	

Table A2.4. Recreational landings (lbs.) 1981-2021 by state.

Year	CT	DE	FL EAST	GA	MD	MA	NJ	NY	NC	RI	SC	VA	NH	ME
1981	0	0	1911323	0	0	0	256539	18402	26515	0	366	0	0	0
1982	0	0	1291789	0	0	0	10119563	27291	83807	5062	0	0	0	0
1983	0	0	341955	0	6557	0	73390	0	0	599581	1515	0	0	0
1984	19178	0	601192	0	52210	0	3323401	42294	15540	43744	21841	0	0	0
1985	0	21652	134337	0	32404	0	234371	275510	8911	38685	0	1049	0	0
1986	8098	0	0	0	70667	483412	28541	71844	0	1707819	0	23301	0	0
1987	28620	0	66165	0	0	2390	174787	103031	14910	145005	362	210279	0	0
1988	40532	0	26392	0	810508	3377	288019	69197	6016	120802	1929	123437	0	0
1989	26952	14573	244001	0	171987	1971	1923087	145514	116393	33096	11175	18345	0	0
1990	26129	9469	130434	0	7859	9098	263177	82565	22547	44727	3966	46315	0	0
1991	12491	410	5642	0	8677	202248	302915	329289	94896	254112	4722	0	0	0
1992	10655	377	67883	952	27672	83083	75043	774917	23078	52388	10102	7707	0	0
1993	30175	0	0	686	0	126175	0	138153	49289	50931	11691	1907	0	0
1994	83035	0	14068	0	0	298462	92482	41493	23713	8406	30680	11380	0	0
1995	0	0	0	0	5858	122341	47567	39844	41312	24679	4299	11061	0	0
1996	0	0	0	0	0	62300	134711	22750	5395	22891	0	9526	0	0
1997	172	0	0	0	0	50876	93068	118179	162981	133098	21072	0	0	0
1998	4753	7564	0	0	19701	0	175400	45197	145838	60967	8479	2736	0	0
1999	0	2480	0	0	0	6074	26308	68112	38658	105231	5811	0	0	0
2000	0	0	1711	13375	0	18468	11096	0	69580	11290	3411	0	0	0
2001	16257	0	15503	0	0	146012	46615	0	23603	24216	2075	0	0	0
2002	0	2945	0	0	4841	52117	11770	0	97116	92914	0	0	0	0
2003	0	0	0	0	47384	36771	411244	6572	6684	40197	0	24145	0	0
2004	0	0	0	0	0	50241	496395	0	48253	31548	223	0	0	0
2005	0	0	0	3477	26	258162	8777	0	9387	11704	1371	0	0	0
2006	0	0	0	0	0	62512	12344	342	4458	0	0	0	0	0
2007	204867	0	0	0	0	267251	6356	0	34694	83211	18032	0	0	0
2008	0	0	26892	0	0	36577	0	933	39092	306	0	0	0	0
2009	0	0	0	0	0	60133	98082	0	13799	313	0	0	0	0
2010	0	0	223	0	0	26932	38319	0	8018	51	9471	0	0	0
2011	0	0	0	3408	16275	89852	19141	0	287461	0	0	4	0	0
2012	0	0	0	8616	0	76917	0	0	95947	68	112	0	1457	59501
2013	0	0	0	0	174	0	44531	0	99252	61165	0	0	0	0
2014	8067	355	0	0	13	98646	181485	16590	91230	7119	0	0	0	0
2015	0	0	0	1960	0	48295	0	46716	102409	5628	0	653	4	0
2016	1400	0	2562	0	0	5304	37463	0	22128	0	752	0	0	0
2017	622	0	0	0	37	8325	200907	35	9579	43951	0	772	0	0
2018	13415	4427	168	1770	28049	93679	51343	0	42880	36722	12011	10690	2932	0
2019	39273	1074	0	3585	2183	101523	228776	15812	122932	102213	2099	0	0	0
2020	18	0	0	146	1171	133210	41213	14407	179805	61134	86	3386	677	0
2021	1393	0	0	0	0	53098	8779	9572	104790	16319	8320	0	8248	0
Overall	1%	0%	12%	0%	3%	8%	50%	6%	6%	10%	0%	1%	0%	0%
10-Year	2%	0%	0%	1%	1%	21%	27%	3%	29%	11%	1%	1%	0%	2%

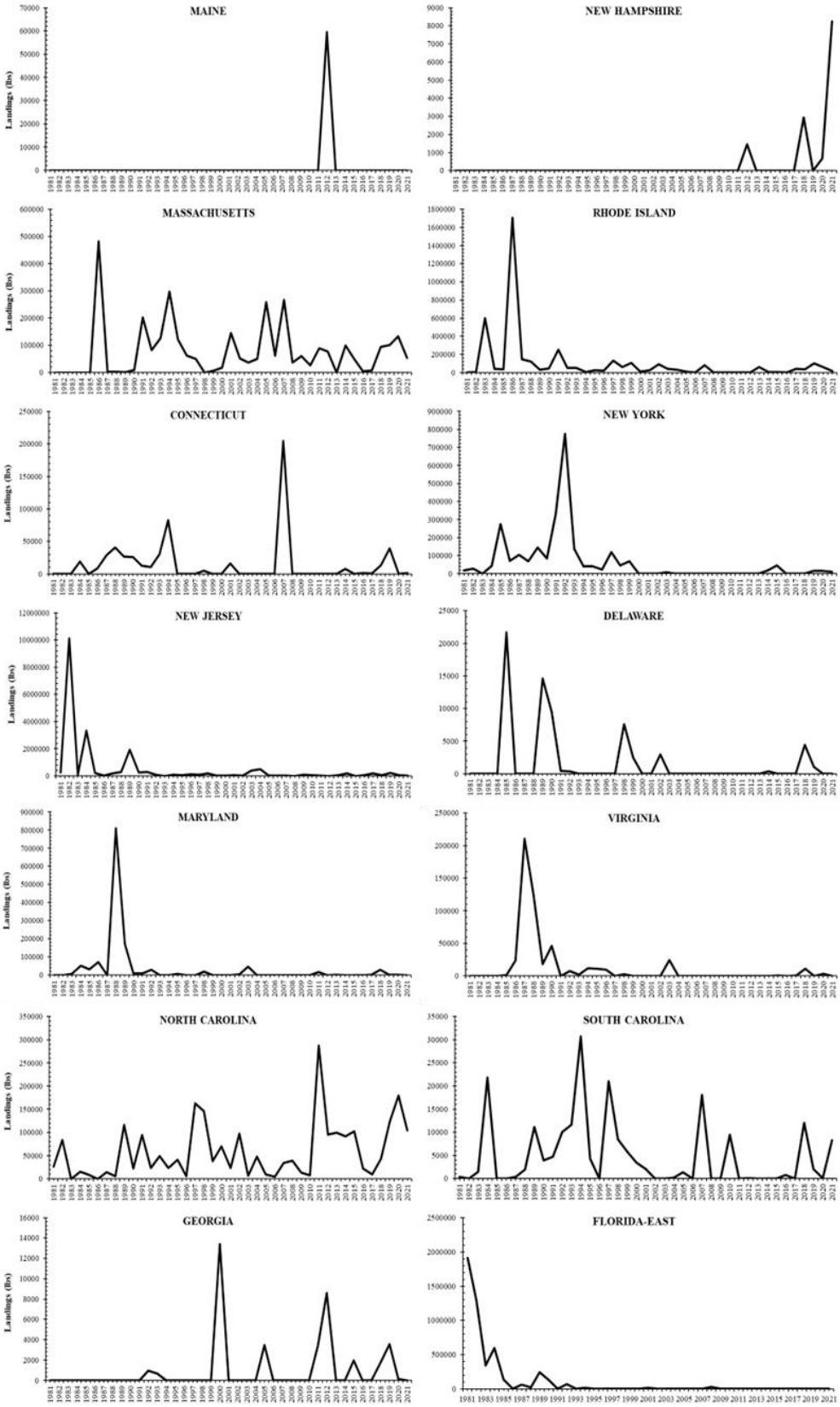

Figure A2.2. Recreational landings (lbs.) 1981-2021 by state.

Table A2.5. Percentage of recreational landing 1981-2021 by fishing mode for each region.

Year	Mid-Atlantic			North Atlantic			South Atlantic		
	Shore	For Hire	Private	Shore	For Hire	Private	Shore	For Hire	Private
1981	0%	94%	6%	0%	0%	0%	0%	2%	98%
1982	0%	98%	2%	0%	100%	0%	0%	4%	96%
1983	57%	7%	36%	0%	89%	11%	0%	26%	74%
1984	0%	99%	1%	0%	31%	69%	41%	12%	47%
1985	0%	39%	61%	0%	100%	0%	0%	0%	100%
1986	0%	38%	62%	21%	78%	1%	0%	0%	0%
1987	0%	65%	35%	0%	6%	94%	0%	3%	97%
1988	2%	72%	26%	0%	35%	65%	0%	5%	95%
1989	0%	54%	46%	15%	39%	45%	1%	42%	57%
1990	2%	12%	86%	9%	23%	68%	83%	11%	6%
1991	20%	14%	66%	89%	3%	9%	0%	50%	50%
1992	7%	3%	90%	30%	4%	66%	0%	13%	87%
1993	0%	19%	81%	49%	6%	44%	0%	30%	70%
1994	0%	12%	88%	19%	12%	69%	1%	53%	47%
1995	0%	0%	100%	28%	14%	58%	0%	24%	76%
1996	0%	6%	94%	17%	8%	76%	0%	89%	11%
1997	0%	39%	61%	0%	34%	66%	0%	15%	85%
1998	0%	9%	91%	1%	5%	94%	83%	8%	9%
1999	0%	2%	98%	23%	2%	75%	0%	33%	67%
2000	0%	0%	100%	0%	44%	56%	0%	83%	17%
2001	0%	0%	100%	0%	5%	95%	24%	33%	43%
2002	0%	0%	100%	0%	54%	46%	0%	0%	100%
2003	0%	12%	88%	23%	30%	47%	0%	56%	44%
2004	0%	3%	97%	0%	14%	86%	0%	2%	98%
2005	0%	10%	90%	13%	5%	82%	0%	8%	92%
2006	0%	100%	0%	0%	0%	100%	0%	0%	100%
2007	0%	100%	0%	44%	13%	43%	0%	6%	94%
2008	0%	100%	0%	0%	1%	99%	0%	74%	26%
2009	0%	0%	100%	0%	2%	98%	0%	88%	12%
2010	0%	0%	100%	100%	0%	0%	0%	100%	0%
2011	0%	14%	86%	0%	0%	100%	0%	3%	97%
2012	0%	0%	0%	0%	1%	99%	0%	19%	81%
2013	0%	0%	100%	0%	1%	99%	0%	7%	93%
2014	0%	9%	91%	40%	14%	46%	0%	4%	96%
2015	0%	1%	99%	5%	1%	93%	0%	3%	97%
2016	0%	0%	100%	0%	46%	54%	0%	29%	71%
2017	0%	96%	4%	0%	1%	99%	0%	35%	65%
2018	5%	4%	91%	5%	0%	95%	0%	11%	89%
2019	8%	27%	65%	47%	4%	50%	0%	6%	94%
2020	32%	8%	60%	22%	1%	77%	0%	3%	97%
2021	0%	1%	99%	21%	1%	78%	0%	5%	95%
2022	0%	19%	81%	29%	3%	69%	0%	13%	87%

Table A2.6. Percentage of recreational landing 1981-2021 by fishing mode (SH = Shore; FH = For Hire; PR = Private) for each state.

Year	CT			DE			FL			GA			MD			MA		
	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR
1981	0%	0%	0%	0%	0%	0%	0%	2%	98%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1982	0%	0%	0%	0%	0%	0%	0%	1%	99%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1983	0%	0%	0%	0%	0%	0%	0%	26%	74%	0%	0%	0%	0%	84%	16%	0%	0%	0%
1984	0%	100%	0%	0%	0%	0%	44%	6%	50%	0%	0%	0%	0%	100%	0%	0%	0%	0%
1985	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	63%	37%	0%	0%	0%
1986	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	52%	48%	96%	0%	4%
1987	0%	9%	91%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
1988	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	99%	1%	0%	0%	100%
1989	0%	42%	58%	0%	100%	0%	0%	56%	44%	0%	0%	0%	0%	15%	85%	0%	0%	100%
1990	0%	0%	100%	0%	99%	1%	100%	0%	0%	0%	0%	0%	0%	100%	0%	78%	6%	17%
1991	0%	0%	100%	0%	15%	85%	0%	0%	100%	0%	0%	0%	0%	34%	66%	99%	0%	1%
1992	0%	30%	70%	0%	100%	0%	0%	0%	100%	0%	100%	0%	0%	87%	13%	28%	0%	72%
1993	44%	4%	52%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	70%	4%	27%
1994	0%	7%	93%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	25%	13%	62%
1995	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	34%	6%	60%
1996	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	5%	75%
1997	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	23%	77%
1998	0%	5%	95%	0%	33%	67%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%
1999	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	12%	0%	88%
2000	0%	0%	0%	0%	0%	0%	0%	1%	99%	0%	0%	100%	0%	0%	0%	0%	47%	53%
2001	0%	0%	100%	0%	0%	0%	0%	71%	29%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2002	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%
2003	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	21%	79%	0%	8%	92%
2004	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	11%	89%
2005	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	83%	0%	100%	0%	9%	5%	86%
2006	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2007	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	92%	4%	4%
2008	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2009	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	99%
2010	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%
2011	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%
2012	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	1%	99%
2013	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
2014	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	46%	15%	39%
2015	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	2%	98%
2016	0%	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	58%	42%
2017	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
2018	0%	0%	100%	100%	0%	0%	0%	100%	0%	0%	9%	91%	0%	0%	100%	0%	0%	100%
2019	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	6%	94%	0%	22%	78%	23%	9%	68%
2020	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	1%	99%
2021	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	99%
2022	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	29%	3%	69%

Table A2.6. Percentage of recreational landing 1981-2021 by fishing mode (SH = Shore; FH = For Hire; PR = Private) for each state (Cont.).

