Text-Messaging: A novel approach to collect catch and effort information from North Carolina king mackerel tournament anglers.

Final Report

For

COASTAL RECREATIONAL FISHING LICENSE

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Final Project Summary: Fisheries managers often avoid charactering CPUE at fishing tournaments because of the non-normal fishing behavior associated with these events. For some fisheries, including king mackerel, tournament catch is thought to account for a significant portion of the total harvest. The objective of this study was to evaluate the use and applicability of the text message based catch and effort reporting method "RecText" (www.RecText.org) in the tournament setting. To educate anglers about the importance of the project and the need for more detailed information from this fishery, project team members personally interacted with an estimated 2,500 anglers (1,000+ boats) at 6 tournaments. Through a combination of paper and text message surveys, approximately 15% of tournament trips were characterized by volunteer anglers. Project researchers coordinated with DMF biologists to collect biological information (lengths, otoliths, etc.) from 867 king mackerel at tournament weigh-ins. Researchers were unable to board boats at the weigh-in area and verify the number of fish kept but not entered into the tournament, but a number of indirect methods were used to characterize and reveal differences in report contents and data quality. For example, fish lengths reported by anglers participating in one type of tournament format were significantly different from official measurements of the same fish at weigh-in whereas lengths reported by anglers participating in a different format of tournament were not significantly different. Interestingly, the total number of king mackerel kept per angler hour reported by anglers in this study was not statistically different than that reported by fishermen submitting paper surveys to DMF biologists at 4 tournaments in 1992 -1993. Feedback from participating anglers and results from the exit surveys indicate that tournament anglers are willing to provide data and can readily adapt to new survey technologies. With minimal effort and increased coordination between tournament organizers and fisheries managers, cell phone based reporting approaches like the one described in this study could be expanded and improved. Overall, the study was successful and generated positive feedback from the public, press, anglers and other scientists also considering the use of text messaging and social media to conduct research in fisheries.

Introduction

Arguably the most pressing issue in marine fisheries management today is the timely and accurate collection of recreational catch and effort data. In 2007, it was estimated that 5.7 million marine recreational fishing trips were conducted in North Carolina alone (National Marine Fisheries Service, Fisheries Statistics Division website, 2011, pers. comm.). Unlike commercial fisheries, where effort and species specific landings are monitored closely, recreational landings are only estimated because of the enormous number of saltwater anglers and their access to an almost infinite number of access points along the coast. While the Marine Recreational Information Program (MRIP) has made great improvements in this national survey in the last several years, total catch and effort associated with special situations such as fishing tournaments remain problematic to characterize.

It is extremely difficult to survey a random group of tournament anglers present with their catch, not simply the fish associated with the leader-board. This is because a significant percentage of successful anglers may avoid the weigh-in altogether if they know beforehand that their catch will not be eligible for a prize. Fisheries scientists are then left with a non-random, potentially non-representative sample of fish. For this reason, fisheries managers typically avoid tournament data collection.

Although the tournament sampling issue may be irrelevant for some species, king mackerel (*Scomberomorus cavalla*) is the primary focus of at least 18 of the 46 fishing tournaments listed on the North Carolina Division of Marine Fisheries (NCDMF) website, www.ncdmf.net. In fact, king mackerel is the target species of the Southern Kingfish Association (SKA), the largest saltwater tournament series in the world, with 3 of the total 12 amateur divisions comprised of North Carolina anglers and tournaments. King mackerel tournaments attract a large number of anglers and usually include 1-2 days of fishing. But the harvest can be significant. Although exact figures are unknown, the tournament harvest is estimated to be somewhere in the range of 30-50% of the total recreational landings (Randy Gregory, NCDMF, pers. comm.). This figure is significant considering that in 2009, king mackerel were fifth highest in recreational landings (0.864 million lbs), superseded only by Dolphinfish (3.8 million lbs), other tunas (1.6 million lbs), bluefish (.97 million lbs) and Spanish mackerel (0.89 million lbs) (National Marine Fisheries Service, Fisheries Statistics Division website, 2011, pers. comm.).

In addition to collecting biological samples from fish brought to the tournament weigh station, from the late 1980's to the mid 1990's, NCDMF distributed fish measurement sheets for volunteer anglers to collect information on not only fish that were kept, but also fish that were released. From 1984 to 1998, NCDMF compiled the largest sample of fisheries dependent tournament data in the Southeast United States (SEDAR 2008). This was a giant step in incorporating more length data, primarily derived from cooperating fishermen, into the management process. While successful, major drawbacks to this process were the time and effort necessary to retrieve the datasheets from fishermen as well as the manpower needed to manually enter the raw data into the computer database.

In 2008, a simple but fully customizable reporting method was developed that allowed anglers to submit effort and catch information to an online database via text messages sent directly from cell phones (Baker and Oeschger, 2009). To evaluate this new approach, captains on behalf of six marine for-hire operations were asked to send a text message to document effort, catch and disposition of catch by species at the completion of each trip. Report submission was facilitated by RECTEXT, a compact syntax developed to allow anglers to submit information within the technical limitations of 160 character text message framework. Free data aggregation was made possible by the social media service www.Twitter.com. During the course of the 4.5 month evaluation, captains submitted 128 trip-level reports that described 1,957 finfish interactions. Results and feedback from captains indicated that the approach was easy to use, cost efficient and allowed for real-time reporting of information directly to an online database. A final recommendation of that study was to further evaluate the approach at recreational fishing tournaments as the real time nature of reporting and the organized structure of tournaments may provide a mechanism to both interact with all registered anglers and facilitate design of an unbiased sampling protocol to validate the self-reported data.

In the South Atlantic, king mackerel populations are currently not overfished and overfishing is either not occurring or is at a low level (SEDAR 2008). Because king mackerel harvested from tournaments may have a significant impact on the stock, it will become even more important to get a handle on this aspect of the fishery. King mackerel is clearly one of the most important fisheries to North Carolina. Any improvements in data collection methods or technologies may not only enhance our understanding of this fishery, but also involve more recreational anglers in the fisheries management process.

This project had 5 objectives. (1) Evaluate a mechanism by which tournament anglers can electronically submit a catch and effort fishing report from a wireless phone, (2) Educate tournament anglers about proper catch and release methods, measuring fish at sea, and the importance of providing catch, effort and biological data crucial to stock assessments; (3) Collect biological samples (lengths, weights, otoliths, sex) from king mackerel submitted to the tournament weigh station, as well as randomly from other tournament anglers; (4) Compare official measurements to measurements provided by tournament anglers; and (5) Compare catch and effort data collected in this study to current and historical data collected by NCDMF and the participating tournaments for each event.

Methods and Procedures

Objective 1. Development of a text-message based reporting infrastructure for fishing tournaments

Text message infrastructure and RecText survey

The text message reporting application "RecText" developed by Baker and Oeschger (2009) was adapted for use in this study. A graphical overview of the information architecture of this system is shown in Figure 1. The system is based on four primary components: mobile (cell) phones, an operating language or syntax (RecText), a text message aggregating service, and a database to archive and display reports submitted by anglers. Since this reporting approach has already been described in detail elsewhere, this report will only address adaptations that were made to the system to allow for open access, real time data collection at fishing tournaments.

A pre-study consultation with Randy Gregory (NCDMF) helped to identify key components for inclusion in the tournament text message reporting infrastructure. As in the pilot study, only basic information was requested from tournament anglers. To that end, we asked tournament anglers to provide the following in each fishing report:

- keyword to identify our data aggregation account on the server;
- tournament issued boat number;
- number of anglers on the boat that fished today
- total number of hours spent fishing;

- quantity and disposition of catch (kept or released) by species;
- fork length measurements (cm) for each king mackerel kept or released.

Since it has been observed that relatively few species are encountered by fishermen participating in king mackerel tournaments, we reduced the available 2-letter species codes in the pilot study from 57 to 13. Using RECTEXT, tournament boat numbers were indicated by the letter "B" followed by the boat number. The number of anglers and effort expended were indicated by a single "N" and "E" prior to the number, respectively. The species or species groupings encountered by tournament anglers were indicated by unique two letter codes prior to the number of observations for that particular item. For example, "BL2" would indicate that the angler kept two bluefish. Fish that were released were separated from those that were kept by the inclusion of a trailing "R" after the species code and observation combination (i.e. BL3R). Finally, we requested that each angler measure and include in the report fork length (cm) for each king mackerel caught. Individual measurements were reported by placing an "X" between the species code and the fork length measurement. For example, an 88 cm king mackerel that was kept by the boat would be reported as "KMx88". Although data fields did not have to be entered in any particular order by anglers, a space was needed in between each data field to facilitate automated parsing of the data into our database. The codes used as well as an example of a typical tournament fishing report can be seen in the folding, wallet sized (19.2 cm x 8.8 cm) instruction sheet that was distributed to anglers who volunteered to participate in the program (Figure 2).

Adjusting the reporting infrastructure used in the pilot study to be compatible with the king mackerel tournament format required some reconfigurations. First, the free text message data aggregating service www.Twitter.com was replaced with the commercial data aggregator www.EzTexting.com at $25 per month plus $0.05 per message sent. Unlike Twitter, which requires users to register to use the service, EzTexting allows customers (fishermen) to send text messages to a central location (EzTexting account) without prior registration or "opt-in". In the pilot study, captains used pre-paid cell phones that were linked to or had an account with Twitter. In this study, it was crucial to have a system whereby any angler with a cell phone could submit a text message fishing report for a given registered boat at any time without prior registration as most anglers would have just learned about the study at tournament registration. Conventionally, services such as these are used by businesses and marketing agencies to send blasts of text-message based marketing updates to many subscribers who legally opt in to receive the updates. In this study, the EzTexting account was used as a central collection point for fishing reports

submitted by anglers. Because EzTexting supplies a unique identification number to each message it receives, it was possible to associate individual text messages to the individual users who submitted them. Like many websites, EzTexting allowed all messages, once received, to be sent to our online database (www.RecText.org) in real-time via a syndication technology called RSS. Another benefit of the EzTexting platform was the ability to manage fishing reports by tournament event. For half of the six tournaments surveyed, a text message reminder message was sent to those anglers who elected to receive it. Those anglers provided the project team with their cell phone number and tournament boat number (for tracking purposes). The following is an example of the "text message reminder" sent to participating anglers cell phones:

Subject:	RecText
Message:	Reminder - text your catch - fish or not - for a chance at $225. Use orange card as a guide. Create a new message - do not reply to this msg. Thanks!

