



# WHAT'S HAPPENING AT THE WHARF?

## NOVA SCOTIA RECREATIONAL MACKEREL FISHING SURVEY: KEY FINDINGS

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### INTRODUCTION

Atlantic mackerel (*Scomber scombrus*) is a small pelagic fish found in large schools throughout Atlantic Canadian waters. Mackerel play a critical role in the ocean's food web; needed as prey by many species including tuna, sharks, sea birds, and whales. Indigenous peoples have fished the abundant mackerel runs for millennia in this region and continue to do so for food, cultural, and economic value. This tiny fish supports several commercial fleets in Atlantic Canada as a directed commercial fishery and as bait for other important fisheries such as the Atlantic lobster fishery, the economic backbone of our inshore fishing communities.

Aside from its commercial and ecosystem importance, Atlantic mackerel is one of the remaining marine fish that Atlantic Canadians can fish recreationally for food or sport without having to own a commercial fishing licence. Thousands of people fish for mackerel recreationally on the wharves throughout Atlantic Canada every year and the cumulative catch is significant.

Unfortunately, decades of commercial over-exploitation of Atlantic mackerel combined with increasing variability in ocean temperatures, currents, and food availability has left this important species at critically depleted levels. The status of the Atlantic mackerel stock has been in the critical zone since 2010 and continues to decline.<sup>1</sup> In addition to the impacts of commercial harvest, the 2017 stock assessment noted concerns about the use of the traditional recreational fishery as a loophole for significant unreported catches of mackerel for commercial fishing bait. It also highlighted a gap in quantifying and monitoring the true recreational fishery that is enjoyed by Atlantic Canadians on wharves and shores annually. This highlighted a large gap in our understanding of fishing impacts on this species in Atlantic Canada.

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<sup>1</sup> DFO 2019. Assessment of the Atlantic mackerel stock for the northwest Atlantic (subareas 3 and 4) in 2018. CSAS Science Advisory Report 2019/035.

Understanding the traditional recreational fishery while gaining knowledge from fishers who have fished recreationally in the same spot for decades, can inform Fisheries and Oceans Canada (DFO) to make better sustainable management decisions. Increased understanding also helps stakeholder organizations like the Ecology Action Centre (EAC) offer informed recommendations for sustainable management at DFO decision making tables to help restore the abundance of mackerel while respecting Indigenous rights to fish and supporting access to food and recreational fishing for all Atlantic Canadians.

In June 2018, the EAC initiated research to address this knowledge gap.

## WHAT ARE FORAGE FISH?

A forage fish is an important source of food or prey for larger fish, seabirds, and marine mammals. These species represent an important link in the food web because they transfer energy from plankton to larger predators. Forage species often experience high predation mortality and high fishing pressure at the same stage of their lives.<sup>2</sup>

Forage fish often have other important biological characteristics that influence their ability to

withstand or recover from the impacts of fishing and complicate our ability to manage them effectively. In particular, they undergo large and relatively rapid natural fluctuations in abundance in response to environmental factors. They also form dense schools for at least a part of the annual cycle and are short-lived, from several weeks to a few years. These dense schools are easily harvested even when their populations size is low, making them particularly vulnerable to overfishing. However, their short life cycle also means rapid population recovery is possible when being managed sustainably.

## MANAGEMENT OF ATLANTIC MACKEREL IN CANADA



**Figure 1.** Current management area of Atlantic mackerel by the Department of Fisheries and Oceans (DFO). Source: EAC Making Forage Fish Count Report

In Canada, Atlantic mackerel are fished commercially using purse seine, trap, weir, handline, gillnet, and jig. The commercial fishery is managed by DFO as one large stock with an annual allowable catch limit (8000t in 2020) shared across the whole region (Figure 1). Population assessment and management is complicated with gaps in unrecorded catch by commercial fishers to use directly as bait and, the recreational fishery that has no catch limits and is not yet fully quantified or assessed.<sup>3</sup> The complex role that forage fish hold in the ecosystem along with their sensitivity to environmental changes such as ocean temperature and current shifts also add to the complexity of managing our impact on these important fish.

<sup>2</sup>DFO 2009. Policy on New Fisheries for Forage Fish.

<sup>3</sup>Guenette, Sylvie & Melvin, Gary & Bundy, Alida. (2014). A review of the ecological role of forage fish and management strategies. Canadian Technical Report of Fisheries and Aquatic Sciences. 3065. 75.