Year	NJ			NY			NC			RI			SC			VA			ME			NH		
	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR
1981	0%	99%	1%	0%	18%	82%	0%	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1982	0%	99%	1%	0%	0%	100%	0%	47%	53%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1983	62%	0%	38%	0%	0%	0%	0%	0%	0%	0%	89%	11%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1984	0%	100%	0%	0%	0%	100%	0%	100%	0%	0%	1%	99%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1985	0%	0%	100%	0%	64%	36%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1986	0%	0%	100%	0%	34%	66%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	54%	46%	0%	0%	0%	0%	0%	0%
1987	0%	18%	82%	0%	88%	12%	0%	16%	84%	0%	5%	95%	0%	100%	0%	0%	94%	6%	0%	0%	0%	0%	0%	0%
1988	9%	12%	79%	0%	100%	0%	0%	26%	74%	0%	48%	52%	0%	0%	100%	0%	26%	74%	0%	0%	0%	0%	0%	0%
1989	0%	59%	41%	0%	32%	68%	3%	11%	85%	28%	40%	32%	0%	67%	33%	0%	5%	95%	0%	0%	0%	0%	0%	0%
1990	3%	12%	85%	0%	3%	97%	0%	56%	44%	0%	40%	60%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1991	1%	16%	83%	39%	11%	49%	0%	50%	50%	85%	5%	10%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1992	81%	0%	18%	0%	0%	100%	0%	26%	74%	38%	5%	57%	0%	66%	34%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1993	0%	0%	0%	0%	19%	81%	0%	13%	87%	2%	14%	83%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1994	0%	5%	95%	0%	7%	93%	1%	23%	76%	0%	20%	80%	0%	100%	0%	0%	91%	9%	0%	0%	0%	0%	0%	0%
1995	0%	0%	100%	0%	0%	100%	0%	16%	84%	0%	53%	47%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1996	0%	0%	100%	0%	0%	100%	0%	89%	11%	7%	15%	77%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
1997	0%	2%	98%	0%	68%	32%	0%	16%	84%	0%	38%	62%	0%	13%	87%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1998	0%	0%	100%	0%	0%	100%	88%	8%	5%	1%	5%	94%	0%	15%	85%	0%	2%	98%	0%	0%	0%	0%	0%	0%
1999	0%	0%	100%	0%	3%	97%	0%	29%	71%	23%	2%	75%	0%	62%	38%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	100%	0%	0%	0%	0%	100%	0%	0%	39%	61%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2001	0%	0%	100%	0%	0%	0%	42%	2%	56%	0%	37%	63%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2002	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%	85%	15%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2003	0%	4%	96%	0%	100%	0%	0%	56%	44%	45%	51%	5%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2004	0%	3%	97%	0%	0%	0%	0%	1%	99%	0%	19%	81%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2005	0%	9%	91%	0%	0%	0%	0%	6%	94%	98%	2%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2006	0%	100%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007	0%	100%	0%	0%	0%	0%	0%	9%	91%	0%	72%	28%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2008	0%	0%	0%	0%	100%	0%	0%	56%	44%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2009	0%	0%	100%	0%	0%	0%	0%	88%	12%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2010	0%	0%	100%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2011	0%	25%	75%	0%	0%	0%	0%	2%	98%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2012	0%	0%	0%	0%	0%	0%	0%	12%	88%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%
2013	0%	0%	100%	0%	0%	0%	0%	7%	93%	0%	1%	99%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2014	0%	2%	98%	0%	78%	22%	0%	4%	96%	0%	13%	87%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2015	0%	0%	0%	0%	0%	100%	0%	1%	99%	48%	0%	52%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%
2016	0%	0%	100%	0%	0%	0%	0%	18%	82%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2017	0%	96%	4%	0%	100%	0%	0%	35%	65%	0%	1%	99%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2018	0%	8%	92%	0%	0%	0%	0%	14%	86%	12%	0%	88%	0%	0%	100%	0%	0%	100%	0%	0%	0%	80%	0%	20%
2019	9%	28%	63%	0%	11%	89%	0%	4%	96%	88%	0%	12%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2020	47%	2%	51%	0%	10%	90%	0%	2%	98%	70%	1%	29%	0%	100%	0%	0%	38%	62%	0%	0%	0%	0%	86%	14%
2021	0%	3%	97%	0%	0%	100%	0%	0%	100%	51%	2%	47%	0%	59%	41%	0%	0%	0%	0%	0%	0%	100%	0%	0%
2022	0%	18%	82%	0%	0%	0%	0%	11%	89%	34%	3%	63%	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%

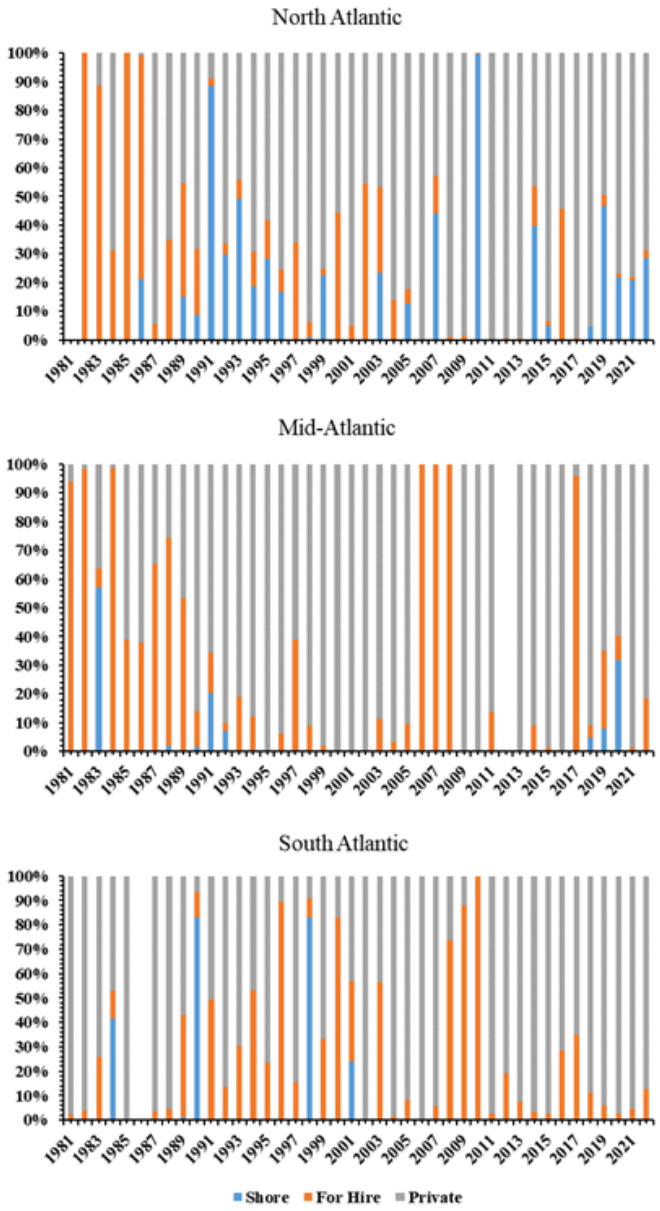

Figure A2.3. Percentage of recreational landing 1981-2021 by fishing mode for each region.

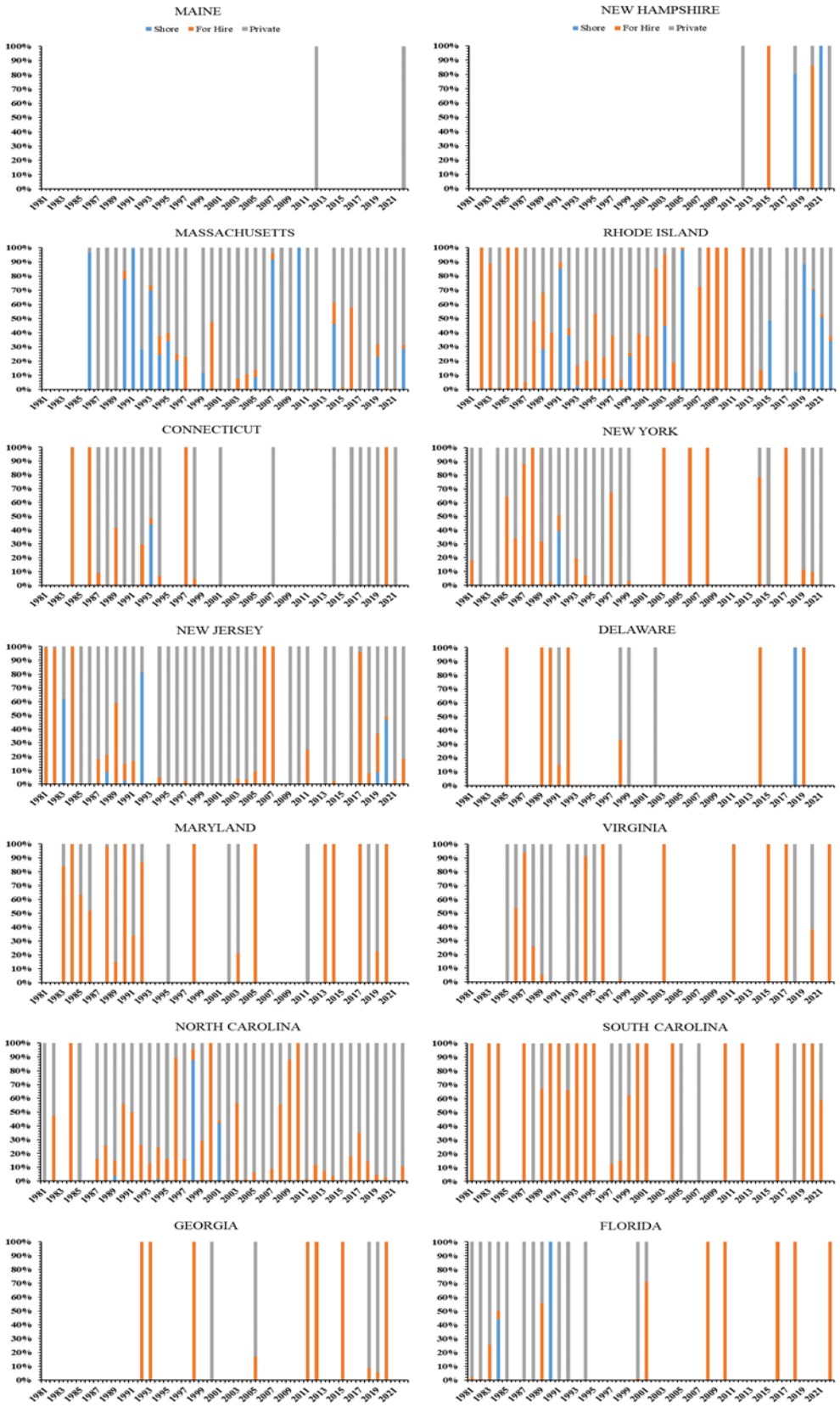

Figure A2.4 Percentage of recreational landing 1981-2021 by fishing mode for each state.

Table A2.7. Percentage of recreational landing 1981-2021 in state and federal waters for each region.