To submit data using this approach, a tournament angler (reporting on the total fishing activity of a specific boat) composed a text message fishing report using the RECTEXT syntax and then submitted it the aggregating service, EzTexting, where they were stored ephemerally. At this point, the angler submitting the message received an automatic "Thank You" text message that acted as a confirmation receipt. From the online database, anglers' RECTEXT reports were queried and received from EzTexting as Extensible Markup Language (XML). The XML data was transmitted from EzTexting to our website by RSS via Hypertext Transfer Protocol (HTTP). Once received, the XML was parsed for the appropriate data and translated into recreational fishing information, and used to populate the MySQL relational database at www.RecText.org (Figure 3). Finally, the database was made available to web users via the scripting language PHP and HyperText Markup Language (HTML).

Inclusion of paper survey option (2009 only)

Initial consultations with at least two experienced tournament directors expressed concern with the proposed "text-only" reporting format. To remedy this, a paper version of the catch and effort survey (similar to the NCDMF surveys distributed at king mackerel tournaments in the late 1980's to mid 1990's) was developed so that anglers would have a choice with regards to reporting format (Figure 4). The paper survey, however, was only offered at the 4 tournaments surveyed in 2009.

Prizes to increase survey participation

To maximize the potential number of paper or RecText surveys received from anglers, grant funds were used to offer a cash raffle drawing at the awards ceremony of each tournament surveyed. To be eligible for the drawing, anglers must have submitted a paper or RecText survey to the research team prior to the awards ceremony, regardless of whether any fish (including king mackerel) were caught. Prizes varied by tournament with larger (Cash) prizes offered to those who chose to use the RecText format. A total of $450, divided into 2 to 6 raffle drawings eligible to survey participants, was distributed as prizes at each tournament.

Fishing tournaments selected for data collection

It was originally intended that data collection activities would take place at four tournaments in Carteret County in 2009 only. However, after the study was initiated, it was determined that 2 of the 4 tournaments were to be discontinued in 2009. After consulting with NCDMF staff, 2 additional tournaments were identified outside of Carteret County and the organizers agreed to let us collect data at those events. At the conclusion of sampling in 2009, the decision was made to obtain a no cost extension to collect data at 2 additional tournaments in 2010. The list of king mackerel tournaments surveyed for this study is shown in Table 1.

Post data submission (exit) survey

To assess the overall usability of the text message based reporting approach, tournament anglers who submitted surveys were given the opportunity to participate in a “follow-up” or “exit survey” (Figure 5). The primary goal of this survey was find out more information about the types of anglers that participated in the process and determine their impression of this new reporting system. Anglers who participated in data collection either stopped by the tournament booth (paper survey) during the tournament or were notified of the exit survey opportunity via the “Thank You” confirmation receipt described earlier. At the last 3 tournaments surveyed, door prizes were given to those who participated in the exit survey.

Objective 2. Educate tournament anglers about proper catch and release methods, measuring fish at sea, and the importance of providing catch, effort and biological data crucial to stock assessments.

With the cancellation of the 2 of the 4 original tournaments, each affiliated with a local sportfishing club in Carteret County, so were several opportunities to educate anglers about aspects of the study prior to the event itself. One trip was made to the Raleigh Saltwater Sportfishing Club monthly meeting held a few weeks prior to the Club's tournament in July, and this effort proved to be beneficial in communicating to anglers about the objectives of the study.

As the RecText survey methodology would be new to all anglers, it was determined that it would be difficult to verbally explain the intricacies of the system as well as educate anglers about the importance of the study…all in a very condensed and often hectic registration period. In order to maximize anglers' understanding and acceptance of the survey, considerable time and effort was spent designing a survey kit to be distributed to anglers. The kit, shown in Figure 6, consisted of a clearly labeled re-closeable plastic bag (15 cm x 25 cm) that contained the following components: 1) short welcome letter / project overview (Figure 7), 2) paper survey form (2009 only) and instructions, 3) RecText wallet card with sample report; 4) combination key chain and fabric tape measure (0-150 cm) and 5) a golf pencil.

In order to distribute survey kits to as many anglers and boat (team) representatives as possible during the registration period, two approaches were tested. Each method required two to four members of the project team to establish a project headquarters (with approval of the tournament director) at or near the registration table at each event, and opportunistically intercept and initiate conversation with anglers once they had completed the registration process (Table 1). In order to stand out in the crowd, each member of the research team wore a bright green "RecText king mackerel data collection" t-shirt. At four of the tournaments, survey kits were distributed opportunistically to as many anglers as possible. For the other two events, tournament staff and/or project personnel included the survey kit into each "Captain's bag" that was later distributed to all boat during registration – thus insuring that all registered boats received a survey kit. Regardless of the survey kit distribution method used, an effort was made to speak to as many anglers as possible throughout the registration. Finally, at each tournament, tournament directors allowed research staff to make an announcement describing the study to all the anglers present at the Captain's meeting, which usually occurred midway through the registration period the evening prior to the fishing event.

Objective 3. Collect biological samples (lengths, weights, otoliths, sex) from king mackerel submitted to the tournament weigh station, as well as randomly from other tournament anglers.

Division of Marine Fisheries personnel collect biological information (lengths, weights, otoliths, sex, etc.) from a range of size classes of king mackerel at 4 to 5 tournaments every year. This information is used to characterize the age-size structure of the recreational king mackerel fishery. To maximize efficiency of staff on-site, the project team relied on DMF personnel to collect biological information from king mackerel weighed-in (entered) to tournament competition. It was envisioned that fish kept, but not weighed in to the tournament, would be sampled by project team members after anglers submitted surveys from the boat (on the water) and prior to weighing fish at the tournament.

To encourage those anglers submitting surveys to provide kept fish (but fish not weighed-in) or additional information for further processing by research staff, a text message "invite / thank you" was automatically sent to each respondent after the RecText was received. Several message formats were considered. Here is an example of one message used:

Message: "Thanks! Help us more-show us your catch at dock to verify report. Look for green shirts. Plz submit a report tom as well. To opt out= Reply STOP REC to End"

Objective 4. Compare official measurements to measurements provided by tournament anglers.

As mentioned earlier, anglers who accepted survey kits were encouraged by project team members to submit length measurements for as many king mackerel as possible, especially those that would be weighed-in to the tournament. In order for the length data provided by fishermen to be used for management purposes, ideally statistical analyses should be performed to determine if the data is accurately measured. Agreement between angler and DMF length measurements of the same fish were evaluated with a Wilcoxon Signed Rank Test ($p = 0.05$) as well as a paired, 2 sample t-test ($p=0.05$).

Objective 5. Compare catch and effort data collected in this study to current and historical data collected by NCDMF and the participating tournaments for each event.

Catch Per Unit Effort (CPUE) surveys administered by DMF at king mackerel tournaments from 1984 to 1998 (DMF program 451) included many of the same data fields and questions as our surveys (number of participating boats, hours fished, number of king mackerel weighed-in, number of surveys returned, etc.). The survey data has been used last in 1996 to attune the Virtual Population Analysis associated with the SAFMC king mackerel stock assessment. Data obtained from this study was compared directly to the extent possible to data compiled from 4 events surveyed by DMF from 1992-1993. Of particular interest is the Catch-Per-Unit-Effort numbers of kept king mackerel, calculated in this study and from existing DMF data as the number of king mackerel kept per angler*hour fished.

Results and Discussion

Data collection occurred from July to October 2009 and again from September to October 2010 at a total of 6 king mackerel tournaments (Table 1). The tournaments occurred in Southport (n=3), Carolina Beach (n=1) and Atlantic Beach (n=2). Each tournament was different than the other and all were challenging to survey considering that members of the project team had never surveyed or sampled at king mackerel tournaments prior to this study.

The Raleigh Saltwater Sportfishing Club tournament (Raleigh) and the Brunswick Isles tournament (BrIsles) both consisted of one day of fishing. The East Coast Got-Em-On Live tournament (GotEmOn) was one fishing day, but captains had to commit at registration on one of two possible days on which they would fish (e.g. Friday or Saturday). The Atlantic Beach tournament (AB) and the U.S. Open (Open_09 and Open_10) events consisted of 2 fishing days – with the expectation that most anglers would fish each day. Onsite registration, the period most critical to this study, ranged from 2 (AB) to 14 (Open) hours. Registration always occurred the day or evening prior to the first day of competition. Weigh-in time and location also varied by tournament. While the Raleigh, AB, Open and BrIsles had weigh-in locations that were convenient for conducting and collecting surveys, angler access at GotEmOn was more difficult due to the proximity to a busy road. Weigh-in times were fairly uniform among tournaments surveyed, but the awards ceremony and thus the deadline for survey submission occurred either the same day as competition (GotEmOn, AB, Open, BrIsles) or the following day (Raleigh). As expected, weather was different

from event to event and likely affected registration numbers. The two tournaments surveyed in 2010 were each postponed two weeks from the original scheduled date. Finally, the Open was the only tournament surveyed more than once and this was the only tournament not associated the SKA and thus not bound by the 1 fish per boat limit for weigh-in per day fished. The goal was to survey the Atlantic Beach tournament (AB) again in 2010, but conflicting schedules precluded this from occurring.