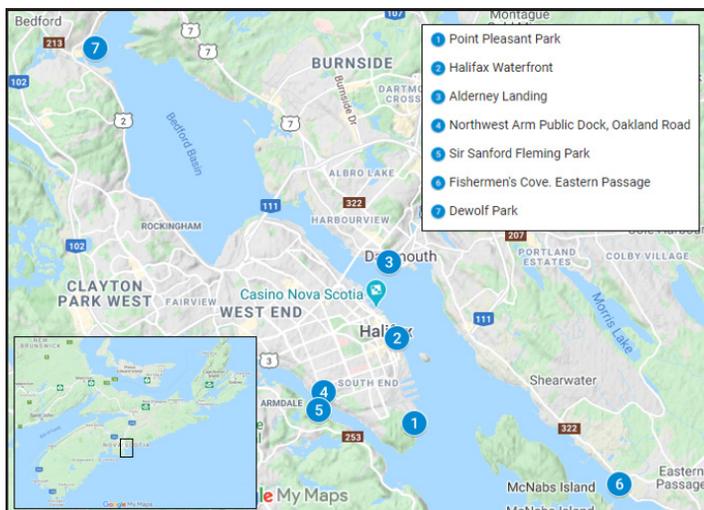
## STUDY PURPOSE

This study was intended to gather basic information about the recreational mackerel fishery in Nova Scotia including timing, intensity, and fish size distribution, as well as fisher motivations and views on management issues. Through this project, EAC sought to generate new knowledge that would help us better understand the full scope of pressures acting on the Atlantic mackerel stock in Canadian waters. It also served as an important opportunity for the EAC to initiate engagement with the recreational fishing community and learn from the long-term knowledge many have built over their years of observing mackerel runs.

## METHODS

Our study combined qualitative fisher surveys with some quantitative catch data. We began with a preliminary 9 question survey for recreational fishers in 2018 and expanded these surveys to 19 questions in 2019 (Appendix A). In the results sections below, we indicate the year(s) in which a given question was asked as well as the total number of responses obtained because some questions were only asked in 2019. For simplicity, we combined data for both years where applicable throughout this report.

Fieldwork was conducted by Ecology Action Centre staff and volunteers. Surveys were conducted at six locations surrounding Halifax, NS: (1) Point Pleasant Park, (2) Halifax Waterfront, (3) Alderney Landing, (4) Northwest Arm Public Dock, Oakland Road, (5) Sir Sanford Fleming Park, (6) Fishermen's Cove, Eastern Passage, (7) Dewolf Park (Figure 2).



**Figure 2.** 2018 and 2019 Survey areas throughout the region of Halifax, NS.

## ATLANTIC MACKEREL BIOLOGY

Atlantic mackerel are distributed across the North Atlantic, ranging in the Northwest Atlantic from Labrador to Cape Hattaras.<sup>4</sup> Mackerel feed on small organisms in the water column known as zooplankton and they follow this food from US waters into Canadian waters and back again in an annual cycle. In Atlantic Canada, the mackerel population moves to inshore waters during the spring and summer to spawn, and back to deeper, warmer waters at the edge of the continental shelf and into US waters in late fall.<sup>5</sup> Spawning occurs in the southern Gulf of St. Lawrence in June and July.

In terms of appearance, the underside of the mackerel is silver, while the upper side shimmers green and blue with irregular dark stripes down the back. Mackerel can grow to be about 40 cm in length and weigh up to 800 g. They can live up to 15 years and typically mature between ages 2 and 3.

<sup>4,5</sup>DFO 2014. Assessment of the Atlantic Mackerel Stock for the Northwest Atlantic (Subareas 3 and 4) in 2013. Canadian Science Advisory Secretariat, Science Advisory Report 2014/30

## METHODS CONTINUED

For surveys and fish measurement sampling, fishers were approached by surveyors to answer questions while they fished. Observations of fishing activity were documented at each study location to illustrate the unique recreational fishing contexts for the individual locations. Timing of survey trips was varied to better understand the daily use patterns in fishing activity at each location. Each participant also had three of their retained fish chosen at random and measured (total length) by surveyors. An effort to obtain more information on fishing effort at wharves in two-hour survey windows was made by recording a rod count, total catch, and the number of fish retained; however, consistency for much of this data collection was challenging (see 'Challenges' section). We instead used catch data collected or reported by individual fishers.

## SURVEY RESULTS

Over the course of the two-year study, a total of 88 qualitative surveys (41 in 2018 and 47 in 2019) were conducted with mackerel fishers over 26 days (11 in 2018 and 15 in 2019) between June and September.

### LENGTH OF PARTICIPATION IN THE FISHERY

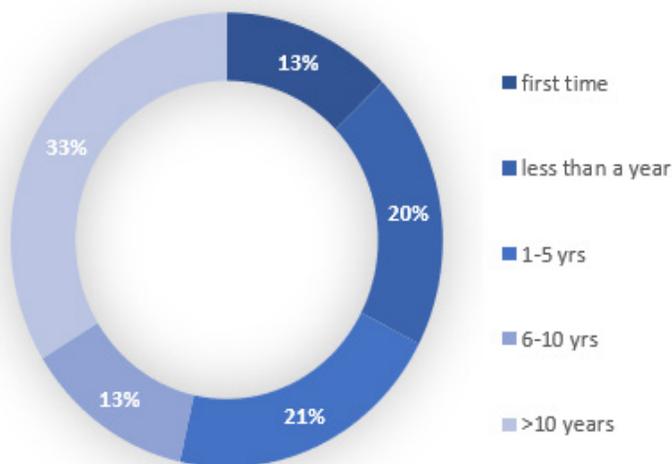
We asked 88 fishers in 2018 and 2019 how long they had been fishing mackerel recreationally in Nova Scotia and received 86 responses. The vast majority (87%) are repeat fishers and nearly 33% have been fishing for more than a decade (Figure 3).