Year	Mid-Atlantic		North Atlantic		South Atlantic	
	Federal	State	Federal	State	Federal	State
1981	99%	1%	0%	0%	97%	3%
1982	100%	0%	100%	0%	75%	25%
1983	43%	57%	89%	11%	67%	33%
1984	98%	2%	31%	69%	28%	72%
1985	64%	36%	100%	0%	100%	0%
1986	84%	16%	79%	21%	0%	0%
1987	76%	24%	85%	15%	79%	21%
1988	96%	4%	71%	29%	77%	23%
1989	95%	5%	53%	47%	36%	64%
1990	66%	34%	41%	59%	14%	86%
1991	48%	52%	9%	91%	81%	19%
1992	83%	17%	10%	90%	24%	76%
1993	36%	64%	19%	81%	100%	0%
1994	60%	40%	1%	99%	79%	21%
1995	98%	2%	17%	83%	25%	75%
1996	100%	0%	4%	96%	100%	0%
1997	72%	28%	47%	53%	87%	13%
1998	97%	3%	48%	52%	6%	94%
1999	98%	2%	41%	59%	59%	41%
2000	0%	100%	46%	54%	100%	0%
2001	91%	9%	46%	54%	53%	47%
2002	40%	60%	64%	36%	34%	66%
2003	100%	0%	30%	70%	56%	44%
2004	100%	0%	14%	86%	48%	52%
2005	10%	90%	4%	96%	63%	37%
2006	97%	3%	100%	0%	100%	0%
2007	58%	42%	4%	96%	74%	26%
2008	0%	100%	0%	100%	59%	41%
2009	100%	0%	0%	100%	88%	12%
2010	8%	92%	0%	100%	100%	0%
2011	100%	0%	0%	100%	35%	65%
2012	0%	0%	44%	56%	67%	33%
2013	91%	9%	0%	100%	14%	86%
2014	91%	9%	24%	76%	14%	86%
2015	1%	99%	5%	95%	82%	18%
2016	100%	0%	41%	59%	48%	52%
2017	96%	4%	76%	24%	78%	22%
2018	94%	6%	20%	80%	75%	25%
2019	88%	12%	13%	87%	31%	69%
2020	50%	50%	36%	64%	18%	82%
2021	31%	69%	32%	68%	44%	56%
2022	100%	0%	21%	79%	36%	64%

Table A2.8. Percentage of recreational landing 1981-2021 in state and federal waters for each state.

Year	CT		DE		FL		GA		MD		MA	
	Federal	**State**	**Federal**	**State**	**Federal**	**State**	**Federal**	**State**	**Federal**	**State**	**Federal**	**State**
1981	0%	0%	0%	0%	96%	4%	0%	0%	0%	0%	0%	0%
1982	0%	0%	0%	0%	74%	26%	0%	0%	0%	0%	0%	0%
1983	0%	0%	0%	0%	67%	33%	0%	0%	100%	0%	0%	0%
1984	100%	0%	0%	0%	24%	76%	0%	0%	100%	0%	0%	0%
1985	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%
1986	43%	57%	0%	0%	0%	0%	0%	0%	100%	0%	4%	96%
1987	9%	91%	0%	0%	85%	15%	0%	0%	0%	0%	100%	0%
1988	0%	100%	0%	0%	86%	14%	0%	0%	100%	0%	100%	0%
1989	42%	58%	100%	0%	38%	62%	0%	0%	100%	0%	0%	100%
1990	0%	100%	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%
1991	0%	100%	100%	0%	0%	100%	0%	0%	100%	0%	1%	99%
1992	0%	100%	100%	0%	0%	100%	100%	0%	100%	0%	4%	96%
1993	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	5%	95%
1994	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	1%	99%
1995	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	12%	88%
1996	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
1997	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	20%	80%
1998	0%	100%	100%	0%	0%	0%	100%	0%	100%	0%	0%	0%
1999	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2000	0%	0%	0%	0%	99%	1%	100%	0%	0%	0%	12%	88%
2001	0%	100%	0%	0%	71%	29%	0%	0%	0%	0%	42%	58%
2002	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	100%
2003	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	8%	92%
2004	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	11%	89%
2005	0%	0%	0%	0%	0%	0%	17%	83%	100%	0%	4%	96%
2006	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
2007	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2008	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
2009	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2010	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
2011	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	100%
2012	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2013	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
2014	0%	100%	100%	0%	0%	0%	0%	0%	100%	0%	24%	76%
2015	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2016	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	52%	48%
2017	100%	0%	0%	0%	0%	0%	0%	0%	100%	0%	9%	91%
2018	44%	56%	0%	100%	0%	100%	100%	0%	100%	0%	23%	77%
2019	0%	100%	100%	0%	0%	0%	100%	0%	100%	0%	21%	79%
2020	0%	100%	0%	0%	0%	0%	100%	0%	100%	0%	50%	50%
2021	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	33%	67%
2022	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	21%	79%

Table A2.8. Percentage of recreational landing 1981-2021 in state and federal waters for each state (Cont).

Year	NJ		NY		NC		RI		SC		VA		ME		NH	
	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State
1981	99%	1%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
1982	100%	0%	94%	6%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1983	38%	62%	0%	0%	0%	0%	89%	11%	100%	0%	0%	0%	0%	0%	0%	0%
1984	98%	2%	79%	21%	100%	0%	1%	99%	100%	0%	0%	0%	0%	0%	0%	0%
1985	100%	0%	26%	74%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%
1986	100%	0%	56%	44%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%
1987	92%	8%	0%	100%	56%	44%	100%	0%	100%	0%	100%	0%	0%	0%	0%	0%
1988	88%	12%	68%	32%	26%	74%	93%	7%	100%	0%	100%	0%	0%	0%	0%	0%
1989	98%	2%	42%	58%	26%	74%	66%	34%	84%	16%	90%	10%	0%	0%	0%	0%
1990	66%	34%	74%	26%	78%	22%	74%	26%	100%	0%	39%	61%	0%	0%	0%	0%
1991	94%	6%	5%	95%	85%	15%	15%	85%	100%	0%	0%	0%	0%	0%	0%	0%
1992	0%	100%	90%	10%	57%	43%	22%	78%	100%	0%	100%	0%	0%	0%	0%	0%
1993	0%	0%	35%	65%	100%	0%	64%	36%	100%	0%	100%	0%	0%	0%	0%	0%
1994	63%	37%	43%	57%	40%	60%	17%	83%	100%	0%	100%	0%	0%	0%	0%	0%
1995	100%	0%	95%	5%	17%	83%	41%	59%	100%	0%	100%	0%	0%	0%	0%	0%
1996	100%	0%	100%	0%	100%	0%	15%	85%	0%	0%	100%	0%	0%	0%	0%	0%
1997	45%	55%	93%	7%	86%	14%	57%	43%	100%	0%	0%	0%	0%	0%	0%	0%
1998	95%	5%	100%	0%	6%	94%	52%	48%	15%	85%	100%	0%	0%	0%	0%	0%
1999	100%	0%	97%	3%	53%	47%	43%	57%	100%	0%	0%	0%	0%	0%	0%	0%
2000	0%	100%	0%	0%	100%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2001	91%	9%	0%	0%	38%	62%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2002	0%	100%	0%	0%	34%	66%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2003	100%	0%	100%	0%	56%	44%	51%	49%	0%	0%	100%	0%	0%	0%	0%	0%
2004	100%	0%	0%	0%	48%	52%	19%	81%	100%	0%	0%	0%	0%	0%	0%	0%
2005	9%	91%	0%	0%	75%	25%	2%	98%	100%	0%	0%	0%	0%	0%	0%	0%
2006	100%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007	58%	42%	0%	0%	60%	40%	29%	71%	100%	0%	0%	0%	0%	0%	0%	0%
2008	0%	0%	0%	100%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
2009	100%	0%	0%	0%	88%	12%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
2010	8%	92%	0%	0%	100%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%
2011	100%	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
2012	0%	0%	0%	0%	64%	36%	0%	100%	100%	0%	0%	0%	100%	0%	100%	0%
2013	91%	9%	0%	0%	14%	86%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
2014	98%	2%	11%	89%	14%	86%	45%	55%	0%	0%	0%	0%	0%	0%	0%	0%
2015	0%	0%	0%	100%	82%	18%	52%	48%	0%	0%	100%	0%	0%	0%	100%	0%
2016	100%	0%	0%	0%	52%	48%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2017	96%	4%	100%	0%	78%	22%	88%	12%	0%	0%	100%	0%	0%	0%	0%	0%
2018	98%	2%	0%	0%	67%	33%	6%	94%	100%	0%	100%	0%	0%	0%	0%	100%
2019	90%	10%	59%	41%	27%	73%	10%	90%	100%	0%	0%	0%	0%	0%	0%	0%
2020	53%	47%	26%	74%	18%	82%	5%	95%	100%	0%	100%	0%	0%	0%	77%	23%
2021	65%	35%	0%	100%	40%	60%	47%	53%	100%	0%	0%	0%	0%	0%	0%	100%
2022	100%	0%	0%	0%	35%	65%	66%	34%	0%	0%	100%	0%	0%	100%	1%	99%

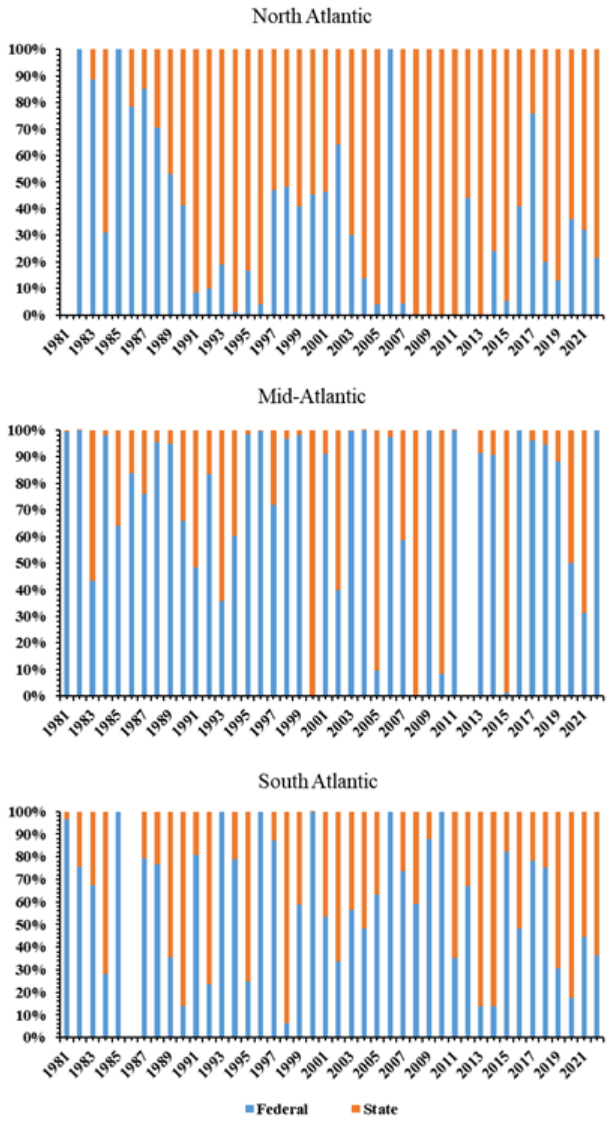

Figure A2.5. Percentage of recreational landing 1981-2021 in state and federal waters for each region.

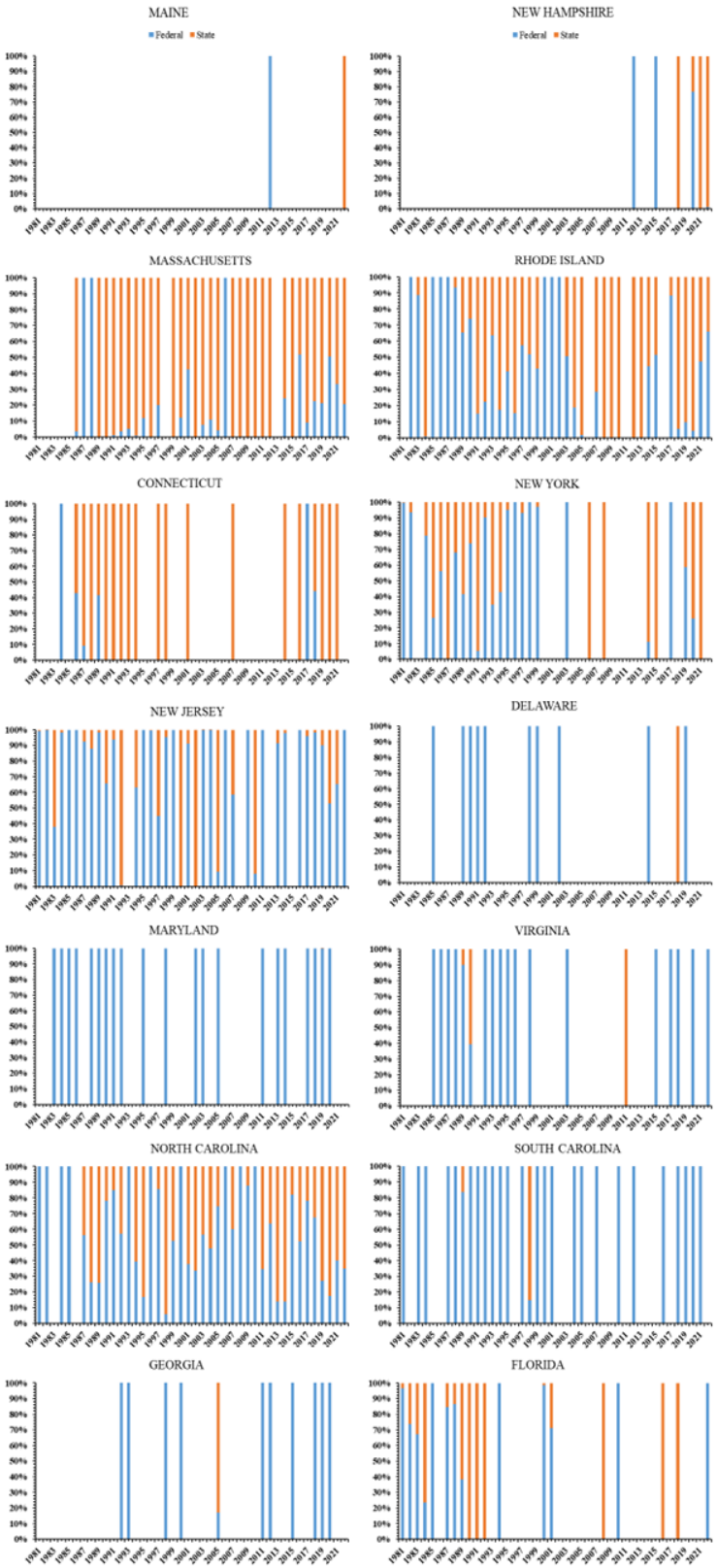

Figure A2.6. Percentage of recreational landing 1981-2021 in state and federal waters for each state.