The size of tournaments surveyed ranged from 59 (Raleigh) to 453 (Open 09) registered boats, resulting in a total of 1,291 boats or 2,224 trips taken (Table 2). In total, survey kits were distributed to 967 boats or 75% of the total boats registered at all events. All anglers at 2 tournaments (Raleigh, n=59 and AB, n=175) received a Captain's bag with the survey kit inside. At the 4 other tournaments, those anglers (boat representatives) that were approached and receptive of the tournament reporting concept (n=733) received a survey kit.

At the final three tournaments surveyed, a text message reminder was offered to those anglers who accepted the survey kit on behalf of the boat at registration. This was done in an effort to increase participation in the survey. The number of boats that accepted survey kits and volunteered cell phone numbers ranged from 44% (BrIsles, n=20) to 57% (n=129, Open 10). These boats received an automated text message reminder (sent from the RecText account on www.EzTexting.com) shortly after the start of the weigh-in period for each tournament. The percent of total surveys received from boats that also received the text message reminder ranged from 15% (BrIsles, n=3) to 47% (Open 09, n=68). In addition, the number of anglers (serving as a proxy for a registered boat or team in the tournament) approached about the study but declined or refused to participate in the survey was recorded and ranged from 2.2% (n=1, BrIsles) to 7.0% (n=17, Open 10).

Although the tournaments surveyed varied largely in the total number of registered boats, the percent of tournament trips in which a boat weighed-in at least one king mackerel was similar. This weigh-in rate was lowest at BrIsles (30.7%) and highest at the Open (43.6%) with an overall mean for all tournaments at 39% (Table 2). On average, non-SKA events (Open 09, Open 10) had a higher weigh-in rate than SKA events. One of the primary differences between these two types of events is that the Open format allows boats to weigh-in up to 3 king mackerel per fish day whereas SKA events only allow 1 king mackerel entry per event or fish day, depending on the situation. A total of 1,461 king mackerel were officially weighed in at the 6 tournaments surveyed.

At the four tournaments surveyed in 2009, one thousand three hundred and sixty-nine boats participated in 1,431 trips (Table 3). Overall, 127 RecTexts and 39 paper surveys (n=166 total) were received in 2009. Fifty six oral surveys requesting similar information as that of the paper and RecText survey were initiated by members of the research team at the AB tournament when survey participation was predicted to be low because of inclement weather and proximity of the weigh-in location to the angler pick-up point. Because these surveys were initiated by project staff, they were excluded from calculation of survey participation rate. The percent of the surveys received that utilized the RecText approach ranged from 57% (GotEmOn and Raleigh) to 95% (AB), with an overall mean of 77%. The participation rate by tournament and year for 2009 events surveyed was calculated using 2 methodologies: (1) the total number of trips taken in the tournament and (2) (preferred) the total number of survey kits accepted by boats at registration. Overall survey participation rates (including both paper and RecText submissions) were 11.6% using method 1 and 14.4% using method 2 for events in 2009.

At the two tournaments surveyed in 2010, three hundred and eighty boats participated in 681 trips (Table 4). Overall, 74 RecTexts were received in 2010. Paper surveys were not offered and oral surveys were not conducted in 2010: thus all surveys were submitted using the RecText method. Similar to 2009, the participation rate by tournament and year for 2010 was calculated using 2 methodologies: (1) the total number of trips taken in the tournament and (2) (preferred) the total number of survey kits accepted by boats at registration. The overall survey participation rate observed at 2010 events was 10.9% using method 1 and 14.8% using method 2.

Effort and catch data voluntarily reported by anglers in 239 survey submissions (39 paper and 200 RecText) were used to describe the characteristics of tournament fishing trips (Table 5). The mean number of anglers per boat (3.6 ± 1.2) ranged from 3.2 ± 0.9 (AB) to 3.7 ± 1.2 (Open 09) and was not significantly different among tournaments (ANOVA, F (5,225) = 0.88, p = 0.49). The mean number of hours fished per boat (7.2 ± 1.5) ranged from 6.8 ± 1.5 (Open 09) to 8.6 ± 2.0 (Raleigh) and was significantly different among tournaments (ANOVA, F (5,221) = 6.02, p < 0.0001). The total number of king mackerel reported kept (including those weighed-in) and released was 372 and 55, respectively. The mean number of king mackerel kept per angler*hour fished (0.07 ± 0.08), which included those fish weighed-in, was not significantly different by tournament (ANOVA, F (5,220) = 0.78, p = 0.57). The mean number of king mackerel released per angler*hour, (0.01 ± 0.04) was also not significantly different by tournament (ANOVA, F (5,220) = 0.50, p = 0.77).

Additional information was also gleaned from survey responses. Of the 239 surveys received, 94 (39.3%) of those were from boats that did not weigh-in king mackerel at the tournaments. This rate increased at the last 3 tournaments surveyed which among other things, coincided with the introduction of the text message reminder sent to participating anglers. Seventy two percent of surveys received included king mackerel fork length measurements. Finally, respondents weighed in a total of 228 king mackerel at the 6 tournaments surveyed, accounting for 16% of the total number of king mackerel weighed-in. In addition to king mackerel, anglers were also asked to provide catch information about other species encountered (Table 6). The most frequently encountered species other than king mackerel included sharks (unclassified), Spanish mackerel, bluefish and greater amberjack. Conversations with anglers indicated that sharks were likely underreported in surveys.

Biological data collected

One thousand four hundred and sixty one king mackerel were brought to the scales at these 6 tournaments. DMF biologists collected biological information (lengths, otoliths, etc.) from all fish weighed-in at 3 tournaments in 2009 and 1 tournament in 2010. Project team members collected official lengths on all fish weighed-in at the BrIsles tournament. Because of the large number of fish weighed-in at the U.S. Open in 2009, only a subsample of these fish was measured by DMF biologists. To illustrate the size structure of all king mackerel officially weighed-in at the tournaments surveyed (excluding Open_09), length data is plotted in Figure 9.

Anglers who submitted surveys also recorded measurements for 272 king mackerel, 39 of which were released. A length frequency bar graph of these measurements overlaid on the length frequency of all fish entered in 5 tournaments provides perspective on the size range of fish encountered by anglers (Figure 10).

While it was beyond the scope and resources of this study to validate length measurements of released fish, we requested that anglers measure at least the king mackerel(s) that would eventually be weighed-in to the tournament, so that these could be validated with measurements taken by DMF biologists or project staff. There were 108 king mackerel that had both angler and DMF measurement data, and the percent difference of those measurements is presented in Figure 11. Non-SKA data (n=65) was more positively skewed than SKA data (n=43).

Self reported measurements were compared to DMF measurements of the same fish using a Wilcoxon Signed Rank Test. When all length observations were included into a single grouping, the median difference between measurements (12.5 mm) was significantly different from zero (W = 1090, p = 0.0001). When the measurement data was separated into SKA and non-SKA categories because of skewness indicated by the percent differences graphs, contrasting results were obtained. The median difference between SKA angler measurement data and DMF measurement data was not significantly different than zero (W = 109, p = 0.15) whereas the median difference between non-SKA angler measurement data and DMF measurement data was significantly different than zero (W = 502, p = 0.0002). The same comparisons were analyzed using less rigorous paired, 2 sample t-tests with similar results.

Exit survey administered to survey participants

A total of 18 exit or follow-up surveys were completed by anglers who submitted either a paper survey (n=1) or a RecText (n=17). All respondents were White (Non-Hispanic): 15 males and 3 females. The mean age of exit survey respondents was 42 years (range 12 to 63 years). Thirteen of 17 respondents indicated that all catch was encountered. Five of 18 respondents reported some problems/difficulties/issues were encountered when composing a RecText survey. Fifty-three percent of Rectexts were submitted “offsite, away from the boat” and the remainder of surveys submitted from the boat (as requested). All 17 respondents utilizing the RecText survey option stated that “some” or “all” of the anglers onboard could have submitted the text message report and all indicated that they had used text messages before the day of the tournament. Of 16 respondents that answered the question, 12 used text messaging on a daily basis, 1 used it on a weekly basis and 3 used it a few times in the past. All but one respondent was supportive of continued data collection at king mackerel tournaments, with 6 anglers (35%) interested in receiving a summary of the data collected from this study. When asked how many tournaments they would normally fish in an average year, 13 of 16 respondents said 1-2 tournaments and 3 said 5 or more tournaments. When these responses were sorted by tournament type (SKA vs. non-SKA), mean number of tournaments fished per year was higher in the SKA group (3.7 ± 3.1) compared to the non SKA group (2.0 ± 2.7), but were not significantly different from each other (ANOVA, F (1,32) = 3.09, p = 0.09).

Condition and Validity of RecText data

Rectext survey information that was submitted by anglers was viewable in raw form (code) at the www.EzTexting.com account as well as at the www.RecText.org site. More than 200 RecTexts were received during this project, but there were several instances where anglers submitted information more than one time for the same trip. These had to be manually removed from the database. Twenty one texts were received that used little or none of the required syntax. For example, reports were received that that included “No fish today” or “We kept 3 KM Friday.” One hundred and seventy nine text reports, which included a total of 595 data fields (e.g. Boat#, anglers. effort, etc.), were reviewed for any errors that would have caused the XML / PhP parsing function to not visualize the data properly on the external site www.RecText.org. A total of 122 errors were observed of which 49 included improper use of zeros (e.g. KMx0, 28 trips), 30 that did not include “x” in between species code and measurement (e.g. KM88, 13 trips), 18 that involved improper spacing between data fields (e.g. KMx 88, 12 trips), and 25 other unclassified errors, mostly typographical in nature (e.g. spelling out species names, wrong species codes, etc., 18 trips). Many trips had multiple errors. Ultimately, all of the data submitted by anglers was usable upon correction and 111 surveys were received complete without any errors.