These findings highlight the long tradition of recreational mackerel fishing in the region as well as the dedication of the fishers participating, with many returning year after year.

### REASONS FOR FISHING

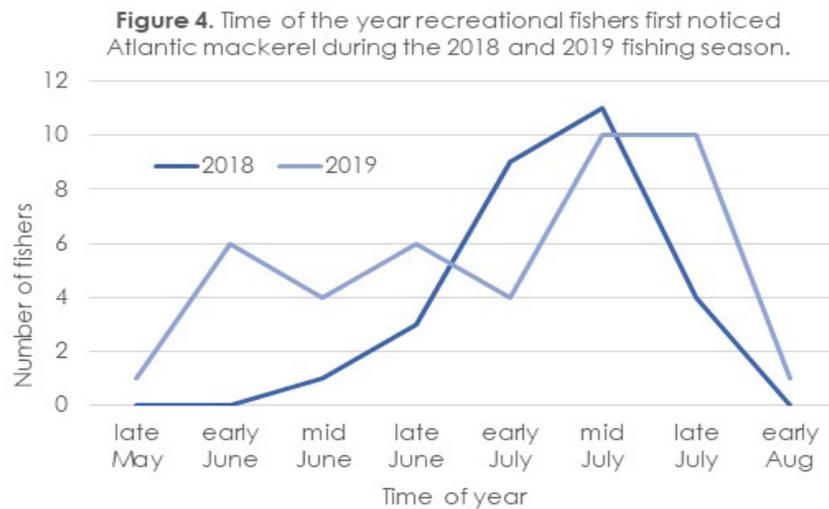
To gain insight into fisher motivations, we asked the 47 people surveyed in 2019 why they fished for mackerel in Nova Scotia. The responses were varied, and many fishers stated that they were fishing for multiple reasons. Overall, 68% of fishers surveyed said they fished, at least in part, for extractive purposes (i.e. food or bait) indicating that more caught fish are likely being kept than are being returned to the ocean in this fishery. This is consistent with the catch information that we collected for this study, which indicated a 61% retention rate (see 'Catch Information' section). Approximately a third (32%) of fishers said they were fishing purely for sport (i.e. catch and release).

**Figure 3.** Length of time fishing recreationally for Atlantic mackerel



## TIMING OF THE FISHING SEASON

To better understand the arrival times of mackerel in the Halifax region and help facilitate comparisons in the future (e.g. to study the effects of climate change on migratory timing), we asked 88 fishers when they first observed the runs of mackerel in significant numbers during the season in which they were interviewed. We received 70 responses to this question (28 in 2018 and 42 in 2019) as some fishers had not yet caught any mackerel during the surveyed season. Of the fishers who provided a response, 69% identified July as the month when the mackerel start arriving in numbers. There were slight differences in the earliest observation of significant numbers of mackerel from the respondents between the two years (Figure 4). Fewer respondents (14%) observed the fish running in June of 2018 compared to 2019 (38%). The majority (> 50%) of respondents in both 2018 and 2019 said the fish were running by mid-July.



The observations by recreational fishers on timing of mackerel runs matches the migration timing tracked by DFO scientists on annual basis and demonstrates the knowledge that recreational fishers can contribute.<sup>6</sup> This is especially important as we strive to understand the impacts that climate driven ocean changes such as water temperature and current shifts will have on the Atlantic mackerel population and migration in our waters.

In addition to knowing when fishers observed the mackerel starting to run in the region and when they started fishing annually, we also wanted to know the time of year recreational fishers were mainly fishing - 1) on the summer run of mackerel as they came up from the US heading towards the Gulf of St Lawrence to spawn and/or 2) on the fall run of mackerel as they return again along the Atlantic side of Nova Scotia towards the US for the winter. We asked 47 fishers about this in 2019. We found that those who were high frequency fishers (more than 20 trips per month) fished consistently on both the summer and fall runs while 20% of fishers said they only fished in the summer and did not continue to fish into fall. Overall trip frequency was higher in the summer months and declined as the colder weather set in during the fall (Figure 5).

Understanding when the most effort from recreational fishing is happening during the year may help inform future management measures such as closed seasons.

<sup>6</sup>DFO 2019. Assessment of the Atlantic mackerel stock for the northwest Atlantic (subareas 3 and 4) in 2018. CSAS Science Advisory Report 2019/035.

## DAILY TIMING AND DURATION OF FISHING TRIPS

In 2019, we asked 47 fishers what time during the day they preferred to go fishing and how long they spent fishing for mackerel each trip. No strong preference for time of day (morning, afternoon, evening/after work) emerged with many fishing when their schedule allowed. **However, the majority of fishers (57%) timed their fishing to coincide with the tidal flow they knew would be most beneficial for catching mackerel.** This indicates a good level of knowledge amongst recreational fishers about mackerel behaviour and fishing techniques for decreasing effort while fishing from a wharf or shoreside.