Table A2.9. Recreational discards (individuals) 1981-2022 by region.

Year	Mid-Atlantic	North Atlantic	South Atlantic	Total Discards
1981	166496	6882	0	173378
1982	422974	0	0	422974
1983	55840	6365	0	62205
1984	117650	5000	0	122650
1985	81357	0	0	81614
1986	133696	0	368	134064
1987	339159	4513	1643	345315
1988	791460	1853	33354	826667
1989	278505	85	5647	286574
1990	66509	1008	1057	68574
1991	20114	4938	10413	36296
1992	11585	3202	3020	18656
1993	19547	7642	11733	38922
1994	52890	14752	18932	86574.9
1995	351181	15810	7163	374154
1996	2976	51932	11140	66048
1997	2946	16523	34367	53836
1998	54067	19873	20469	96099
1999	12647	45795	3759	62201
2000	64983	21908	17914	113016
2001	49204	21852	6489	80630
2002	209831	34670	30165	274666
2003	25949	6965	13049	50021
2004	289	31505	19082	51057
2005	8240	12313	42411	62964
2006	189336	42708	2755	234799
2007	0	33194	8810	42032
2008	0	11112	23411	34677
2009	0	2441	2561	5691
2010	139	14660	17279	32134
2011	4957	0	28618	33575
2012	0	251	14039	14290
2013	60946	12736	50273	123955
2014	257349	52277	62125	371751
2015	4561	18298	1783	24642
2016	4091	42615	12643	59349
2017	12914	745	49043	62873
2018	19901	419164	16222	455287
2019	25411	80319	27722	133701
2020	27011	28895	23817	95085
2021	20866	101587	8449	130902
2022	249793	113988	11773	375554
Mean	68%	21%	11%	-
10-Year	37%	47%	15%	-

Table A2.10. Recreational discards (individuals) 1981-2022 by state.

Year	CT	DE	GA	MD	MA	NJ	NY	NC	RI	SC	VA	FL	ME	NH
1981	0	0	0	0	0	5634	303	0	6882	0	0	160559	0	0
1982	0	0	0	0	0	247795	0	0	0	0	0	175179	0	0
1983	0	0	0	1358	6365	0	0	0	0	0	0	54482	0	0
1984	0	0	0	0	0	0	0	0	5000	0	0	117650	0	0
1985	0	0	257	0	0	0	109	0	0	0	0	81248	0	0
1986	0	0	0	0	0	0	614	368	0	0	1653	131429	0	0
1987	0	0	0	0	0	66	1687	1609	4513	34	1198	336208	0	0
1988	0	0	0	711	1155	289811	0	32981	698	373	1332	499606	0	0
1989	0	3375	2337	0	0	76196	2487	4214	85	1433	1058	195389	0	0
1990	0	379	0	0	223	12699	17285	1057	785	0	299	35847	0	0
1991	0	5	831	0	1520	2480	4252	9622	3418	791	9361	4016	0	0
1992	0	0	849	0	2483	1236	2695	2747	719	273	1693	5961	0	0
1993	0	0	0	0	993	0	1355	1690	6649	10043	0	18192	0	0
1994	0	0	0.9	0	14254	35581	517	18932	498	0	8158	8634	0	0
1995	0	0	0	10700	12409	18611	68779	2407	3401	4756	1198	251893	0	0
1996	36055	0	0	1600	7326	0	0	10845	8551	295	0	1376	0	0
1997	0	0	0	0	10988	0	2924	29817	5535	4550	0	22	0	0
1998	3119	0	1690	0	5036	32444	20506	8837	11718	11632	0	1117	0	0
1999	0	0	0	0	1831	3429	9218	2682	43964	1077	0	0	0	0
2000	829	98	8211	0	15466	2684	0	9257	5613	8657	2384	59817	0	0
2001	3170	0	3085	2692	17297	0	0	5001	1385	1488	0	46512	0	0
2002	0	0	0	0	33532	0	19490	30165	1138	0	2045	188296	0	0
2003	882	1963	4058	9155	0	203	11707	12968	6083	0	2921	0	0	0
2004	4119	0	181	0	1966	0	0	19082	25420	0	0	289	0	0
2005	0	0	0	0	12301	5898	0	42363	12	48	0	2342	0	0
2006	0	0	0	0	42708	189336	0	2755	0	0	0	0	0	0
2007	11379	0	28	0	15073	0	0	4523	6742	4287	0	0	0	0
2008	0	0	154	0	9474	0	0	23411	1638	0	0	0	0	0
2009	0	0	689	0	2441	0	0	2561	0	0	0	0	0	0
2010	0	0	56	139	14660	0	0	16583	0	696	0	0	0	0
2011	0	0	0	0	0	0	0	28618	0	0	4957	0	0	0
2012	0	0	0	0	251	0	0	7858	0	6181	0	0	0	0
2013	0	0	0	0	2192	60412	534	4609	10544	45664	0	0	0	0
2014	1389	619	0	1645	41634	175714	1429	59925	9254	2200	0	77942	0	0
2015	0	0	0	0	12983	0	4561	1325	5315	458	0	0	0	0
2016	6045	0	0	0	13377	0	0	10196	23193	2447	0	4091	0	0
2017	0	0	171	4873	242	5623	2012	40094	503	8949	59	347	0	0
2018	10086	1648	0	4153	378413	12572	1528	11745	26211	4477	0	0	97	4357
2019	21662	15	249	5009	23917	8388	11999	24033	34740	3689	0	0	0	0
2020	0	2	15362	0	20509	17561	9448	23817	7337	0	0	0	0	1049
2021	25	0	0	0	96060	17363	3503	7793	5094	656	0	0	0	408
2022	1103	0	0	0	99486	221623	28170	11773	4466	0	0	0	0	8933
Overall	2%	0%	1%	1%	15%	23%	4%	8%	4%	2%	1%	40%	0%	0%
10-Year	2%	0%	1%	1%	38%	28%	3%	11%	7%	4%	0%	4%	0%	1%

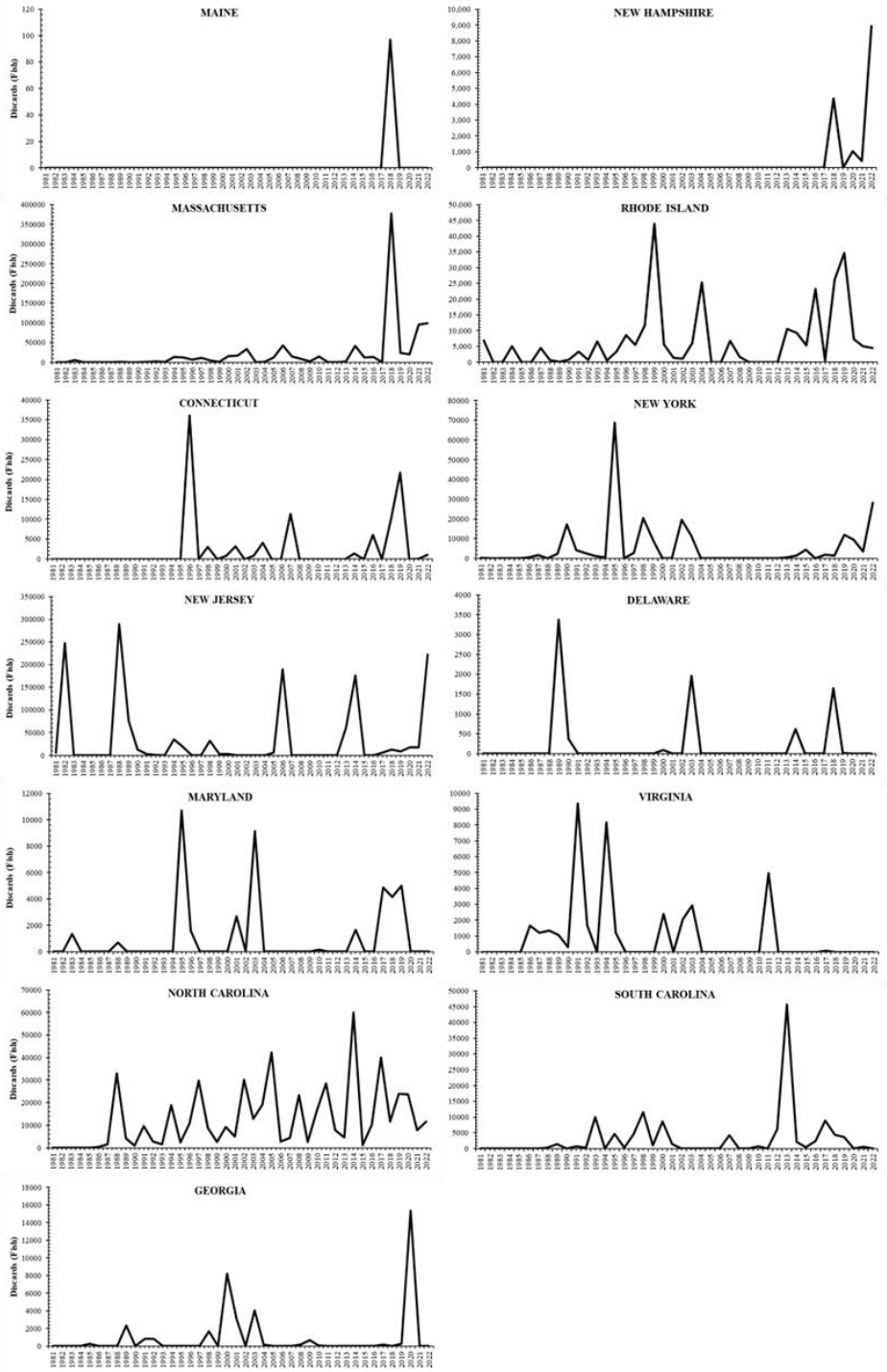

Figure A2.7. Recreational discards (individuals) from 1981-2021 by state.

Table A2.11. Percentage of recreational discards 1981-2021 by fishing mode for each region.

Year	Mid-Atlantic			North Atlantic			South Atlantic		
	Shore	For Hire	Private	Shore	For Hire	Private	Shore	For Hire	Private
1981	0%	94%	6%	0%	0%	0%	0%	2%	98%
1982	0%	98%	2%	0%	100%	0%	0%	4%	96%
1983	57%	7%	36%	0%	89%	11%	0%	26%	74%
1984	0%	99%	1%	0%	31%	69%	41%	12%	47%
1985	0%	39%	61%	0%	100%	0%	0%	0%	100%
1986	0%	38%	62%	21%	78%	1%	0%	0%	0%
1987	0%	65%	35%	0%	6%	94%	0%	3%	97%
1988	2%	72%	26%	0%	35%	65%	0%	5%	95%
1989	0%	54%	46%	15%	39%	45%	1%	42%	57%
1990	2%	12%	86%	9%	23%	68%	83%	11%	6%
1991	20%	14%	66%	89%	3%	9%	0%	50%	50%
1992	7%	3%	90%	30%	4%	66%	0%	13%	87%
1993	0%	19%	81%	49%	6%	44%	0%	30%	70%
1994	0%	12%	88%	19%	12%	69%	1%	53%	47%
1995	0%	0%	100%	28%	14%	58%	0%	24%	76%
1996	0%	6%	94%	17%	8%	76%	0%	89%	11%
1997	0%	39%	61%	0%	34%	66%	0%	15%	85%
1998	0%	9%	91%	1%	5%	94%	83%	8%	9%
1999	0%	2%	98%	23%	2%	75%	0%	33%	67%
2000	0%	0%	100%	0%	44%	56%	0%	83%	17%
2001	0%	0%	100%	0%	5%	95%	24%	33%	43%
2002	0%	0%	100%	0%	54%	46%	0%	0%	100%
2003	0%	12%	88%	23%	30%	47%	0%	56%	44%
2004	0%	3%	97%	0%	14%	86%	0%	2%	98%
2005	0%	10%	90%	13%	5%	82%	0%	8%	92%
2006	0%	100%	0%	0%	0%	100%	0%	0%	100%
2007	0%	100%	0%	44%	13%	43%	0%	6%	94%
2008	0%	100%	0%	0%	1%	99%	0%	74%	26%
2009	0%	0%	100%	0%	2%	98%	0%	88%	12%
2010	0%	0%	100%	100%	0%	0%	0%	100%	0%
2011	0%	14%	86%	0%	0%	100%	0%	3%	97%
2012	0%	0%	0%	0%	1%	99%	0%	19%	81%
2013	0%	0%	100%	0%	1%	99%	0%	7%	93%
2014	0%	9%	91%	40%	14%	46%	0%	4%	96%
2015	0%	1%	99%	5%	1%	93%	0%	3%	97%
2016	0%	0%	100%	0%	46%	54%	0%	29%	71%
2017	0%	96%	4%	0%	1%	99%	0%	35%	65%
2018	5%	4%	91%	5%	0%	95%	0%	11%	89%
2019	8%	27%	65%	47%	4%	50%	0%	6%	94%
2020	32%	8%	60%	22%	1%	77%	0%	3%	97%
2021	0%	1%	99%	21%	1%	78%	0%	5%	95%
2022	0%	19%	81%	29%	3%	69%	0%	13%	87%

Table A2.12. Percentage of recreational discards 1981-2021 by fishing mode (SH = Shore; FH = For Hire; PR = Private) for each state.