As mentioned earlier, the cheat sheet that was distributed to anglers contained an example of a fishing report (Figure 2). In this hypothetical example, boat number 55, with four anglers onboard, fished for 6 hours. The anglers collectively kept one 120 cm (47.25”) FL king mackerel and one wahoo. They also released one 70 cm king mackerel and 3 bluefish. The frequency of 120 cm king mackerel were relatively rare in the 5 tournaments in which all fish weighed-in were measured by DMF (number of fish ≥ 120 cm FL = 35 or 8.3% of total). A fish of this size class would weigh approximately 29 pounds and would have a good chance of placing in a tournament depending on the situation. To that end and as an indirect measure of report validity, it could be assumed that all king mackerel ≥ 120 cm FL would be weighed-in to the tournament. Twelve of the RecText surveys (trips) received during this study contained king mackerel length measurements of exactly 120 cm, identical the king mackerel example listed on the RecText instructions. Two of these 12 trips contained details regarding trip specifics that were exactly like the example and for a variety of other reasons were removed from the database and labeled as false reports. The remaining 10 trips actually entered fish in the tournament and 8 of these had DMF accompanying measurements at weigh-in. The two reports that weighed-in but did not have corresponding DMF measurements occurred at Open_09 when DMF only measured a portion of the total number of fish weighed-in.

Therefore, of the 12 trips containing exact king mackerel measured at exactly 120 cm, only 2 were excluded from the study.

Fixed costs associated with RecText as configured

In order to allow an open-access system by which any cell phone could submit a RecText survey to the online database, an account was needed with a third party text message aggregator. The project obtained a keyword "REC" account for $25 a month from www.EzTexting.com for the duration of the study (18 months x $25 per month, no contract). This ensured that the keyword "REC" would be available throughout the data collection period since this keyword was printed on all project literature. The cost of text messages sent by anglers and received by this account (and forwarded to the www.RecText.org database) was billed at standard text message rates (Baker and Oeschger, 2009). Every message that was sent from the EzTexting account was billed at $0.05 per message. Text messages sent from the EzTexting account were used to send "confirmation receipts" upon receipt of RecTexts as well as participation reminder texts to those that provided phone numbers. Electronic data collection costs associated with the study is described in Table 7.

Results compared to historical DMF survey data

To the extent possible, catch and effort results from this study were compared to CPUE survey data collected by DMF in 1992-1993. For this analysis, Randy Gregory and Jacob Boyd selected 4 tournament data sets from that period which were readily available in the DMF database. The tournaments selected were the 1992 Raleigh Sportfishing Club Saltwater Classic (Raleigh_92), the 1992 Wrightsville Beach tournament (WB_92), the 1992 U.S. Open (Open_92) and the 1993 U. S. Open (Open_93) (Table 8). These tournaments were all large in terms of the number of registered boats as was customary for the time period (Randy Gregory, DMF, pers. comm.).

There were several noticeable differences observed between the DMF study and the results reported here. First, the 1992-1993 tournaments surveyed had lower overall weigh-in rates than this study. Simply put, fewer boats brought fish to the scales during the 1992-1993 period than observed in this study. Although not depicted in the summary table, another major difference between studies was that almost all anglers that participated in 1992-1993 surveys submitted data for each day of the tournament. In this study, only 3 of the 6 tournaments surveyed (AB, Open_09,

Open_10) operated under the 2 days of fishing format. By comparison, of the 39 paper surveys returned in this study, only 5 were from boats that did not weigh-in fish. Furthermore, 4 of those boats actually submitted 2 days worth of data, with each boat weighing in fish on the other tournament day. Finally, out of the 4 tournaments surveyed, not a single king mackerel was reportedly released by anglers.

There were two obvious similarities observed between periods. First the number and percent of trips that participated in data collection varied, but overall was similar to this study. Likewise, so was the number and percent of survey trips not weighing in king mackerel.

Finally, the data from the 1992-1993 period was sorted to compare mean number of anglers, hours fished, and rates of kept king mackerel (weighed-in, kept, sold, etc.) per angler*hour fished to the same data calculated for the 6 tournaments in 2009-2010. ANOVA indicated that the mean number of anglers reported in this study (3.6 ± 1.2) was significantly higher than the mean number of anglers reported in 1992-1993 (3.2 ± 1.0) (ANOVA, F (1,516) = 17.82, $p < 0.0001$. ANOVA also indicated that the mean number of hours fished as reported by anglers in this study (7.2 ± 1.5) was significantly higher than the effort reported by anglers in 1992-1993 (7.0 ± 1.4) (ANOVA, F (1,517) = 4.74, $p = 0.03$. Despite these differences, ANOVA indicated that the mean rate of kept king mackerel per angler*hour reported in this study (0.07 ± 0.08) was not significantly different from the mean rate reported by anglers in 1992-1993 (0.07 ± 0.08) (ANOVA, F (1,518) = 1.22, $p = 0.27$. While these data are merely snapshots in time, annual surveys conducted over a wide range of tournaments could be used to produce perhaps the best available estimate of catch and effort associated with the king mackerel tournaments.

Conclusions

The results indicate that anglers participating in the survey were able to adapt to the “RecText” only participation method in 2010, versus the 2009 study year in which both paper and RecText methods were offered. This is evidenced by the fact that the overall data collection survey participation rate was almost identical in 2010 (14.8%) to that observed in 2009 (14.4%). Indeed, there were numerous instances in which the same anglers (identified by boat name) submitted paper surveys in 2009 and submitted RecText surveys in 2010.

Given the changes with regards to the total number and size (boats registered) of king mackerel tournaments surveyed in this study compared tournaments sampled in 1992-1993, it is surprising that the calculated number of king mackerel kept per angler*hour fished was not significantly different between time periods. Although the standard deviation about the mean of each estimate was high (from 100 to 150%) and would likely make it difficult to detect any significant differences without enormous sample sizes, the inclusion of many "zero king mackerel" in both 1992-1993 and this study confirms that both successful and unsuccessful anglers participated in the study.

Because of the strict rules and procedures associated with unloading and weigh-in at tournaments, the relatively low number of surveys received and the fact that approximately 53% of survey respondents submitted surveys after they had left the water, it was practically impossible to validate contents or reports other than the length estimates of fish that were weighed in. Also factoring in to this problem was the relatively short "drop-off" period that most tournaments enforced to in order to expedite the unloading process of boat representatives with the fish(es) to be weighed-in. At most of the tournaments surveyed, the "drop-off" period was less than 2 minutes per boat, hardly enough time to board a vessel, much less dig through someone's fish box. More thought needs to go into how to validate kept fish from boats that weigh-in.

One of the most interesting and useful findings of this study was of the comparison between length measurements taken at-sea by fishermen and corresponding length measurements (of the same fish) collected by DMF biologists at weigh-in. When visualization of the percent differences between measurements revealed dissimilarities between the non-SKA events (Open_09, Open_10) and the 4 SKA events surveyed, other underlying factors were considered for the cause of these differences. The first possibility is the difference in the number of king mackerel that can be weighed-in and thus measured by DMF: SKA events allow one fish per boat per day whereas the non-SKA (Open) format allows three. While there were no issues with the SKA data (only one observation per boat), several Open anglers weighed-in and provided measurements for multiple fish although these could not be individually identified on the survey. Second, the U.S. Open format is unlike most other king mackerel tournaments in North Carolina because it is still an event which attracts a large number of local fishermen and families who have participated in the event year after year (Randy Gregory, DMF, pers. comm.). Second, conversations with tournament anglers throughout the study indicated that by and large, a significant number of anglers that participate in the Open, do not participate in many other tournaments. As one of the oldest king mackerel tournaments in North Carolina, the 2009 U.S. Open was also the largest on the East

Coast (453 boats). Finally, during the exit survey, respondents were asked how many tournaments they would normally fish in an average year. Thirteen of 16 respondents said 1-2 tournaments and three said 5 or more tournaments. When these responses were sorted by tournament type (SKA vs. Open), mean number of tournaments fished per year was higher in the SKA group (3.7 ± 3.1) compared to the Open group (2.0 ± 2.7), but were not significantly different from each other (ANOVA, F (1,32) = 3.09, p = 0.09). The test was significantly affected by one Open respondent that reportedly fished in 10+ tournaments per year. Considering the differences between the Open format and that of the SKA, one reason behind the lack of difference between angler and DMF measurements in SKA events is the higher frequency in which anglers may fish or handle fish. Regardless, length data reported from SKA events was not significantly different than DMF measurements and Open data was significantly different than DMF data collected.

In this study, it was difficult to compile all of the necessary information necessary for analysis. Generally speaking, the vast majority of anglers registered for the tournament onsite with less than 5% pre-registering prior to the events. Similar to hectic weigh-in periods of tournaments, registration periods were busy for everyone making it difficult to have quality interactions and provide survey instructions to anglers. The Captains' meeting provided good exposure for the study, but at more than one event, it was difficult to hear the speaker from the audience. The implementation of the text reminder in the last three tournaments was well received by anglers. The number and percent of surveys received that would not have otherwise weighed-in increased after this practice was initiated, perhaps because anglers remembered that their survey would be eligible for the prize regardless of whether king mackerel (or and fish) were caught or not. The text reminder was most beneficial during the Open events because anglers who submitted a survey on the first day were very likely to submit a survey on the second day if they received the reminder each day. But perhaps the most frustrating aspect of this study was the fact that king mackerel tournament awards or prize placement is based solely on the heaviest fish weighed-in; fish lengths, which are important for fisheries dependent indices and some cases, stock assessment analyses, are not normally collected by tournaments. At these 6 tournaments, DMF or project team members collected lengths on most of the fish weighed-in. In most cases, DMF would not collect fish weight because that crucial data was already being collected by the tournament. In order to obtain the complete biological picture of each fish weighed-in to the tournament, DMF would request the weight data and merge datasets at a later date. In several cases, it was a prolonged length of time before the length data collected at the tournament could be manually merged a second time with

survey data identified by boat number, tournament identification and date. Of course, every step removed from the actual data collection increased the likelihood of transcription error.