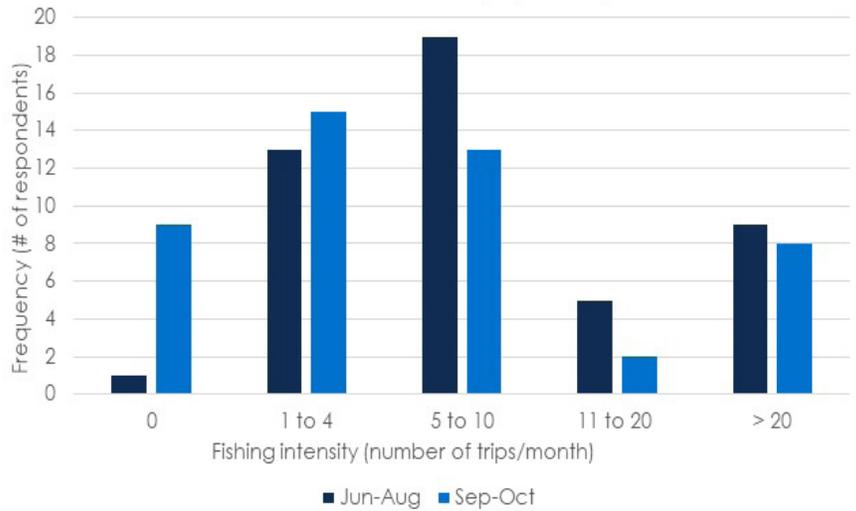
In terms of duration, 68% of those surveyed said they fished for 2-3 hours and 21% said they fished for four hours or more, while 11% said they fished for roughly 1 hour.

## MACKEREL CATCH

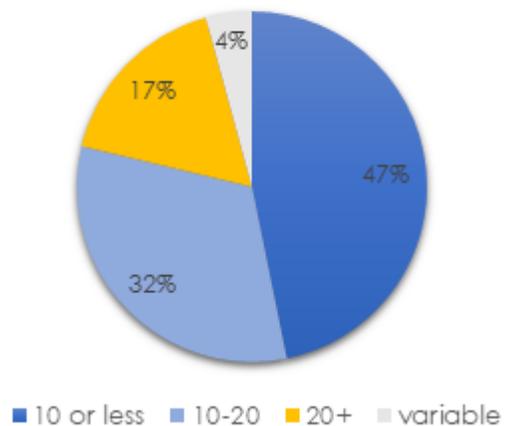
One of our survey goals was to understand catch rate and effort amongst recreational fishers. While we ultimately found it challenging to quantify catch rate due to the variables involved (see Challenges section below) we were able to gain a better understanding of how many fish were being caught in an average trip, how many were being retained, size of fish being retained, reason for discarding, and health of the fish when returned to the water.

We asked 47 fishers in 2019 how many mackerel they caught on average per trip (Figure 6). **Most fishers reported catching less than 20 per trip with only 17% reporting that they caught more than 20 mackerel on average per trip.** We also asked fishers how many mackerel they had caught and retained the day of the survey. Our survey team also visually estimated the number of mackerel in the fishers' buckets at the time of survey. These numbers closely matched the answers reported by fishers of estimated average catch per trip, thus lending confidence to estimates of catch over the season.

**Figure 5.** A comparison of the number of trips taken during the beginning of summer (June to August) vs the number of trips taken in late summer and fall (Sept to Oct).



**Figure 6.** Number of fish reported caught by recreational fishers per trip



## MACKEREL RETAINED, REASON FOR DISCARD, AND CONDITION ON RELEASE

We asked 88 fishers in 2018 and 2019 how many mackerel they had caught on the day of the survey and, of those, how many they had kept. The total of this 'day of catch' report over the two survey years was 541 mackerel and the total number of fish kept out of that catch was 332. This is a relatively high level of overall retention at 61% and supports our finding noted above that most recreational fishers are fishing for food and/or bait (for other recreational fishing, like striped bass) and will tend to keep their fish.

Reasons for discarding reported were that the fishers were only fishing for sport or that the fish were too small.

For mackerel that were caught and then released back into the ocean, we wanted to know how healthy the fishers thought the fish were at the time of release. We asked this question to the 47 fishers surveyed in 2019 with 13% reporting the fish were in fair health, 66% reporting the fish were in good to very good health while 21% chose not to comment. It is important to note that condition of fish discarded was self-reported. Post release mortality of mackerel caught and released by recreational fishers should be considered when assessing impact of the fishery and would depend on many variables such as the skill of those fishing.

## SIZE OF FISH CAUGHT AND COMPLIANCE WITH MINIMUM SIZE RULE

The mackerel recreational fishery currently has a minimum size limit of 26.8 centimeters\*. The fish must be larger than this to keep. We asked the 47 fishers surveyed in 2019 whether and how they measured their fish. Of these fishers, nearly 74% said they measure the fish they catch. Some measured using a ruler or minimum length stick, or a mark indicated on their fishing bucket, tackle box or on the wharf itself, some even estimated against their shoe, if necessary.

This finding indicates quite a high level of awareness and compliance with the minimum size rule, especially considering there is no licence currently required to fish mackerel recreationally and, therefore, little direct way for this rule to be communicated to the thousands of individual recreational fishers on wharfs throughout the region. The DFO has posted signs with the minimum size rule on many of the most popular fishing spots and our survey team observed that fishers did seem to enforce this in a peer to peer way at times by pointing out the measurement marks on the wharf or signage to new fishers.