Year	CT			DE			FL			GA			MD			MA		
	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR
1981	0%	0%	0%	0%	0%	0%	0%	8%	92%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1982	0%	0%	0%	0%	0%	0%	10%	1%	89%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1983	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%	0%	100%	0%	0%
1984	0%	0%	0%	0%	0%	0%	0%	8%	92%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1985	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1986	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1987	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1988	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	100%
1989	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1990	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
1991	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	0%	73%	0%	27%
1992	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	82%	0%	18%
1993	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
1994	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	8%	54%	38%
1995	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	18%	82%	40%	0%	60%
1996	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	21%	0%	79%
1997	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	32%	15%	53%
1998	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
1999	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2000	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
2001	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	27%	0%	73%
2002	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2003	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	100%	0%	10%	90%	0%	0%	0%
2004	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	2%	98%
2005	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	5%	95%
2006	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2007	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
2008	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
2009	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
2010	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	100%	0%	0%
2011	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2012	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
2013	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2014	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	41%	0%	59%
2015	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	99%
2016	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	58%	1%	41%
2017	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%
2018	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	36%	0%	64%
2019	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	27%	73%	0%	4%	96%
2020	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
2021	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2022	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	58%	0%	42%

Table A2.12. Percentage of recreational discards 1981-2021 by fishing mode (SH = Shore; FH = For Hire; PR = Private) for each state (Cont.).

Year	NJ			NY			NC			RI			SC			VA			ME			NH		
	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR	SH	FH	PR
1981	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1982	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1983	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1984	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1985	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1986	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1987	0%	100%	0%	0%	0%	100%	0%	2%	98%	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1988	99%	0%	1%	0%	0%	0%	100%	0%	0%	0%	29%	71%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1989	100%	0%	0%	0%	33%	67%	0%	2%	98%	0%	0%	100%	0%	40%	60%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1990	0%	0%	100%	0%	0%	100%	0%	4%	96%	0%	74%	26%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1991	0%	0%	100%	0%	18%	82%	0%	0%	100%	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1992	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1993	0%	0%	0%	0%	41%	59%	30%	22%	48%	0%	2%	98%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1994	0%	0%	100%	0%	0%	100%	81%	5%	13%	0%	0%	100%	0%	0%	0%	0%	92%	8%	0%	0%	0%	0%	0%	0%
1995	0%	0%	100%	0%	0%	100%	0%	23%	77%	0%	8%	92%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
1996	0%	0%	0%	0%	0%	0%	0%	12%	88%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1997	0%	0%	0%	0%	0%	100%	0%	5%	95%	20%	20%	60%	0%	89%	11%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1998	0%	0%	100%	0%	0%	100%	72%	15%	13%	0%	0%	100%	0%	49%	51%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1999	0%	0%	100%	0%	0%	100%	0%	93%	7%	13%	0%	87%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	100%	0%	0%	0%	0%	6%	94%	81%	2%	17%	0%	9%	91%	0%	0%	100%	0%	0%	0%	0%	0%	0%
2001	0%	0%	0%	0%	0%	0%	0%	2%	98%	0%	11%	89%	0%	11%	89%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2002	0%	0%	0%	100%	0%	0%	2%	2%	96%	0%	4%	96%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
2003	0%	100%	0%	0%	0%	100%	0%	14%	86%	0%	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2004	0%	0%	0%	0%	0%	0%	0%	1%	99%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2005	0%	30%	70%	0%	0%	0%	0%	1%	99%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2006	0%	0%	100%	0%	0%	0%	0%	8%	92%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007	0%	0%	0%	0%	0%	0%	0%	15%	85%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2008	0%	0%	0%	0%	0%	0%	0%	15%	85%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2009	0%	0%	0%	0%	0%	0%	0%	8%	92%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2010	0%	0%	0%	0%	0%	0%	0%	3%	97%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2011	0%	0%	0%	0%	0%	0%	0%	1%	99%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
2012	0%	0%	0%	0%	0%	0%	21%	9%	70%	0%	0%	0%	0%	1%	99%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2013	0%	0%	100%	0%	100%	0%	0%	23%	77%	0%	0%	100%	0%	1%	99%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2014	0%	0%	100%	0%	0%	100%	0%	0%	100%	2%	3%	95%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2015	0%	0%	0%	0%	0%	100%	0%	14%	86%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2016	0%	0%	0%	0%	0%	0%	0%	5%	95%	94%	0%	6%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2017	0%	0%	100%	0%	0%	100%	0%	4%	96%	0%	2%	98%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2018	14%	0%	86%	0%	5%	95%	0%	3%	97%	38%	0%	62%	0%	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	100%
2019	19%	15%	66%	36%	0%	64%	0%	3%	97%	64%	0%	36%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2020	9%	0%	91%	12%	0%	88%	0%	1%	99%	42%	2%	55%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2021	0%	2%	98%	0%	0%	100%	31%	1%	68%	0%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2022	0%	3%	97%	0%	0%	100%	0%	3%	97%	4%	3%	93%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

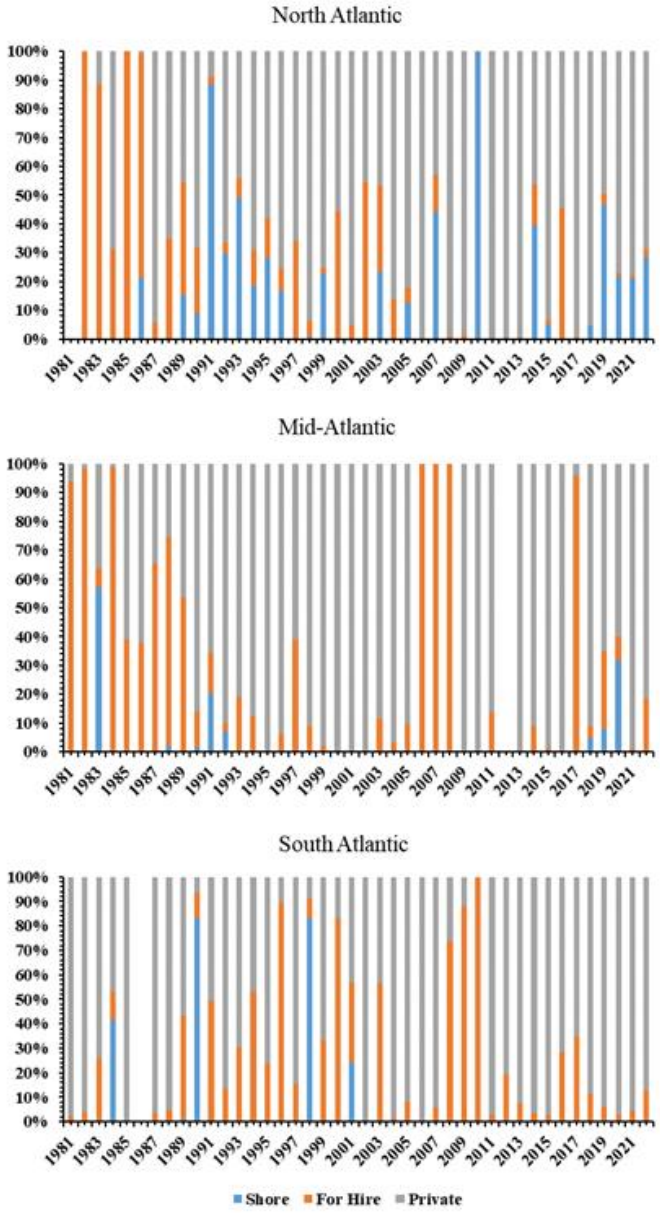

Figure A2.8. Percentage of recreational discards 1981-2021 by fishing mode for each region.

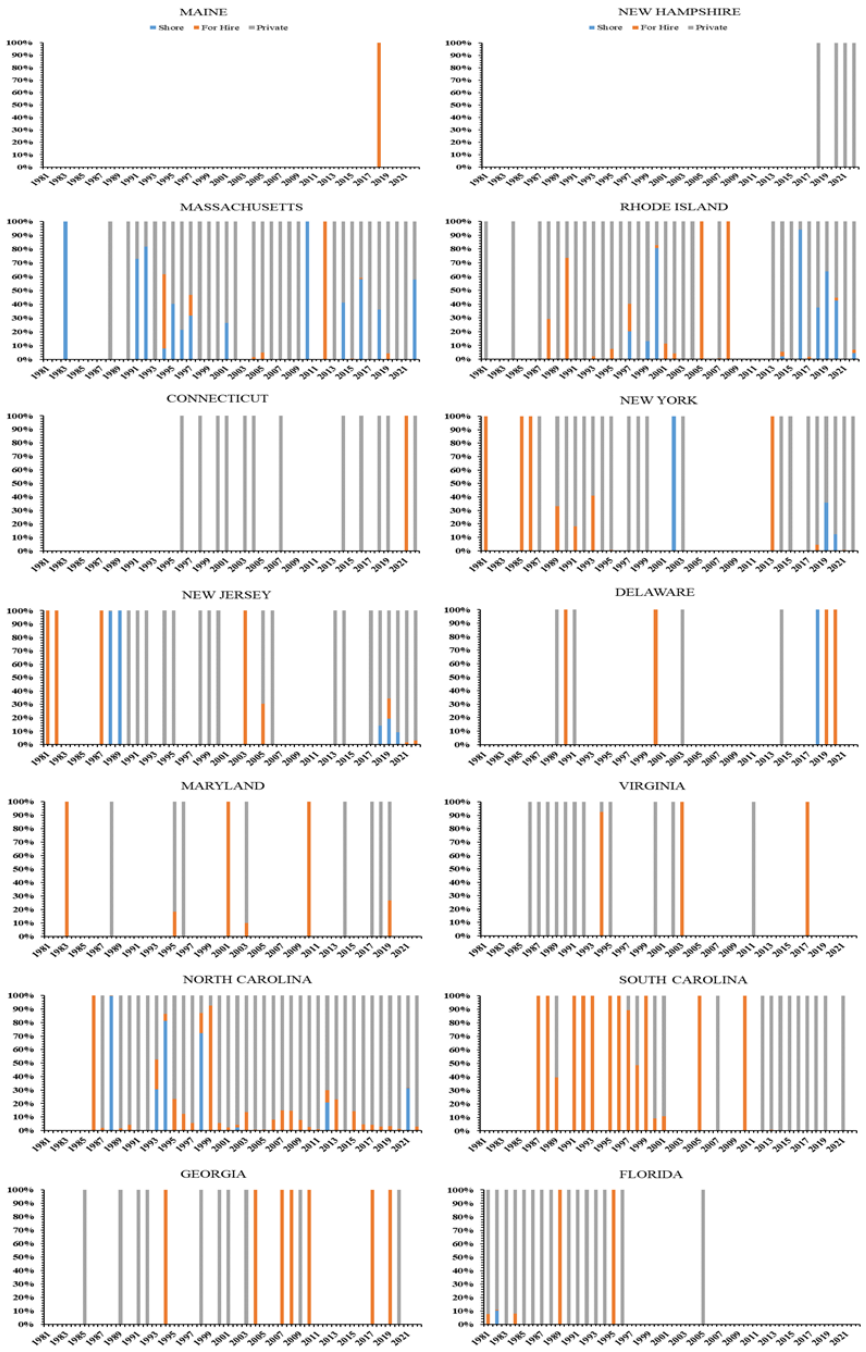

Figure A2.9. Percentage of recreational discards 1981-2021 by fishing mode for each state.

Table A2.13. Percentage of recreational discards 1981-2021 in state and federal waters for each region.