Recommendations for future study

As some of the basic effort data needed for management is already being collected by king mackerel tournaments themselves, whether it is for prize distribution and management or simply to update the contact list for next year's tournament invitations, it seems most feasible that tournaments could manage a voluntary survey program in which interested anglers could participate. Organizers are simply in an excellent position to conduct a voluntary survey such as this and verify reports simply because so much of the data is already being reported. For example, at least one tournament organizer has implemented a mandatory "Check-in" requirement for liability insurance purposes in which anglers, by the end of the day, must call-in to verify their safety if they did not weigh-in fish. As the actual expenses for the text message based reporting approach described in this study are low, the additional time and effort extended by tournament staff to collect and verify information from anglers could be rewarded prize funding or promotions from DMF or more likely, by allotting a small portion of the total prize purse to the raffle populated by survey participants.

Feedback from participating anglers and results from the exit surveys indicate that tournament anglers are willing to provide data and can readily adapt to new survey technologies. With minimal effort and increased coordination between tournament organizers and fisheries managers, cell phone based reporting approaches like the one described in this study could be expanded and improved to collect additional self-reported data from anglers.

References

Baker, M. S., Jr. and I. Oeschger. 2009. Description and initial evaluation of a text message based reporting method for marine recreational anglers. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 1:143–154.

Review of Recreational Fisheries Survey Methods. 2006. National Research Council. National Academies Press, Washington, DC, ISBN: 978-0-309-66036-5, 202 pages.

SEDAR (Southeast Data Assessment and Review). 2008. South Atlantic and Gulf of Mexico king mackerel. Section II: Data Workshop Report. Charleston, South Carolina. 164 pages.

Outreach and Project Exposure

This project received a lot public exposure and was well received by anglers, the general public, members of the media, and particularly other scientists exploring the use of social media to conduct field based research in fisheries and other disciplines.

Newspaper articles

2010, Mar., "Citizen Science in Full Flight. Charlotte Observer article about ScienceOnline 2010 conference and panel that I co-led and organized. http://www.newsobserver.com/2010/03/29/411487/citizen-science-in-full-flight.html

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Internet

2010, Jan., "YouTube" video of Citizen Science Panel discussion at ScienceOnline2010 conference. http://www.youtube.com/watch?v=59MDfYtiieA

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2010, Jan., Media Coverage of Science Online 2010 Conference including RecText presentation. http://scienceblogs.com/clock/2010/01/blogmedia_coverage_of_scienceo.php

2010, Jan., "The Back Channel of Science." Coverage of ScienceOnline conference. http://seedmagazine.com/content/article/the_back-channel of science/

2010, Jan., "Publicity matters to scientists, too." Coverage of ScienceOnline conference. http://www.newsobserver.com/2010/01/19/291480/publicity-matters-to-scientists.html

2010, Jan., "Online science conference draws 250: Scientists, reporters, bloggers from around world share ideas in Research Triangle Park. Coverage of ScienceOnline conference. http://www.charlotteobserver.com/2010/01/18/1187649/3-day-conference-draws-250-to.html#ixzz0vSa3eJHF

2009, Aug., "Scientists merge texts, "tweets" and fishing. Text message work (past and current) featured on UNCW research homepage. http://www.uncwil.edu/research/fishing.html

Presentations

2009, Text Message Project Overview to Raleigh Saltwater Sportfishing Club. 50 people.

2009, Invited presentation, SAFMC Limited Access Privilege Program (now Catch Shares) Committee. Charleston, SC. Title: "Text messaging: a real time method to report simple fisheries data." ~50 people each plus webcast of presentations.

2010, Oral presentation entitled "A novel approach to use text messaging as a method to submit self-reported data: Results of a pilot study involving marine recreational anglers.." Association of Natural Resource Extension Professionals (ANREP) 2010 Conf, Fairbanks, AK, 200 attendees.

2010, Oral presentation entitled "Citizen Science." ScienceOnline Conference. www.scienceonline2010.com. Raleigh, NC. 60 people.

2010, Oral presentation entitled “RECTEXT Demo: Reporting fishing tournament data “from the audience” using text messaging.” ScienceOnline Conference. www.scienceonline2010.com. Raleigh, NC. 60 people.

Radio

2010, Mar., Call-in interview on Dr. Bogus (radio) fishing show to discuss text messaging project(s): http://www.wtkf107.com/ZCDBDrBogus030810.mp3

Acknowledgements

I would like to thank tournament directors associated with each event that made this study possible as well as Sara Mirabilio, Jon Vanderfleet, Joe Facendola, and Lisa Humphrey who put in long hours to talk to anglers and distribute survey kits at event registrations and weigh-ins. I would also like to thank DMF staff for the fish measurements and overall direction with the study. Finally, a shout out to Ian Oeschger and Bob Humphrey who assisted with the RecText architecture and MS Access database design, respectively.

Table 1. List and attributes of the 6 king mackerel tournaments surveyed.

Event	2009				2010	
	EC Got-Em-On Live Classic	Raleigh Sportfish-ing Club	Atlantic Beach Saltwater Classic	U.S. Open	Brunswick Isles	U.S. Open
Date	July 10-12	July 31-Aug 2	Sept 17-19	Oct 1-3	Sept 18-19	Oct 14-16
Location	Carolina Beach	Atlantic Beach	Atlantic Beach	Southport	Southport	Southport
Website	www.gotemonliveclassic.com	www.rswsc.org	www.bluewaterpromo.com	www.usopenkmt.com	www.bluewaterpromo.com	www.usopenkmt.com
# fishing days	1	1	2	2	1	2
SKA event	Yes	Yes	Yes	No	Yes	No
On-site registration	10am-11pm	5pm-9pm	5pm-7pm	10am-11:59pm	5pm-8pm	10am-11:59pm
Weigh-in location	Municipal Marina	Sea Water Marina	McCurdy's Restaurant	Municipal Marina	South Harbor Village Marina	Municipal Marina
Adverse weather conditions?	No	Yes – wind almost cancelled	Yes – heavy rain	No	No – but postponed once	No – but postponed once

Table 2. Weigh-in rates at the 6 king mackerel tournaments surveyed in 2009 to 2010.

KMT Name	2009				2010		Total
	GotEmOn	Raleigh	Atl Bch*	US Open*#	Br Isles	US Open*#	
Number of boats registered	224	59	175	453	75	305	1,291
Number of trips this event	224	59	334*	814*	75	606*	2,224
Number and (percent) of trips that weighed-in king mackerel	89 (39.7%)	21 (35.6%)	127 (38.0%)	343 (42.1%)	23 (30.7%)	264 (43.6%)	867 (39.0%)
Number of king mackerel weighed-in by all boats	87	21	123	749	23	458	1461

*event consisted of 2 fishing days;
#U.S. Open format allows boats to weigh-in up to 3 king mackerel (of legal recreational size) per tournament fishing day.

Table 3. Comparison of survey participation rates at the 2009 King Mackerel Tournaments surveyed.

NC King Mackerel Tournament	2009				Total
	Got-Em-On	Raleigh	Atl Bch	US Open	
Number of Boats Registered	224	59	175	453	1369
Total number of Trips	224	59	334	814	1431
Number of boat representatives approached at registration that accepted survey packet	181	59*	175* (x2 d)	280 (x2 d)	1150
Surveys submitted by boats					
A. Total number of RecText surveys Rec'd	11	8	18	89	127
B. Total number Paper surveys Rec'd	9	6	1	23	39
C. Total number of Oral surveys collected**	N/A	56	N/A	N/A	56
D. Total number of Surveys Rec'd (A + B)	20	14	19	112	166
Percent of 2009 surveys that used RexText method = A. / D.	57.1%	57.1%	94.7%	79.5%	76.5%
Option 1. Overall survey participation by total number of trips taken					
Percent of trips that participated in data collection = A.+ B. / Total number of trips	8.9%	23.7%	5.7%	13.7%	11.6%
Option 2. Overall survey participation by number of surveys accepted					
Percent of trips that participated in data collection = A+B /(Number of surveys accepted x 2)	11.1%	23.7%	5.7%	20.0%	14.4%

*At these events, we included survey kits in all captains bags distributed at registration.
**56 oral surveys were collected at Atl Bch from boat representatives who agreed to participate upon request, but who did not initiate a paper or text survey. Oral surveys were not included in voluntary participation analyses.

Table 4. Comparison of survey participation rates at the 2010 KMTs.

NC King Mackerel Tournament	2010		Total
	Br Isles	US Open*	
Number of Boats Registered	75	305	380
Total number of Trips	75	606**	681
Number of boats representatives approached at registration that accepted survey packet	45	227 (x2 d)	499
Surveys submitted by boats			
A. Total number of RecText surveys Rec'd	10	64	74
B. Total number Paper surveys Rec'd	N/A	N/A	N/A
C. Total number of Oral surveys collected***	N/A	N/A	N/A
C. Total number of Surveys Rec'd (A + B)	10	64	74
Percent of 2010 surveys that used RexText method = A. / C.	100%	100%	100%
Option 1. Survey participation by total number of trips…			
Percent of trips that participated in data collection = A.+ B. / Total number of trips	13.3%	10.6%	10.9%
Option 2. Survey participation by number of surveys accepted			
Percent of surveys accepted that participated in data collection = A.+ B. / (Number of surveys accepted x 2)	22.2%	14.1%	14.8%

Table 5. Characteristics of fishing trips as reported by volunteer anglers at 6 king mackerel tournaments. Observations are reported as means ± 1 SD. King mackerel = KM.
*U.S. Open format allows boats to weigh-in up to 3 fish per fishing day. Other tournaments surveyed only allow 1 king mackerel per boat per fishing day to be weighed for competition.