To further understand the size distribution of fish caught as part of the recreational fishery, our survey team measured three fish per fisher who completed our 2019 survey questions. These were chosen at random from their catch of the day.



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\*At the time of the surveys, the minimum size was 26.3 cm.



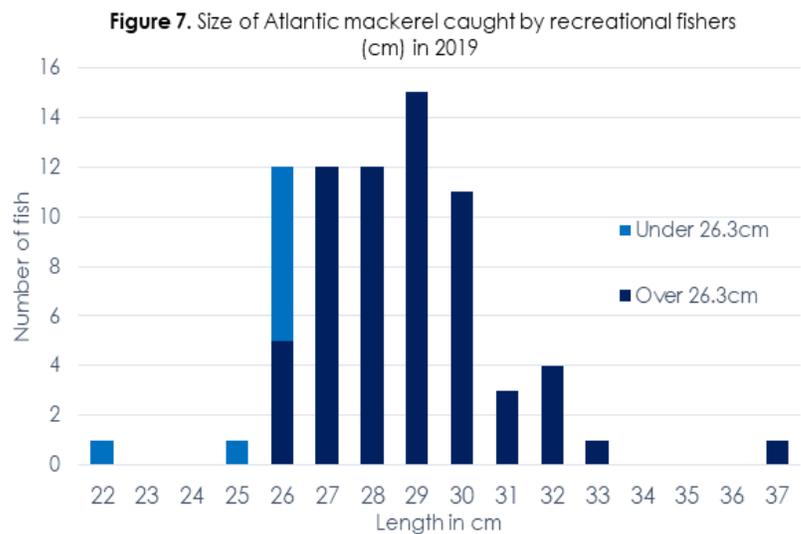


We measured the total length of 71 fish caught and kept by recreational fishers in 2019\*\*. The average size of these fish was 28.7 cm  $\pm$  2.2 SD, with a minimum of 22.0 cm and a maximum of 37.1 cm. Less than 10% of fish measured were smaller than the regulated minimum size in 2019 of 26.3 cm (Figure 7).

Again, our findings indicated good compliance with the minimum size rule. Minimum size regulations are designed to ensure a significant amount of mature fish are surviving to spawn each year to support replenishment of the population. It is, therefore, quite positive that our fish measurements confirm good compliance overall with the minimum size rule.

## PERCEPTION OF TREND IN MACKEREL POPULATION OVER TIME

As noted above, the mackerel population has been overfished for the past 10 years and has now declined into the critical zone. There have also been significant changes in the age structure of the population over time<sup>7</sup>. We were interested to record observations over time about the mackerel population that recreational fishers may offer. Forty-seven (47) percent of those surveyed in 2019 perceived a change in the population over the years they had been recreationally fishing. **Most notably, many of those fishers observed two specific changes 1) that the fish were much smaller in recent years, and 2) that the fish were arriving later in the year.** Both of the observations are similar to observations shared by commercial fleets and to data published by Canada's mackerel scientists.<sup>8</sup> These observations also show that recreational fishers, many of whom have been fishing in the same fishing spot for years, hold important knowledge that can inform our understanding of mackerel populations and management of fishing.



## OTHER FISHING LOCATIONS

We also asked participants throughout this project to list other places in the Maritimes they enjoyed fishing for this species to gain additional insight into the spatial extent of the recreational mackerel fishery in Nova Scotia, determine how far away fishers from the Halifax area may fish, and to identify additional study sites for the future. Overall, the fishers stuck to the Halifax area but other places identified included St. Margaret's Bay, Chester, Blandford, Lunenburg, Bayswater, Bedford, Purcell's Cove, Prospect, Meteghan, Hubbards, Queensland, Bouitliers Point, Dingle, Fox Point, Guysborough, Turo, The Narrows, and Point-du-Chêne, NB.

<sup>7</sup> DFO 2019. Assessment of the Atlantic mackerel stock for the northwest Atlantic (subareas 3 and 4) in 2018.

<sup>8</sup> Atlantic Mackerel Advisory Committee Meetings, March 28, 2019.

\*\*Total length was measured in centimetres from the tip of the snout to the tip of the caudal fin.

## OTHER SPECIES CAUGHT

In addition to mackerel, a number of other fish species were caught in association with the recreational mackerel fishery. We asked fishers surveyed in both years what other species of fish they caught while fishing for mackerel and to estimate the number of each of these they would catch over the season. The catch proved difficult to quantify reliably, however there were some noteworthy findings. The majority of catch for all fishers was indeed mackerel and that was their target. The other main species that the fishers reported catching almost as frequently at some fishing locations was pollock, which were usually returned alive. Some fishers also reported catching a small number of sculpins and cunners over the season. In our 2018 survey season, herring was also reported to be caught frequently. This is significant to note since herring is another important forage fish with critically depleted populations in Atlantic Canada that face many of the same management challenges as Atlantic mackerel.<sup>9</sup>

### WHAT'S A BAG LIMIT?

A bag limit is the number of fish of a certain species that a fisher is legally allowed to catch and retain in a single day.