Year	Mid-Atlantic		North Atlantic		South Atlantic	
	Federal	State	Federal	State	Federal	State
1981	100%	0%	0%	100%	92%	8%
1982	100%	0%	0%	0%	36%	64%
1983	100%	0%	0%	100%	100%	0%
1984	0%	0%	100%	0%	87%	13%
1985	100%	0%	0%	0%	30%	70%
1986	61%	39%	0%	0%	82%	18%
1987	43%	57%	100%	0%	87%	13%
1988	1%	99%	38%	62%	8%	92%
1989	4%	96%	100%	0%	83%	17%
1990	69%	31%	100%	0%	83%	17%
1991	26%	74%	69%	31%	42%	58%
1992	46%	54%	0%	100%	84%	16%
1993	41%	59%	85%	15%	96%	4%
1994	14%	86%	4%	96%	17%	83%
1995	90%	10%	4%	96%	100%	0%
1996	100%	0%	16%	84%	100%	0%
1997	0%	100%	7%	93%	49%	51%
1998	97%	3%	37%	63%	31%	69%
1999	27%	73%	79%	21%	100%	0%
2000	2%	98%	0%	100%	100%	0%
2001	100%	0%	23%	77%	85%	15%
2002	9%	91%	3%	97%	28%	72%
2003	55%	45%	87%	13%	58%	42%
2004	0%	0%	74%	26%	54%	46%
2005	30%	70%	0%	100%	100%	0%
2006	100%	0%	0%	100%	81%	19%
2007	0%	0%	0%	100%	87%	13%
2008	0%	0%	15%	85%	54%	46%
2009	0%	0%	0%	100%	100%	0%
2010	100%	0%	0%	100%	100%	0%
2011	100%	0%	0%	0%	83%	17%
2012	0%	0%	0%	100%	79%	21%
2013	99%	1%	14%	86%	19%	81%
2014	98%	2%	1%	99%	45%	55%
2015	0%	100%	0%	100%	82%	18%
2016	0%	0%	25%	75%	68%	32%
2017	52%	48%	32%	68%	32%	68%
2018	66%	34%	13%	87%	86%	14%
2019	77%	23%	5%	95%	37%	63%
2020	52%	48%	6%	94%	69%	31%
2021	93%	7%	3%	97%	31%	69%
2022	89%	11%	25%	75%	87%	13%

Table A2.14. Percentage of recreational discards 1981-2021 in state and federal waters for each state.

Year	CT		DE		FL		GA		MD		MA	
	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State
1981	0%	0%	0%	0%	92%	8%	0%	0%	0%	0%	0%	0%
1982	0%	0%	0%	0%	36%	64%	0%	0%	0%	0%	0%	0%
1983	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%
1984	0%	0%	0%	0%	87%	13%	0%	0%	0%	0%	0%	0%
1985	0%	0%	0%	0%	30%	70%	100%	0%	0%	0%	0%	0%
1986	0%	0%	0%	0%	81%	19%	0%	0%	0%	0%	0%	0%
1987	0%	0%	0%	0%	88%	12%	0%	0%	0%	0%	0%	0%
1988	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%
1989	0%	0%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%
1990	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	100%	0%
1991	0%	0%	100%	0%	100%	0%	100%	0%	0%	0%	0%	100%
1992	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	100%
1993	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
1994	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	2%	98%
1995	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%
1996	0%	100%	0%	0%	100%	0%	0%	0%	100%	0%	0%	100%
1997	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
1998	0%	100%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
1999	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2000	0%	100%	100%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2001	0%	100%	0%	0%	0%	0%	100%	0%	100%	0%	28%	72%
2002	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2003	0%	100%	100%	0%	0%	0%	100%	0%	100%	0%	0%	0%
2004	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	2%	98%
2005	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
2006	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2007	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2008	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2009	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2010	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	100%
2011	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2012	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2013	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	80%	20%
2014	0%	100%	100%	0%	0%	0%	0%	0%	100%	0%	0%	100%
2015	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2016	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	67%
2017	0%	0%	0%	0%	0%	0%	0%	100%	92%	8%	100%	0%
2018	26%	74%	0%	100%	0%	0%	0%	0%	100%	0%	13%	87%
2019	0%	100%	100%	0%	0%	0%	100%	0%	100%	0%	4%	96%
2020	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	6%	94%
2021	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	2%	98%
2022	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	28%	72%

Table A2.14. Percentage of recreational discards 1981-2021 in state and federal waters for each state (Cont.).

Year	NJ		NY		NC		RI		SC		VA		ME		NH	
	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State
1981	100%	0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
1982	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1983	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1984	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1985	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1986	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	47%	53%	0%	0%	0%	0%
1987	100%	0%	0%	100%	52%	48%	100%	0%	100%	0%	100%	0%	0%	0%	0%	0%
1988	0%	100%	0%	0%	0%	100%	100%	0%	100%	0%	100%	0%	0%	0%	0%	0%
1989	0%	100%	88%	12%	67%	33%	100%	0%	100%	0%	100%	0%	0%	0%	0%	0%
1990	100%	0%	44%	56%	42%	58%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%
1991	0%	100%	100%	0%	8%	92%	100%	0%	100%	0%	0%	100%	0%	0%	0%	0%
1992	0%	100%	33%	67%	58%	42%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%
1993	0%	0%	41%	59%	70%	30%	98%	2%	100%	0%	0%	0%	0%	0%	0%	0%
1994	0%	100%	0%	100%	3%	97%	38%	62%	0%	0%	73%	27%	0%	0%	0%	0%
1995	92%	8%	88%	12%	100%	0%	17%	83%	100%	0%	100%	0%	0%	0%	0%	0%
1996	0%	0%	0%	0%	100%	0%	98%	2%	100%	0%	0%	0%	0%	0%	0%	0%
1997	0%	0%	0%	100%	42%	58%	20%	80%	100%	0%	0%	0%	0%	0%	0%	0%
1998	95%	5%	100%	0%	15%	85%	63%	37%	49%	51%	0%	0%	0%	0%	0%	0%
1999	100%	0%	0%	100%	100%	0%	82%	18%	100%	0%	0%	0%	0%	0%	0%	0%
2000	0%	100%	0%	0%	100%	0%	0%	100%	100%	0%	0%	100%	0%	0%	0%	0%
2001	0%	0%	0%	0%	71%	29%	11%	89%	100%	0%	0%	0%	0%	0%	0%	0%
2002	0%	0%	0%	100%	28%	72%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%
2003	100%	0%	0%	100%	45%	55%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%
2004	0%	0%	0%	0%	53%	47%	92%	8%	0%	0%	0%	0%	0%	0%	0%	0%
2005	30%	70%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%
2006	100%	0%	0%	0%	81%	19%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007	0%	0%	0%	0%	75%	25%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%
2008	0%	0%	0%	0%	53%	47%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2009	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2010	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2011	0%	0%	0%	0%	83%	17%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%
2012	0%	0%	0%	0%	62%	38%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
2013	100%	0%	0%	100%	51%	49%	0%	100%	15%	85%	0%	0%	0%	0%	0%	0%
2014	99%	1%	0%	100%	43%	57%	3%	97%	100%	0%	0%	0%	0%	0%	0%	0%
2015	0%	0%	0%	100%	92%	8%	0%	100%	53%	47%	0%	0%	0%	0%	0%	0%
2016	0%	0%	0%	0%	68%	32%	0%	100%	65%	35%	0%	0%	0%	0%	0%	0%
2017	0%	100%	100%	0%	17%	83%	0%	100%	100%	0%	0%	100%	0%	0%	0%	0%
2018	67%	33%	42%	58%	81%	19%	0%	100%	100%	0%	0%	0%	0%	100%	0%	100%
2019	81%	19%	64%	36%	27%	73%	8%	92%	100%	0%	0%	0%	0%	0%	0%	0%
2020	80%	20%	0%	100%	48%	52%	8%	92%	0%	0%	0%	0%	0%	0%	0%	100%
2021	94%	6%	89%	11%	25%	75%	0%	100%	100%	0%	0%	0%	0%	0%	100%	0%
2022	100%	0%	0%	100%	87%	13%	1%	99%	0%	0%	0%	0%	0%	0%	0%	100%

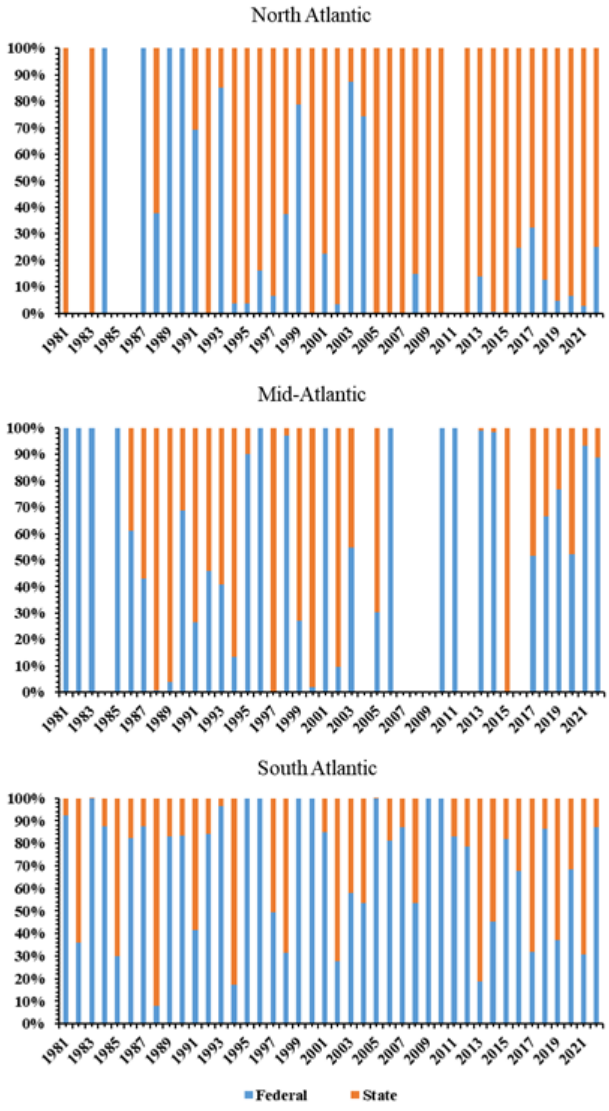

Figure A2.10. Percentage of recreational discards 1981-2021 in state and federal waters for each region.

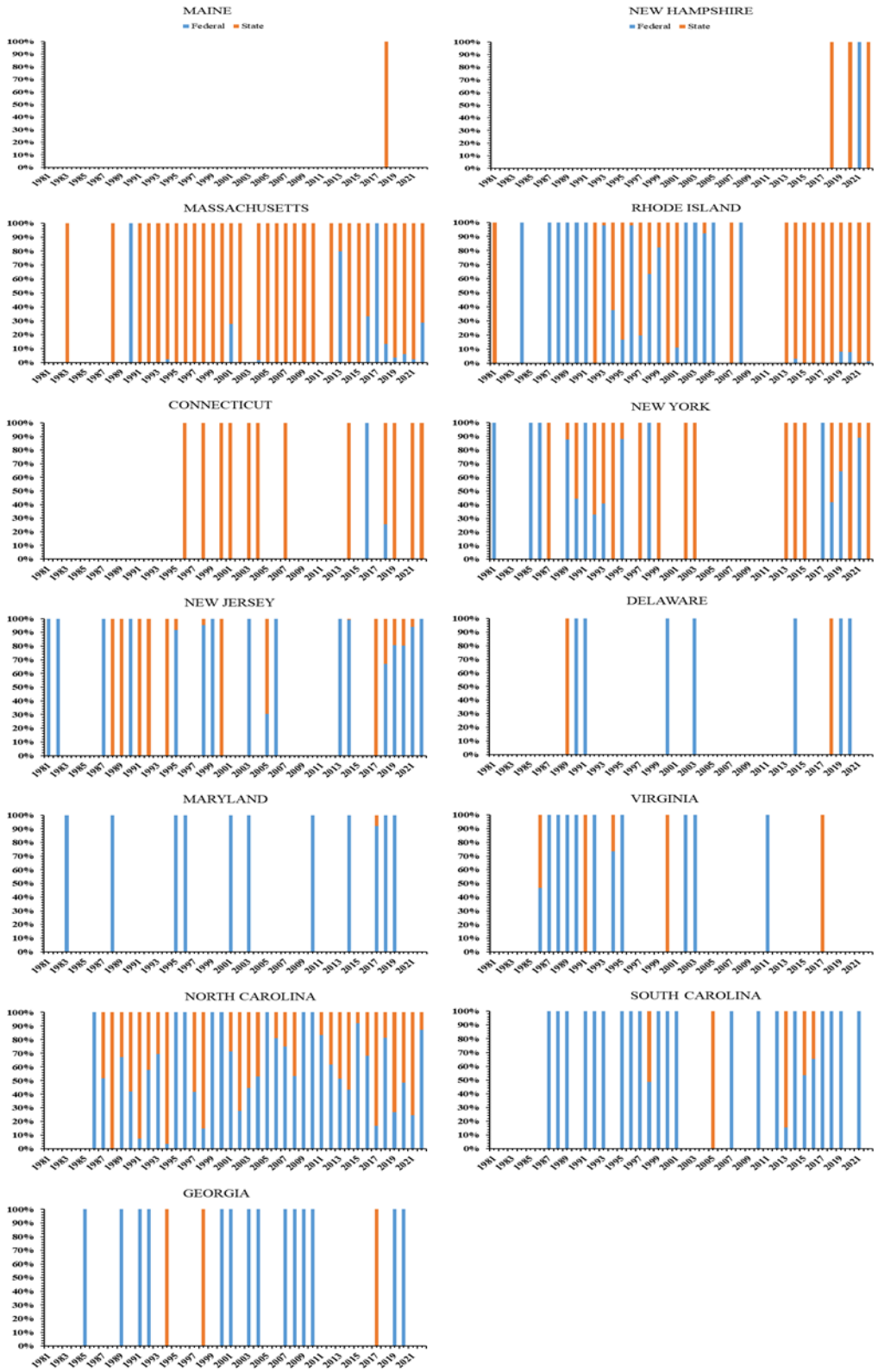

Figure A2.10. Percentage of recreational discards 1981-2021 in state and federal waters for each state.