KMT Name	2009				2010		Overall
	Got-Em-On	Raleigh	Atl Bch*	US Open*	Br Isles	US Open*	
Number of surveys received	20	14	19	112	10	64	239
Anglers per boat	3.4 ± 1.6	3.5 ± 1.2	3.2 ± 0.9	3.7 ± 1.2	3.4 ± 1.4	3.5 ± 1.2	3.6 ± 1.2
Hours Fished	7.9 ± 1.9	8.6 ± 2.0	8.0 ± 1.3	7.1 ± 1.1	6.8 ± 1.9	6.8 ± 1.5	7.2 ± 1.5
Number of KM kept (including those weighed)	42	19	33	197	9	72	372
Number of KM released	5	8	1	31	2	8	55
KM kept per angler*hour fished	0.09 ± 0.11	0.06 ± 0.09	0.07 ± 0.09	0.07 ± 0.08	0.07 ± 0.10	0.06 ± 0.06	0.07 ± 0.08
KM released per angler*hour fished	0.01 ± 0.03	0.02 ± 0.03	0.00 ± 0.01	0.01 ± 0.04	0.01 ± 0.03	0.01 ± 0.05	0.01 ± 0.04

Table 6. Bycatch reported by volunteer anglers during king mackerel fishing tournaments in 2009 and 2010.

	Responses (trips) from all king mackerel tournaments combined including 56 oral interviews from AB KMT	
Species	Kept	Released
False Albacore	2	6
Barracuda	2	5
Bluefish	25	29
Cobia	5	1
Dolfinfish	28	0
Spanish Mackerel	57	14
Sharks (unclassified)	7	256
Wahoo	5	0
Yellowfin Tuna	1	0
Amberjack	5	42
Groupers (All)	5	0
Other	0	0

Table 7. RecText infrastructure costs associated with each event and the study period.

KMT Name	2009				2010		Total
	GotEmOn	Raleigh	Atl Bch	US Open	Br Isles	US Open	
EZTexting keyword rental ($25 per month)*							18 months $450*
Reminder texts sent – one each fishing day (N x $0.05)				292 ($14.60)	20 ($1.00)	258 ($12.90)	$28.50
RecTexts received from anglers (normal text rates apply)	11	8	18	89	10	64	--
Confirmation receipts / exit survey request to respondents (N x $0.05)	11 ($0.55)	8 ($0.40)	18 ($0.90)	89 ($4.45)	10 ($0.50)	64 ($3.20)	$10.00
Total							$488.50

*www.EZTexting.com keyword accounts (necessary to receive and send messages to cell numbers) can be rented for $25 per month with no contract. For this project, the “REC” keyword was rented and thus reserved for the entire award period (18 months x $25 month = $450) to avoid the possibility of having to reprint literature associated with the project.

Table 8. General results from king mackerel tournaments surveyed by NCDMF in 1992 and 1993. All events were 2 (fishing) day tournaments.

KMT Name	1992			1993
	Raleigh	WB	US Open	US Open
# boats registered	98	362	497	471
# trips per event	196	701	967	928
# and % boats that weighed-in	Not available	231 (33.0%)	233 (24.1%)	205 (22.1%)
# of KM weighed-in by all trips	56	377	431	348
# and % of trips that participated in data collection	68 (34.7%)	106 (15.1%)	80 (8.3%)	43 (4.6%)
Number and % of survey trips not weighing in KM	48 (70.6%)	49 (46.2%)	51 (63.8%)	24 (55.8%)
Number of KM measured by anglers	58	207	129	38
Total number KM kept by anglers	70	257	167	57
Number of released KM reported	0	0	0	0

Figure 1. Text message reporting infrastructure used in this study, adopted from Baker and Oeschger 2009.

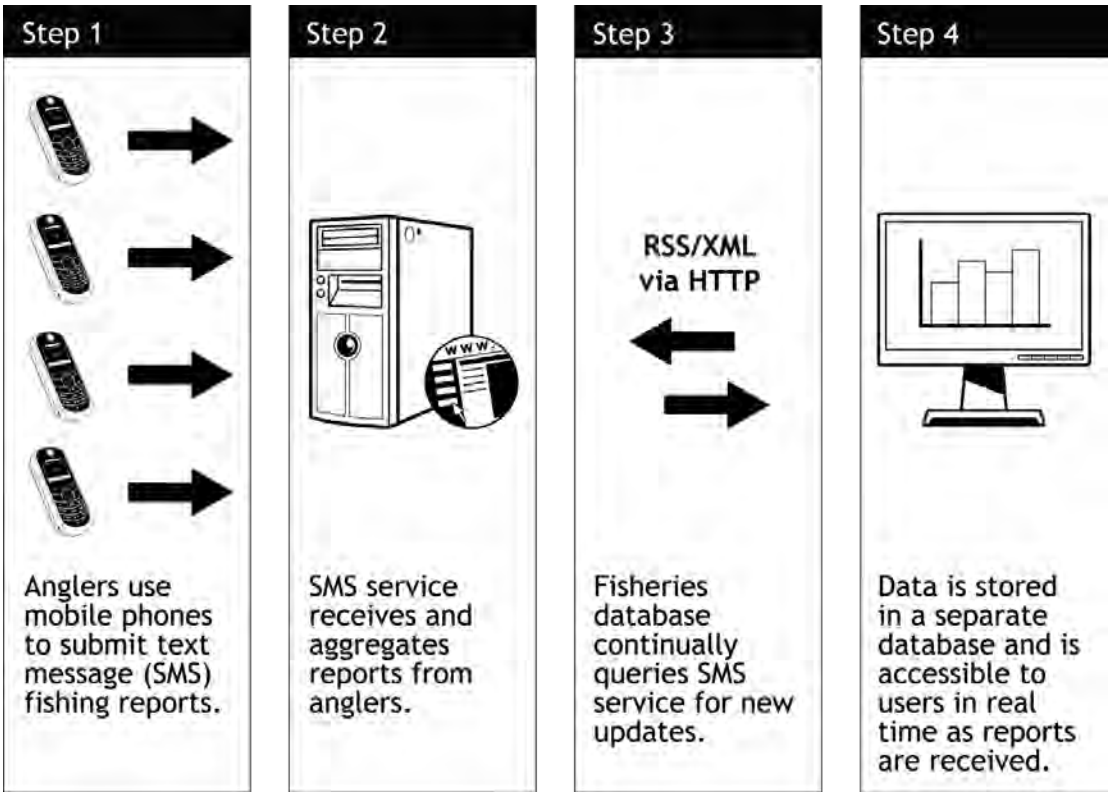
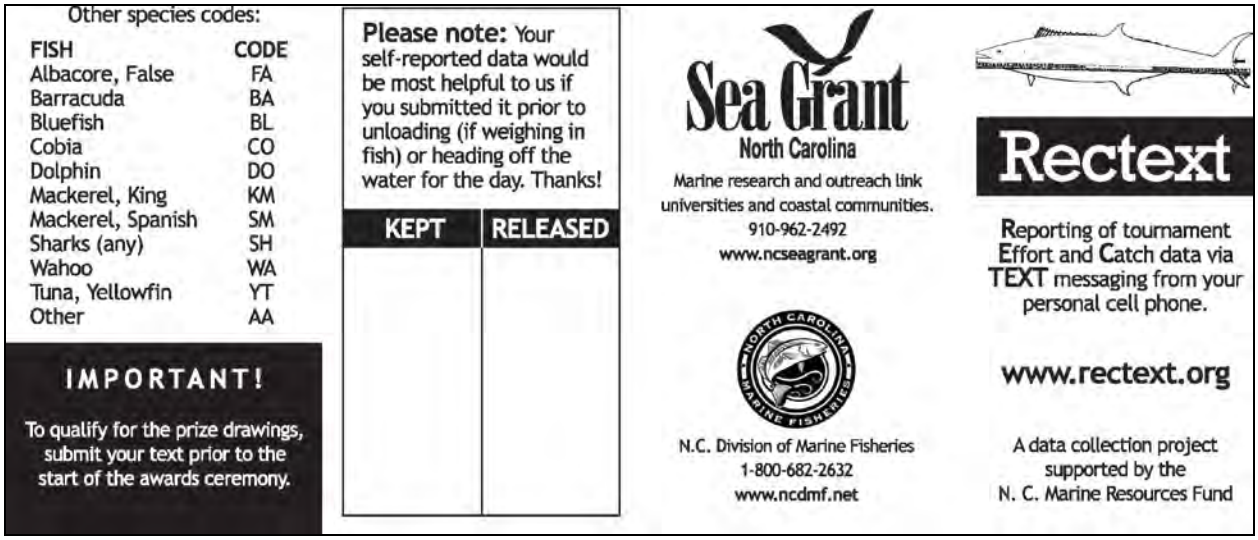


Figure 2. Tri-folding wallet card (printed front and back) instruction sheet developed and given to tournament anglers.

Outside



Other species codes:

FISH	CODE
Albacore, False	FA
Barracuda	BA
Bluefish	BL
Cobia	CO
Dolphin	DO
Mackerel, King	KM
Mackerel, Spanish	SM
Sharks (any)	SH
Wahoo	WA
Tuna, Yellowfin	YT
Other	AA

IMPORTANT!

To qualify for the prize drawings, submit your text prior to the start of the awards ceremony.

Please note: Your self-reported data would be most helpful to us if you submitted it prior to unloading (if weighing in fish) or heading off the water for the day. Thanks!