## FISHERS SUPPORT AND SUGGESTIONS FOR MANAGEMENT OF RECREATIONAL FISHING

As noted above, there is currently only one regulation applied to recreational mackerel fishing in Atlantic Canada, a minimum size limit of 26.8cm. DFO is currently considering further regulations, including a 'bag limit'. This is a common recreational fishing management tool that can help limit effort and is often used when it is not feasible to have enforcement officers monitoring all wharfs and thousands of recreational fishers on any given day.

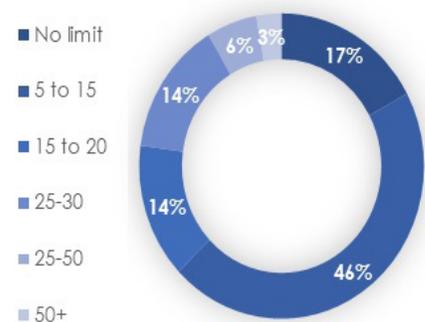
To that end, we wanted to know if fishers would support or oppose a bag limit. **In 2018, 83% of the 41 fishers surveyed supported the introduction of a bag limit.** Of these, 60% thought that a limit between 5 – 20 mackerel a day would be sufficient while 23% of fishers said that a bag limit should allow more than 25 mackerel and 17% felt there should not be a bag limit at all (Figure 8).

Along with a high level of support for a bag limit, our survey found that the majority of fishers keep less than 20 fish per trip and would therefore be well within the proposed daily limit if implemented (see Mackerel Catch Rate section above).

Just under half (49%) of fishers surveyed in 2019 generally supported more monitoring and regulation of the fishery. Similarly, in 2018 only 46% of fishers surveyed supported increased monitoring of catch in the recreational fishery.

Fishers were given the opportunity to contribute their general thoughts and concerns regarding the Atlantic mackerel recreational fishery and its current management (see all comments listed in Appendix B). Many comments addressed concerns mainly for the commercial fishery regulations which included increased monitoring and enforcement on fish size checks, overall stock size, as well as some additional thoughts on a bag limit for the recreational fishery.

Figure 8. Preferred recreational atlantic mackerel bag limit per day



<sup>9</sup> Ecology Action Centre 2018. Making Forage Fish Count Report.

## CHALLENGES AND LIMITATIONS

It is important to consider some of the limitations of the methods used in our study. A key challenge that emerged in our attempt to quantify catch effort was the difficulty keeping track of the number of fish caught and retained. During periods of heavy fishing, it became difficult to engage with fishers, measure catch for length, and keep track of the running tally of fish caught and retained during a 2-hour period. This was especially challenging when fishers had multiple rods in the water, and/or when multiple fishers expressed interest in participating in our survey. This challenge was mainly a result of the limited number of surveyors available at any one time. To count catches and monitor effort, especially on busy days, several surveyors at one wharf would be required. In terms of effort calculations, there proved to be many variables that would influence this for recreational fishing, perhaps even more so than with mobile commercial fishers. For instance, variables such as widely shifting individual fishing schedules, tides and fishing from a fixed place all affect the reliability of effort calculations. Extrapolation from a small sample would be highly uncertain as a result. Estimated catch per day by fishers or by wharf area is more feasible to collect effectively and thus more reliable.

Another challenge was the distrust many fishers held toward fishing observers. Some fishers concealed their catch from view, while others stated they were uncomfortable with observers measuring their fish, despite reassurance that EAC was not concerned with reporting any breach of DFO regulations. Overall, fishers were more eager to participate in qualitative surveys with some more hesitant to have their catch measured and counted. To account for this, instead of trying to count all fish being caught at the wharf by all fishers we focused on those willing to answer surveys. We integrated questions in the survey to document the total number of fish a participant caught that day and the measured lengths of a small portion of their catch. In addition, there were challenges relating to conducting surveys. Language barriers and working with diverse groups of fishers caused difficulty conducting surveys with some recreational fishers. In terms of survey effort, due many fishing locations being geographically spread out, it was a challenge to coordinate a limited number of volunteers to cover all locations throughout the period of data collection.

## CONCLUSION

Atlantic mackerel have been fished sustainably by Indigenous peoples in this region for millennia. Settlers to Atlantic Canada also relied on this abundant little fish for food and trade. Today, continued, sustainable access to mackerel for food and recreation remains important for Atlantic Canadians. However, with the depletion of the population and increasing changes in the ocean environment, impacting mackerel's ability to recover, it is critical to ensure we are managing our access and use sustainably.

Traditional recreational fishing is not the culprit behind the critical depletion of Atlantic mackerel. Years of commercial overfishing on this stock and unreported commercial bait catch paired with a lack of DFO leadership to introduce sustainable management measures has led to the state of the stock. This has now been exacerbated by increased environmental changes as the oceans continue to warm. The improved quantification and management of the recreational fishery must correspond with how DFO sustainably manages the commercial fisheries or this tradition will be lost to the next generation. Information from our work with recreational fishers combined with EAC's long term work at commercial fishing policy tables support a few specific management measures we recommend be introduced for the recreational fishery (see Recommendations box).