APPENDIX 2 LENGTH AND WEIGHT

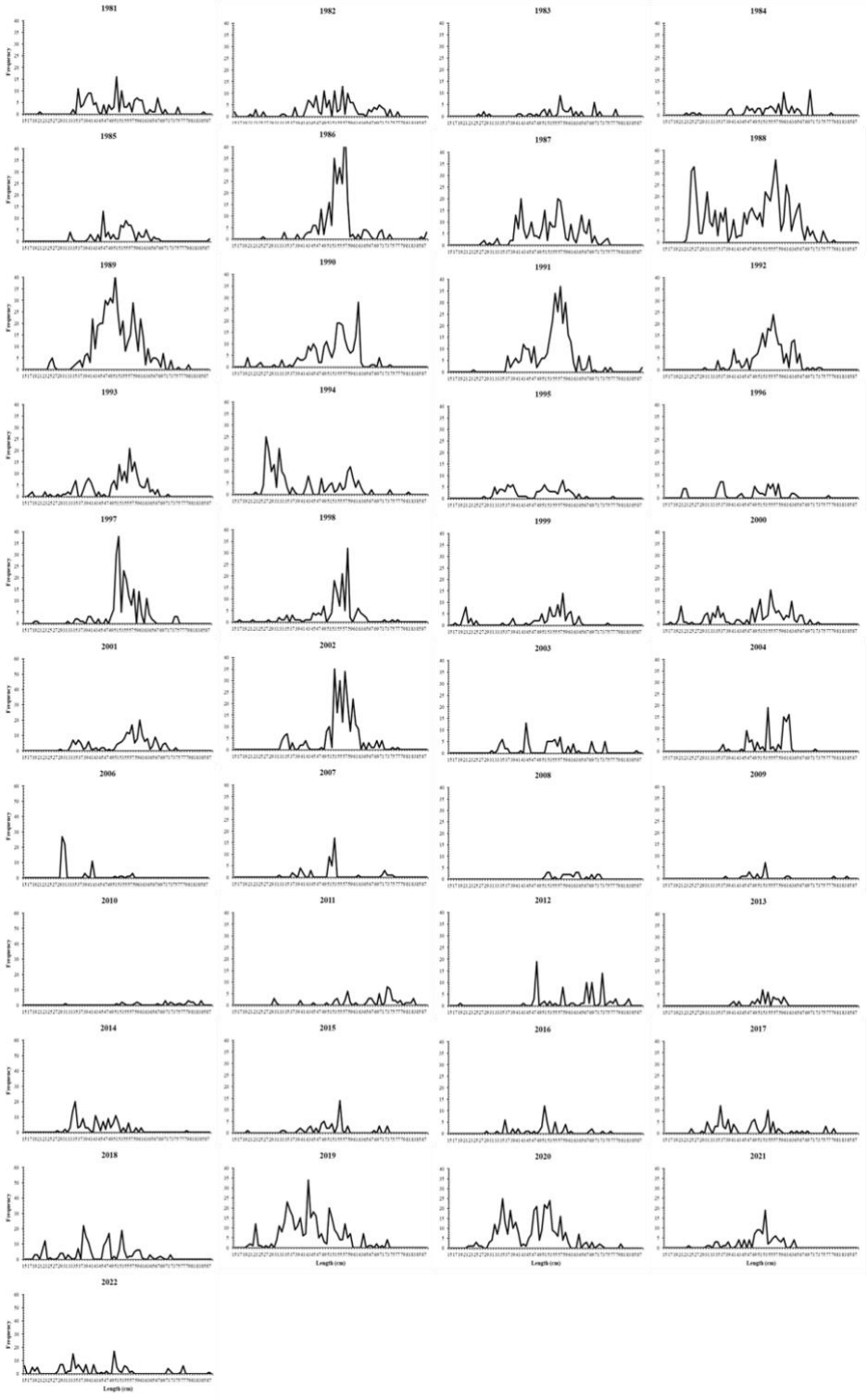

Figure A3.1. The length frequencies from all regions by year.

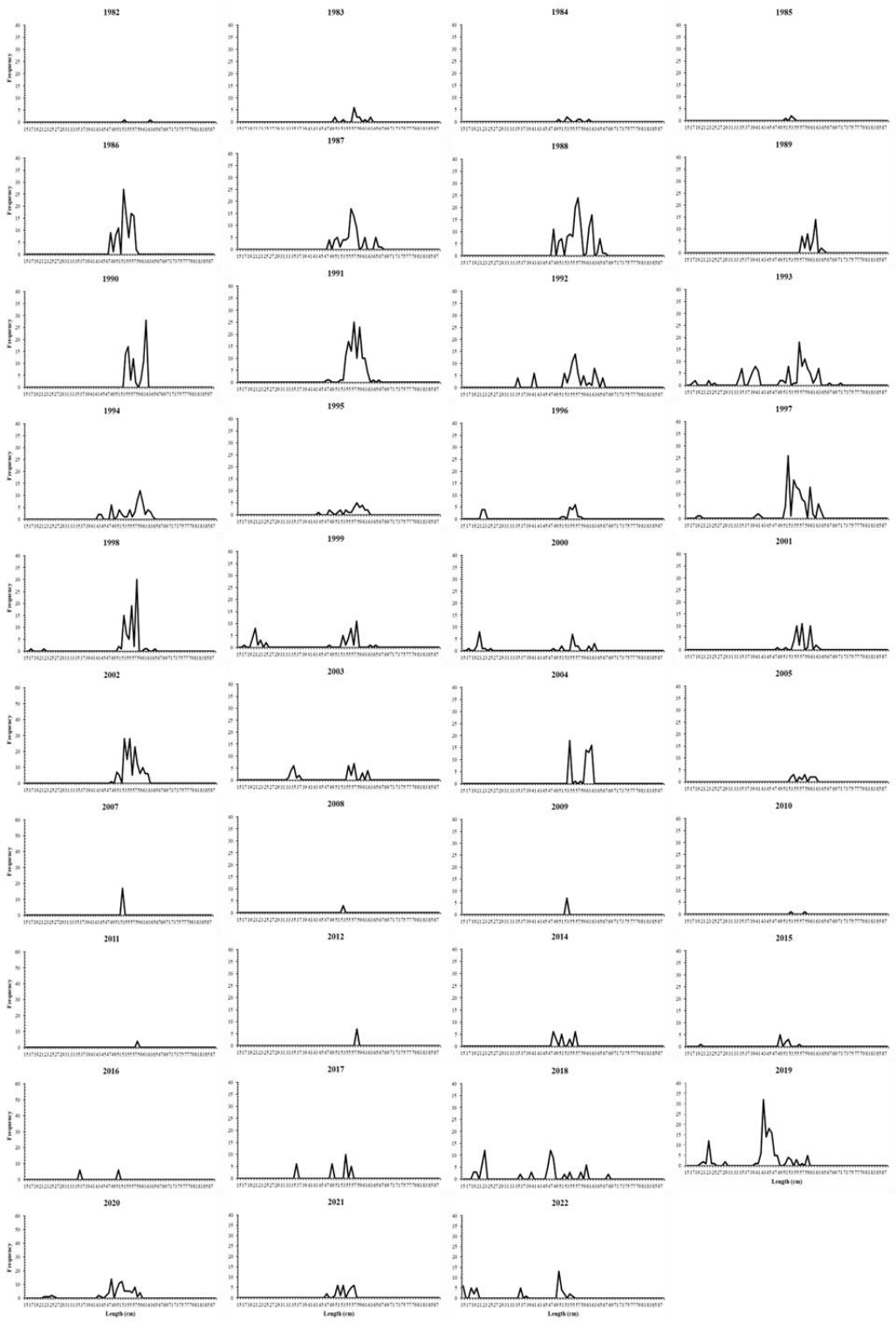

Figure A3.2. The length frequencies from the North Atlantic region by year.

Table A3.1. The summary of length and weight data from the North Atlantic region by year.

Year	North Atlantic								
	Count	Length				Weight			
		Min	Max	Mean	SD	Min	Max	Mean	SD
1981	-	-	-	-	-	-	-	-	-
1982	2	53	63	58.0	7.07	1.0	1.4	1.21	0.316
1983	16	50	63	57.3	3.75	0.8	1.6	1.31	0.236
1984	7	50	61	55.1	3.72	0.8	1.3	1.10	0.176
1985	4	51	54	52.8	1.26	1.1	1.4	1.18	0.169
1986	115	48	58	53.5	2.70	0.8	1.9	1.12	0.211
1987	80	48	67	56.2	4.23	0.8	1.9	1.23	0.255
1988	146	48	67	56.7	4.55	0.7	1.8	1.24	0.255
1989	40	57	65	60.3	2.22	1.2	1.8	1.39	0.168
1990	90	54	62	58.3	3.27	1.0	1.9	1.28	0.231
1991	129	47	66	57.4	2.74	0.7	2.1	1.34	0.266
1992	81	35	66	55.3	7.44	0.5	1.8	1.38	0.235
1993	116	17	71	50.0	11.56	0.0	2.2	1.01	0.509
1994	64	43	64	56.1	5.43	0.5	2.0	1.29	0.426
1995	30	44	62	56.2	4.63	0.6	1.6	1.22	0.316
1996	27	22	58	45.3	15.16	0.1	1.5	0.87	0.547
1997	118	19	64	54.6	6.38	0.0	2.0	1.26	0.380
1998	86	17	65	55.2	6.06	0.0	1.8	1.15	0.367
1999	52	17	65	43.5	17.19	0.0	1.8	0.84	0.632
2000	33	17	63	41.4	18.05	0.0	1.7	0.76	0.644
2001	43	48	63	57.0	2.99	0.8	1.7	1.31	0.173
2002	152	48	62	55.7	3.06	0.8	1.8	1.22	0.226
2003	36	33	62	48.8	11.45	0.2	1.7	0.95	0.558
2004	63	54	62	58.9	3.29	1.0	1.7	1.45	0.245
2005	17	53	62	57.5	3.16	1.0	1.7	1.36	0.241
2006	4	57	58	57.8	0.50	1.1	1.5	1.38	0.179
2007	34	53	113	83.0	30.45	1.0	10.2	5.59	4.662
2008	3	53	53	53.0	0.00	1.0	1.0	0.98	0.000
2009	7	53	53	53.0	0.00	1.0	1.0	0.98	0.000
2010	2	53	58	55.5	3.54	1.0	1.3	1.12	0.189
2011	4	58	58	58.0	0.00	1.3	1.3	1.25	0.000
2012	7	58	58	58.0	0.00	1.3	1.3	1.25	0.000
2013	-	-	-	-	-	-	-	-	-
2014	23	48	56	51.7	3.26	0.5	1.5	0.90	0.309
2015	12	20	56	48.3	9.14	0.0	1.1	0.81	0.260
2016	12	36	51	43.5	7.83	0.3	0.9	0.61	0.291
2017	27	36	56	49.3	7.61	0.3	1.2	0.86	0.320
2018	71	19	68	40.5	14.69	0.0	2.2	0.62	0.529
2019	135	20	59	42.6	8.99	0.0	1.4	0.54	0.262
2020	90	22	59	50.0	7.87	0.0	1.6	0.92	0.338
2021	30	47	57	53.6	2.93	0.7	1.6	1.15	0.268
2022	46	15	55	36.0	15.70	0.0	1.2	0.52	0.444