KEPT	RELEASED

Sea Grant
North Carolina

Marine research and outreach link universities and coastal communities.
910-962-2492
www.ncseagrant.org

N.C. Division of Marine Fisheries
1-800-682-2632
www.ncdmf.net

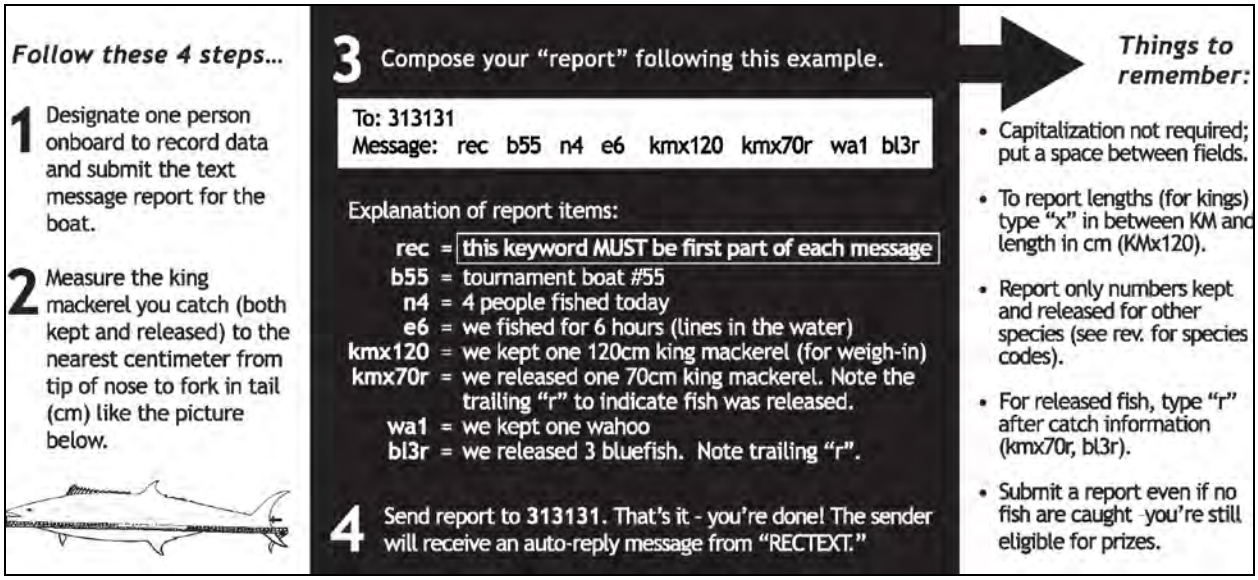
Rectext

Reporting of tournament Effort and Catch data via TEXT messaging from your personal cell phone.

www.rectext.org

A data collection project supported by the N. C. Marine Resources Fund

Inside



Follow these 4 steps...

1 Designate one person onboard to record data and submit the text message report for the boat.

2 Measure the king mackerel you catch (both kept and released) to the nearest centimeter from tip of nose to fork in tail (cm) like the picture below.

3 Compose your "report" following this example.

To: 313131
Message: rec b55 n4 e6 kmx120 kmx70r wa1 bl3r

Explanation of report items:

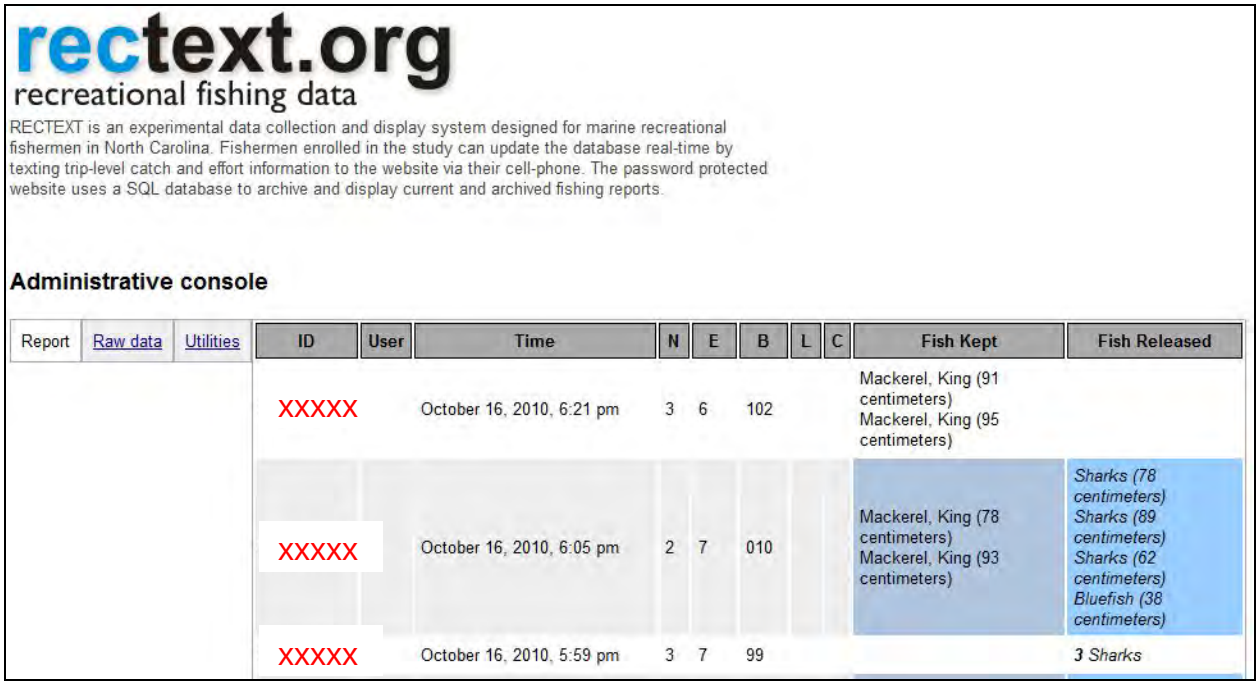
rec = this keyword MUST be first part of each message
b55 = tournament boat #55
n4 = 4 people fished today
e6 = we fished for 6 hours (lines in the water)
kmx120 = we kept one 120cm king mackerel (for weigh-in)
kmx70r = we released one 70cm king mackerel. Note the trailing "r" to indicate fish was released.
wa1 = we kept one wahoo
bl3r = we released 3 bluefish. Note trailing "r".

4 Send report to **313131**. That's it - you're done! The sender will receive an auto-reply message from "RECTEXT."

Things to remember:

- Capitalization not required; put a space between fields.
- To report lengths (for kings) type "x" in between KM and length in cm (KMx120).
- Report only numbers kept and released for other species (see rev. for species codes).
- For released fish, type "r" after catch information (kmx70r, bl3r).
- Submit a report even if no fish are caught -you're still eligible for prizes.

Figure 3. Screenshot of the www.RecText.org database with actual tournament data.



rectext.org

recreational fishing data

RECTEXT is an experimental data collection and display system designed for marine recreational fishermen in North Carolina. Fishermen enrolled in the study can update the database real-time by texting trip-level catch and effort information to the website via their cell-phone. The password protected website uses a SQL database to archive and display current and archived fishing reports.

Administrative console

Report | Raw data | Utilities

ID	User	Time	N	E	B	L	C	Fish Kept	Fish Released
XXXXX		October 16, 2010, 6:21 pm	3	6	102			Mackerel, King (91 centimeters) Mackerel, King (95 centimeters)	
XXXXX		October 16, 2010, 6:05 pm	2	7	010			Mackerel, King (78 centimeters) Mackerel, King (93 centimeters)	*Sharks (78 centimeters)* *Sharks (89 centimeters)* *Sharks (62 centimeters)* *Bluefish (38 centimeters)*
XXXXX		October 16, 2010, 5:59 pm	3	7	99				*3 Sharks*

Figure 4. Paper survey instrument used at 4 tournaments in 2009.

Paper Survey

_____ CB Classic KMT, July 10-12. _____ Raleigh Saltwater KMT, July 31-Aug 2
_____ AB Saltwater Classic KMT, Sept. 17-19 _____ Southport US Open KMT, Oct. 1-3

1. Answer both pages of the survey; 1 survey per boat.
2. Measure every king mackerel you catch, especially the ones entered into KMT.
3. Measure from the tip of the nose to the fork in the tail in centimeters.
4. Even if you do not catch a fish, please complete and return the survey as you're still eligible for the $125 CASH drawing.
5. Please make an effort to complete your survey *on the boat* (if entering fish) so that you can *hand it to us after you have weighed your fish.* Otherwise, return the survey to Sea Grant staff (green shirts) anytime before the start of the awards ceremony and you will still be eligible for the $125 CASH drawing.

Tournament Boat Number _____ **Contact Name** _____

Contact Phone _____ **Email** _____

		Friday	Saturday
1.	Circle each day your boat fished.	1.	
2.	How many people were fishing on your boat?	2.	
3.	How many lines were usually fishing?	3.	
4.	How many hours were the lines in the water?	4.	
5.	Number of king mackerel your boat:		
	(a) entered in the tournament	(a)	
	(b) released that day	(b)	
	(c) kept for personal use that day	(c)	

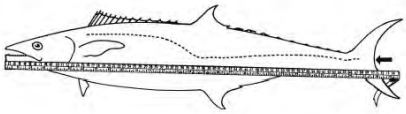
6. We collected data at these tournaments this year. Please check the ones you fished:

_____ East Coast Got-Em-On Classic KMT, July 10-12, 2009.
_____ Raleigh Saltwater Club KMT, July 31 – August 2, 2009.
_____ Atlantic Beach Saltwater Classic KMT, Sept. 17-19, 2009.

7. After the tournament, we will summarize the information reported in this survey. Identifying information will be kept confidential. Would you like to receive a copy of this summary report via the email address you provided above? _____ Yes _____ No

Please record your lengths for each king caught on other side of this page, including the fish that you enter into the tournament!

Page 1 of 2



This king mackerel is 70 centimeters in fork length.

	Friday Lengths (cm)	Saturday Lengths (cm)
(1) Kings entered		
(2) Kings released		
(3) Kings kept for personal or other use		

Please list below the fish you caught **other than king mackerel** during the tournament. Please also list the number and whether kept or released.