Moving forward, expanding survey work across the region is important to learn more about local use and dependence on mackerel for food and recreation, to inform improved management and monitoring across all uses, and to better incorporate recreational fisher knowledge in decision making to rebuild the abundance of Atlantic mackerel.



## RECOMMENDATIONS FOR CONTINUED SUSTAINABLE ACCESS AND IMPROVED MANAGEMENT OF ATLANTIC CANADA'S RECREATIONAL FISHERY:

### **1. Establish a daily fishing limit of 20 mackerel per person.**

This amount allows recreational fishers to enjoy mackerel as an important food source and traditional pastime while also introducing some safeguard against unlimited landings and a rule to enforce as needed.

### **2. Introduce a recreational fishing licence that is affordable or free.**

Having a licence enables us to track the number of people fishing and adjust the amount of fish caught to align with population trends.

### **3. Consider introducing a science-based closed season for fishing during population rebuilding.**

Reducing catch limits or introducing seasonal closure for recreational access to mackerel at the same time as the commercial and bait fisheries for mackerel could contribute to stock rebuilding.

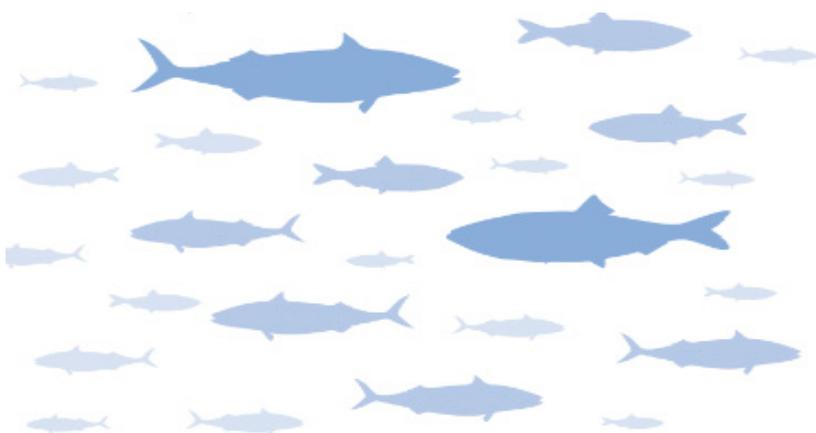
### **4. Improve reporting of all mackerel caught across the region.**

With the mackerel population in the critical zone it is crucial to better understand how many mackerel are being taken out of the water for all purposes. DFO must continue with increased efforts to ensure all discards, bait licence catch, and recreational catches are reported across all regions.

## ACKNOWLEDGEMENTS

We would like to thank all of the fishers who participated in our study and contributed their knowledge to help us better understand this important fishery.

A special thank you to all the Ecology Action Centre volunteers who put in multiple hours gathering the data needed to make this research possible; Zac Greenburg, Max Raissi, Alex Martell and Riley Walker, your work was invaluable!



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## APPENDIX A.

### ATLANTIC MACKEREL RECREATIONAL FISHERY SURVEY – 2018

1. Is this your first time fishing recreationally?
  - a. If no, how long have you been fishing recreationally and on average how many fish do you usually catch each time you go out to fish?
  - b. When did you first notice mackerel in the area and know it was time to go fishing?
2. What type of fish do you hope to catch?
3. What other types of fish have you caught today or in the past?
4. How many fish have you caught today?
5. Would you be ok if we took a size measurement and picture of your fish to better understand the biology of the fish in this area?
6. As the forage fish like Atlantic mackerel, herring and capelin decline do you think its important that fisheries management record the amount of fish caught recreationally? Why?
7. If fisheries management decided to put a daily bag limit/ catch of Atlantic mackerel or herring for the recreational fishery, what would you say was a fair number one person should be allowed to catch per day?
8. What should the boat limit be if a limit was imposed for a group fishing recreationally per day?
9. Is there any other information you would like to share with us to help ensure the forage fish species stay around for generations to come for all to enjoy?
  - a. If yes, would you like to remain anonymous?

### ATLANTIC MACKEREL RECREATIONAL FISHERY SURVEY – 2019

1. How long have you been fishing for mackerel?
  - a. First time b. Less than a year c. 1 – 5 years d. 6 – 10 years e. 10+ years f. 20+ years
2. Why do you fish recreationally for mackerel?
  - a. Sport/leisure b. Food c. Bait d. Other
4. Approximately how many trips per month do you take fishing for mackerel during the months of June, July & August?
  - a. 1 – 4 b. 5 – 10 c. 11 – 20 d. more than 20
5. Approximately how many trips per month do you take fishing for mackerel during the months of Sept & Oct
  - a. 1 – 4 b. 5 – 10 c. 11 – 20 d. more than 20
6. When this year did you first notice Atlantic mackerel were around?
7. How many fish have you caught today? And were they all mackerel? If no, note other species below.
8. How many fish have you retained/kept today?
9. When fish are returned, how would you rate, on average, the health of the fish?  
Very poor/ Poor/ Fair/ Good/ Very good
10. Do you measure your fish when you catch them? (YES / NO) If yes, how do you measure the fish you catch? (i.e., ruler, app, estimate)
11. Do you mind if I measure some of your fish? If yes, choose three.
12. How long have you been fishing for so far today?
13. On average, how many hours do you spend fishing per trip?
14. At what time of day do you fish most often? And why that time of day?
  - a. morning b. afternoon c. evening/post work hours d. depends on the tide
15. On average, how many mackerel would you say you catch on each fishing trip?
  - a. 1 – 3 b. 4 – 10 c. 11 – 20 d. 20+
16. Since you started fishing for mackerel, have you noticed any changes to the population (i.e. size, timing of arrival, number of fish etc.)? (YES / NO) Perceived Change?
17. If yes, when did you first notice these changes?
18. There is currently no monitoring or regulations in place for the recreational mackerel fishery in Nova Scotia, nor is a licence required. Do you feel there should be any monitoring or regulations in place for the recreational mackerel fishery? Why or why not?
19. Do you have any other comments you would like to add that could help us in our efforts to better understand the institution of recreational fishing for Atlantic mackerel in Nova Scotia, or any other fisheries in this area?