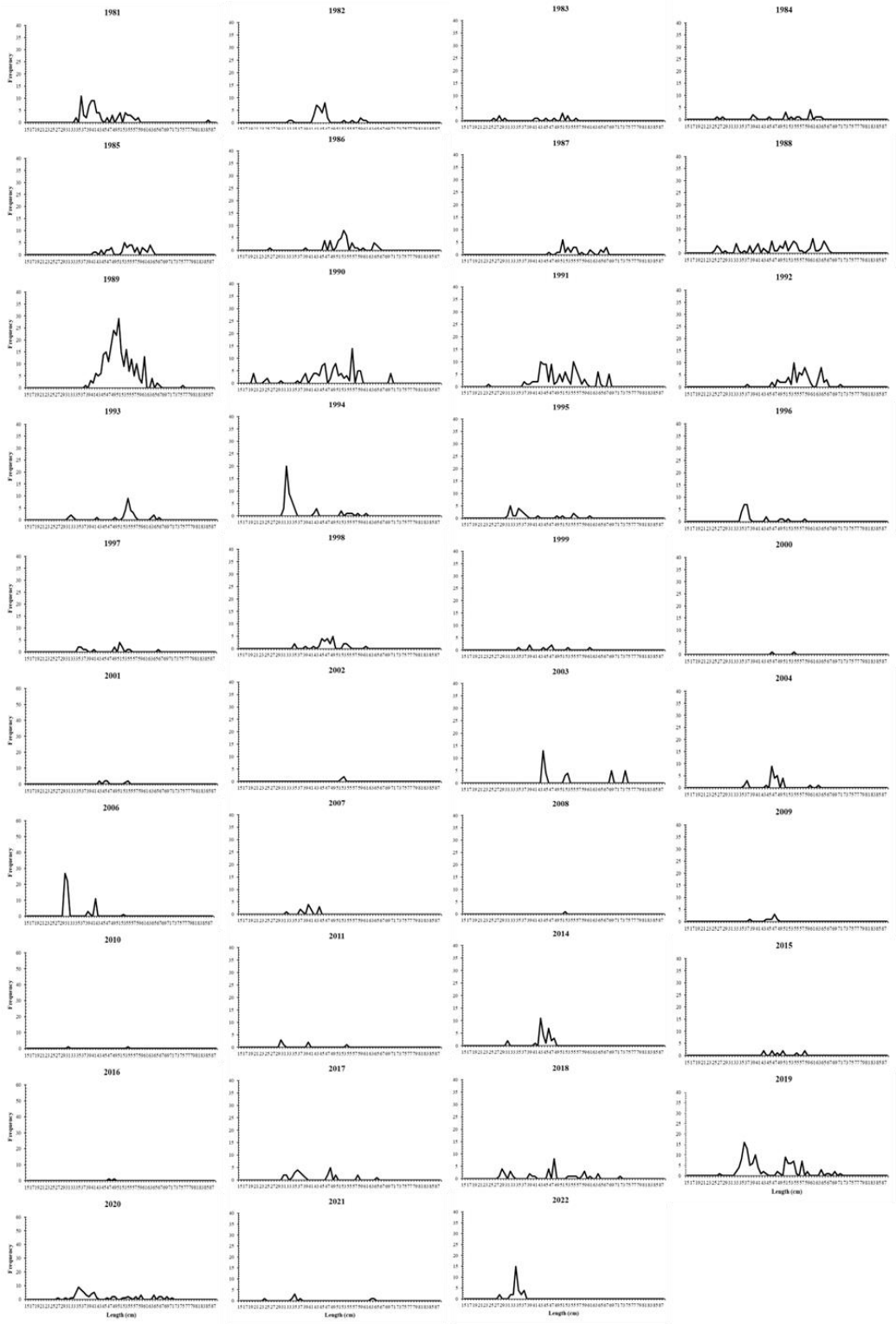

Figure A3.3. The length frequencies from the Mid-Atlantic region by year.

Table A3.2. The summary of length and weight data from the Mid-Atlantic region by year.

Year	Mid-Atlantic								
	Count	Length				Weight			
		Min	Max	Mean	SD	Min	Max	Mean	SD
1981	79	34	85	44.1	8.31	0.1	1.4	0.55	0.346
1982	38	33	61	46.0	6.07	0.3	1.7	0.73	0.365
1983	14	26	56	43.1	10.75	0.3	1.5	0.89	0.400
1984	19	26	64	50.7	11.55	0.3	1.9	1.10	0.509
1985	44	41	64	54.5	6.32	0.4	5.6	1.31	0.793
1986	46	26	66	52.9	6.98	0.1	3.3	1.30	0.671
1987	30	46	67	56.3	6.15	0.5	2.5	1.46	0.518
1988	79	25	67	49.4	11.78	0.0	2.2	1.04	0.687
1989	257	38	76	51.2	5.65	0.4	2.3	1.16	0.450
1990	100	20	70	48.1	10.31	0.0	1.7	0.88	0.448
1991	108	24	68	50.4	8.15	0.1	2.1	0.97	0.490
1992	73	37	71	56.8	5.95	0.5	2.4	1.31	0.334
1993	32	31	66	52.2	8.91	0.2	1.7	1.08	0.411
1994	52	31	61	36.5	8.14	0.2	1.7	0.38	0.387
1995	25	31	61	39.5	9.13	0.2	1.7	0.52	0.470
1996	25	35	58	39.4	6.30	0.3	1.3	0.45	0.273
1997	18	35	66	46.6	8.88	0.2	2.3	0.84	0.519
1998	29	35	61	47.3	5.52	0.3	2.0	0.87	0.432
1999	9	35	61	45.7	7.89	0.3	2.0	0.90	0.597
2000	2	46	54	50.0	5.66	0.6	1.0	0.84	0.268
2001	9	43	54	47.7	4.64	0.6	1.2	0.77	0.243
2002	3	52	53	52.7	0.58	1.0	1.4	1.19	0.207
2003	34	44	74	54.0	12.02	0.5	2.8	1.34	0.804
2004	29	36	63	46.8	5.68	0.2	1.4	0.69	0.232
2005	5	30	46	35.6	7.80	0.2	0.7	0.30	0.246
2006	65	30	53	33.3	5.26	0.2	1.1	0.25	0.160
2007	13	32	44	39.8	3.36	0.2	0.6	0.43	0.108
2008	1	52	52	52.0	-	0.9	0.9	0.87	-
2009	8	38	48	45.3	3.20	0.4	0.7	0.60	0.103
2010	2	31	54	42.5	16.26	0.3	1.3	0.80	0.694
2011	7	30	54	36.4	9.02	0.2	1.3	0.53	0.390
2012	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-
2014	31	31	48	43.8	3.88	0.2	0.7	0.56	0.121
2015	10	43	58	49.7	5.64	0.5	1.3	0.85	0.310
2016	2	47	49	48.0	1.41	0.8	0.8	0.80	0.006
2017	30	31	65	41.7	8.92	0.2	1.8	0.54	0.389
2018	39	28	72	45.5	11.95	0.1	2.5	0.76	0.544
2019	122	27	71	44.6	9.85	0.2	2.6	0.68	0.511
2020	70	27	71	44.4	11.86	0.2	2.6	0.71	0.653
2021	8	24	64	40.9	14.52	0.1	1.8	0.63	0.711
2022	31	28	37	34.1	2.08	0.1	0.4	0.27	0.049

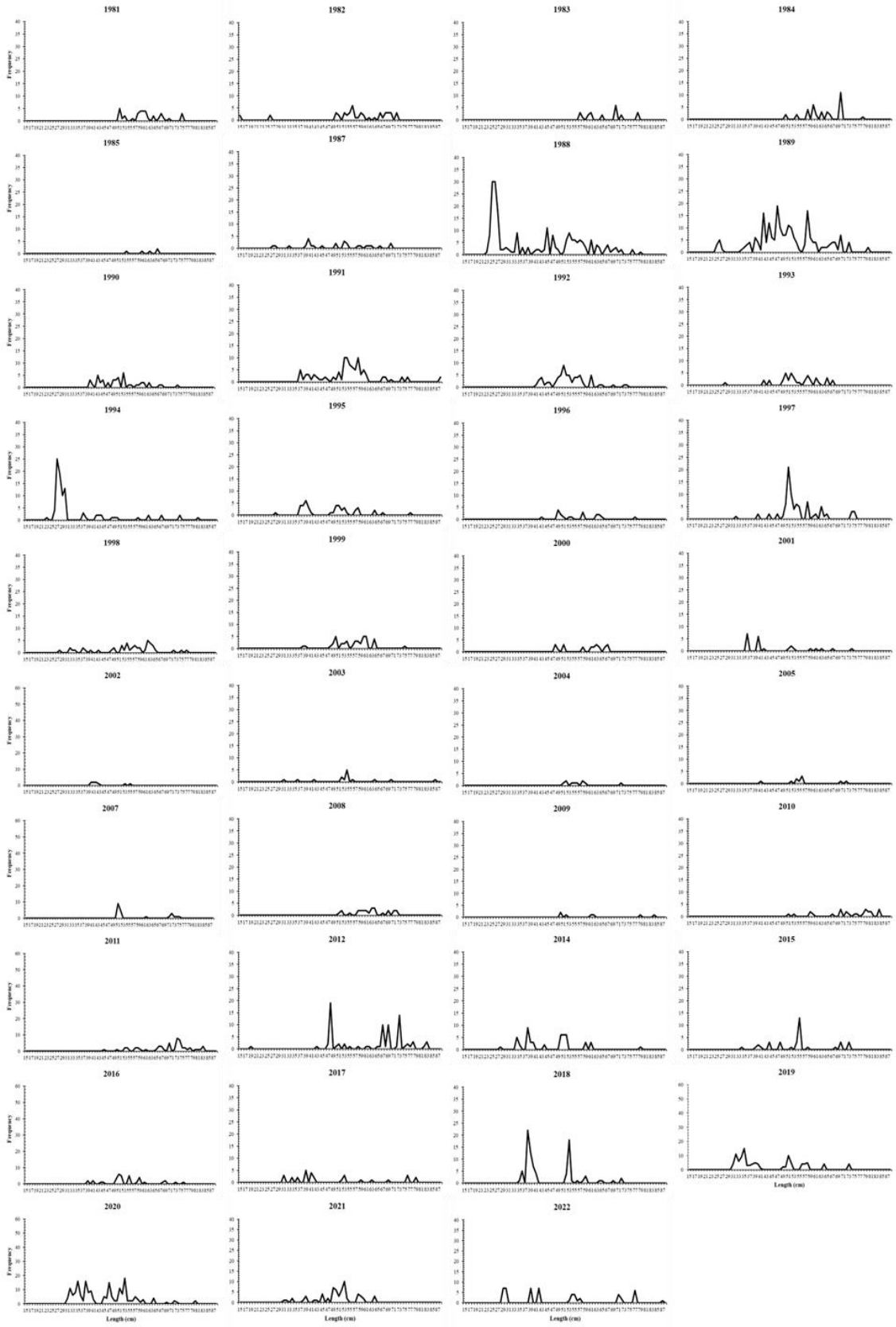

Figure A3.4. The length frequencies from the South Atlantic region by year.

Table A3.3. The summary of length and weight data from the South Atlantic region by year.

Year	South Atlantic								
	Count	Length				Weight			
		Min	Max	Mean	SD	Min	Max	Mean	SD
1981	36	51	75	60.6	6.86	0.5	3.1	1.46	0.593
1982	48	15	72	57.1	13.19	0.0	4.0	1.66	0.895
1983	22	57	78	66.4	7.08	1.2	2.6	1.85	0.508
1984	36	50	78	63.5	6.43	1.1	2.6	1.80	0.535
1985	5	54	66	61.8	5.02	1.2	2.4	1.63	0.476
1986	-	-	-	-	-	-	-	-	-
1987	26	27	70	49.7	12.14	0.1	2.2	0.94	0.636
1988	222	23	79	41.3	15.61	0.4	2.2	1.04	0.455
1989	213	25	80	50.5	10.81	0.0	3.7	0.97	0.631
1990	45	40	74	51.5	8.16	0.3	2.5	0.97	0.482
1991	101	37	88	54.2	9.99	0.3	5.0	1.27	0.852
1992	70	41	74	52.8	6.89	0.4	3.1	1.13	0.506
1993	41	28	67	54.0	7.71	0.1	2.8	1.33	0.608
1994	93	23	81	33.5	12.18	0.1	3.6	0.35	0.622
1995	44	28	77	47.8	10.09	0.2	2.3	0.82	0.563
1996	19	43	77	56.2	8.28	0.4	3.0	1.44	0.763
1997	84	32	75	54.6	7.77	0.2	3.6	1.23	0.667
1998	48	28	77	54.2	11.54	0.1	3.3	1.37	0.968
1999	41	38	75	56.1	6.84	0.4	2.6	1.21	0.575
2000	23	48	67	59.0	6.98	0.6	3.2	1.92	0.902
2001	23	36	74	46.3	11.64	0.3	2.7	0.79	0.669
2002	9	40	55	44.1	5.71	0.4	1.5	0.58	0.360
2003	15	31	86	54.1	13.07	0.2	3.5	1.22	0.901
2004	10	51	72	56.7	6.06	0.8	3.0	1.18	0.654
2005	10	41	72	56.6	8.81	0.6	3.0	1.25	0.856
2006	2	51	56	53.5	3.54	0.8	0.9	0.87	0.095
2007	22	51	75	58.6	10.13	0.8	3.1	1.47	0.849
2008	26	51	72	62.3	6.09	1.0	3.0	2.01	0.634
2009	7	50	84	62.6	13.90	0.8	4.8	2.15	1.499
2010	25	51	84	72.6	9.66	0.8	4.8	3.14	1.157
2011	54	45	83	69.3	9.09	0.8	4.6	2.58	1.048
2012	81	19	83	62.8	12.66	0.0	4.6	1.98	1.110
2013	-	-	-	-	-	-	-	-	-
2014	50	28	79	45.8	9.96	0.2	4.0	0.77	0.600
2015	36	34	73	54.3	10.24	0.3	3.2	1.30	0.874
2016	36	39	76	54.2	8.87	0.3	3.6	1.20	0.744
2017	30	31	79	48.8	15.92	0.2	3.6	1.05	1.207
2018	85	35	72	45.3	9.38	0.2	3.0	0.72	0.575
2019	105	31	73	43.1	11.53	0.2	3.2	0.71	0.763
2020	186	31	80	44.9	10.27	0.2	3.4	0.71	0.628
2021	62	31	64	50.2	7.44	0.2	1.8	0.89	0.385
2022	53	29	87	49.4	17.51	0.1	4.5	1.19	1.224