# APPENDIX B. OVERALL COMMENTS FROM THE 2018-2019 EAC ATLANTIC MACKEREL RECREATIONAL FISHING SURVEY

## MONITORING AND REGULATION

- Any species needs regulation.
- Yes, to monitoring, No licence.
- Mgmt. needs to step game up on preventing illegal fishing, and enforcing regs
- Need collaboration between stakeholder and managers. All data should be considered and mgmt. should look at entire ecosystem
- Regulations for the recreational lake trout fishery in Ontario have been successful, maybe look to adopt one that is similar for mackerel.
- Regular monitoring by government is important to keep the mackerel resources.
- Best to implement some control
- I'm ok with more regulation if it's done right. Predicts licence.
- Monitoring is important
- Having regs gives us a better idea of when to fish, how much we can take etc.
- Should be more monitoring
- Absolutely. It's important to have data so we can understand the ecosystems being managed
- Licence seems like it would be appropriate
- Many people fishing, and with no licence, they could be taking too many and hurting the environment. A licence would be a good idea
- More visits from DFO to mackerel fishing areas
- No licence.
- No licence! Could be more monitoring, but unlikely.
- I don't feel regulation should be required for recreational fishing
- It's so accessible now, regs would take the fun out of it
- Many people are fishing freely. I don't like the regulation.
- Regs, not for mackerel, but for other forage fish species like herring.

## BAG LIMITS

- Limit is ok too.
- Has been chatting with other fishers and heard the limit will be 75/day. Also heard about a guy who was setting gillnets across channel between Georges Island and Halifax waterfront. He got caught.
- Should have bag limits and a place to record the catches that are kept.
- Mackerel come in schools-feast or famine. It's not fair to implement a daily bag limit because one day you could catch 50 and other days you could catch none.
- No to a limit, but a bucket of 20-30 would be appropriate. Absolutely no licence.
- Bag limit 1 day (like trout) would reduce overharvesting when they're biting well. Maybe 20-40

## COMMERCIAL FISHERY

- Instead of focusing on recreational fishery, better regulation of commercial fisheries should occur
- The commercial fishery should have heavier regulations because small mackerel are not sorted from the large ones when they bring in a big haul.
- If it's healthy, it should stay open and accessible. If it's unhealthy, regulate the commercial
- No, regulating the commercial fishing is enough
- No regulation for rec. commercial is worse.
- No regs for recreational fishing. More commercial fishing

## FISH SIZE LIMIT

- Yes, more enforcement on size limits
- Most fishers think that the limit of size is 26cm. But I know that size limitation is changed few years ago.
- Need more monitoring for the size
- More size regulation
- DFO need to regulate the size of mackerel strictly
- More check for size by D.F.O
- Size limitation is enough for regulation
- A lot of people catch small fishes everywhere. How does government regulate that?

## CHANGES IN POPULATION SIZE

- There are still a lot of mackerels
- 50-year-old man has not seen a decline in number of fish from previous years. Suggests a boat with sonar to count them.
- Size and number have gone down
- There are still a lot of mackerel
- Mackerels are good fish for food. There are still many mackerels and many people are catching them.
- Seems to be a lot of them
- Mackerels fishing is good for learning fishing. And there are many fishes.

## GENERAL COMMENTS

- Seems like people are just doing what they want, no enforcement. Impact from rec fishery doesn't seem like it would be too bad
- Seems like the mackerel use to be drawn in by little green fish(?), and those aren't coming into the harbour anymore. Could reduce how many mackerel we're seeing
- Needs better in & out on good release techniques in outreach. Some people not great at it. Size minimum seems appropriate
- Better information about the state of the stock at popular recreational fishing areas would be helpful.
- As long as mackerel are here and strong, I'm going to keep coming to fish!
- The numbers of fisher who would retain the mackerel getting bigger and bigger
- It's just recreational fishing, not commercial fishing. Fishers catch only dozens of fish.
- Commercial fishing is the main problem
- Fishers try to keep the size regulation except very few people.
- This is the fishery you can take your kids fishing. It's important it remains accessible.
- A lot of people fish mackerel. And it's good for kids' education
- Commercial is more of a concern
- Bait fishery is worse
- People catching everything and keep all of them. Not right.
- Mackerel are overfished