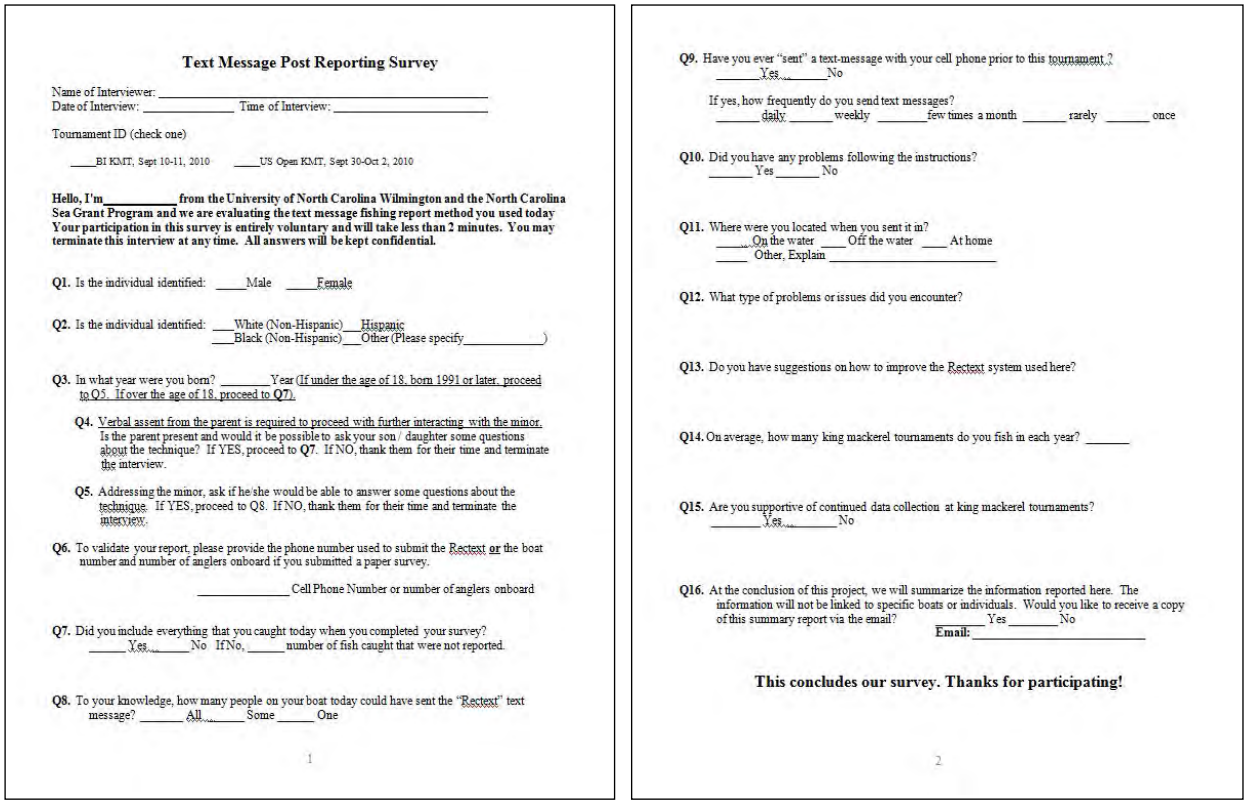
Day	Species	Number	Kept or Released
Friday			
Friday			
Friday			
Saturday			
Saturday			
Saturday			

Please make an effort to hand in your paper survey *when* you enter fish – otherwise hand in anytime before the awards ceremony starts at 7pm Saturday. Look for us (wearing green shirts) as you exit the main tent to return to your boat.

Thank You!

Page 2 of 2

Figure 5. Exit survey used at post data collection at king mackerel tournaments.



Text Message Post Reporting Survey

Name of Interviewer: _____
Date of Interview: _____ Time of Interview: _____

Tournament ID (check one)

____BI KMT, Sept 10-11, 2010 ____US Open KMT, Sept 30-Oct 2, 2010

Hello, I'm_____ from the University of North Carolina Wilmington and the North Carolina Sea Grant Program and we are evaluating the text message fishing report method you used today Your participation in this survey is entirely voluntary and will take less than 2 minutes. You may terminate this interview at any time. All answers will be kept confidential.

Q1. Is the individual identified: _____Male _____Female

Q2. Is the individual identified: ___White (Non-Hispanic) ___Hispanic
___Black (Non-Hispanic) ___Other (Please specify_____)

Q3. In what year were you born? _____Year (If under the age of 18, born 1991 or later, proceed to Q5. If over the age of 18, proceed to **Q7**).

Q4. Verbal assent from the parent is required to proceed with further interacting with the minor. Is the parent present and would it be possible to ask your son / daughter some questions about the technique? If YES, proceed to **Q7**. If NO, thank them for their time and terminate the interview.

Q5. Addressing the minor, ask if he/she would be able to answer some questions about the technique. If YES, proceed to Q8. If NO, thank them for their time and terminate the interview.

Q6. To validate your report, please provide the phone number used to submit the Rectext **or** the boat number and number of anglers onboard if you submitted a paper survey.

_____Cell Phone Number or number of anglers onboard

Q7. Did you include everything that you caught today when you completed your survey?
_____Yes _____No If No, _____number of fish caught that were not reported.

Q8. To your knowledge, how many people on your boat today could have sent the "Rectext" text message? _____All _____Some _____One

1

Q9. Have you ever "sent" a text-message with your cell phone prior to this tournament ?
_____Yes _____No

If yes, how frequently do you send text messages?
_____daily _____weekly _____few times a month _____rarely _____once

Q10. Did you have any problems following the instructions?
_____Yes _____No

Q11. Where were you located when you sent it in?
_____On the water ____Off the water ____At home
_____ Other, Explain _____

Q12. What type of problems or issues did you encounter?

Q13. Do you have suggestions on how to improve the Rectext system used here?

Q14. On average, how many king mackerel tournaments do you fish in each year? _____

Q15. Are you supportive of continued data collection at king mackerel tournaments?
_____Yes _____No

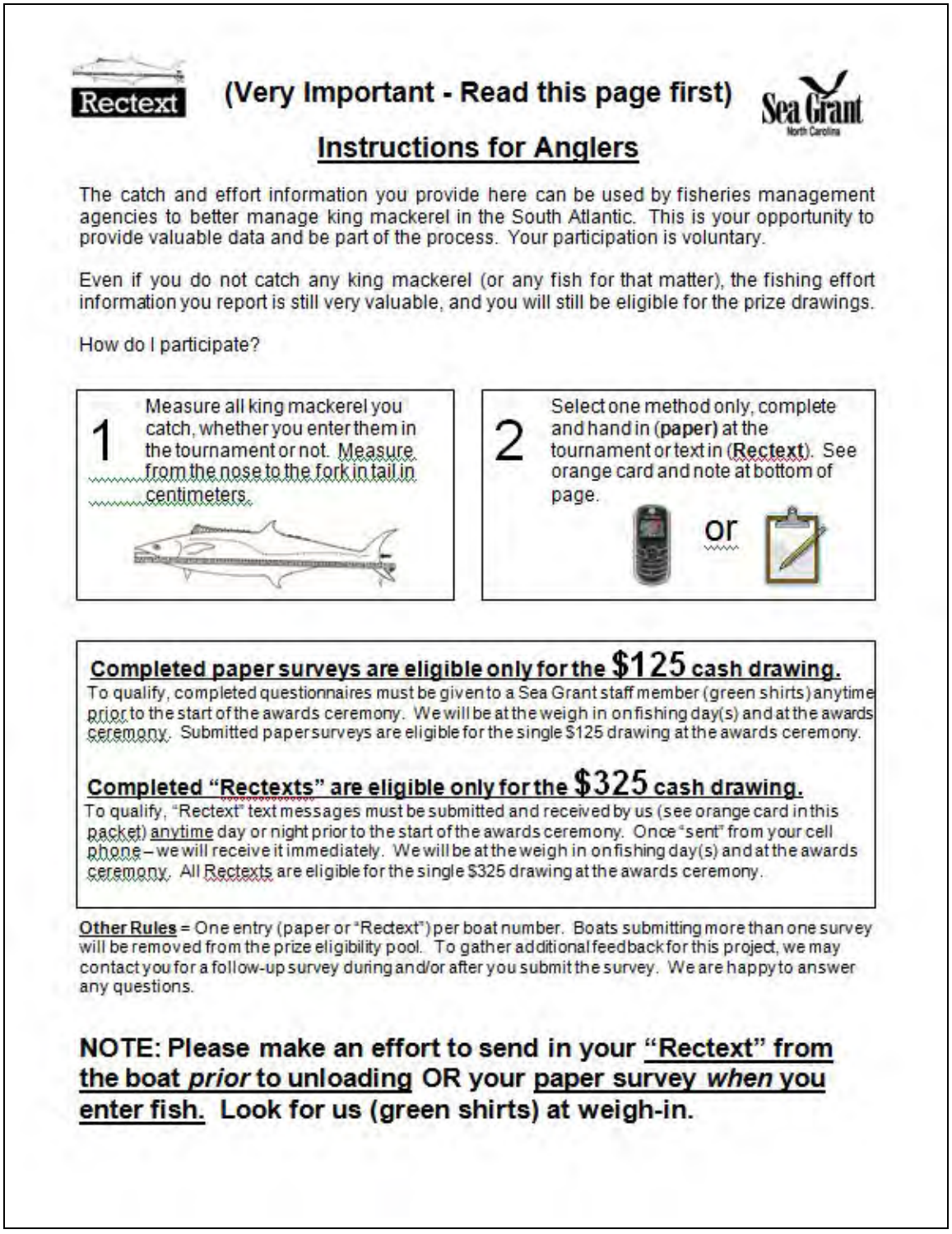
Q16. At the conclusion of this project, we will summarize the information reported here. The information will not be linked to specific boats or individuals. Would you like to receive a copy of this summary report via the email? _____Yes _____No
Email: _____

This concludes our survey. Thanks for participating!

2

Figure 6. Survey kit distributed to anglers. When purchased in bulk, the components for each kit cost a total of $1.25.

Figure 7. 2009 version of the outreach flyer that was included in the survey kit.



Rectext

(Very Important - Read this page first)

Sea Grant North Carolina

Instructions for Anglers

The catch and effort information you provide here can be used by fisheries management agencies to better manage king mackerel in the South Atlantic. This is your opportunity to provide valuable data and be part of the process. Your participation is voluntary.

Even if you do not catch any king mackerel (or any fish for that matter), the fishing effort information you report is still very valuable, and you will still be eligible for the prize drawings.

How do I participate?

1 Measure all king mackerel you catch, whether you enter them in the tournament or not. Measure from the nose to the fork in tail in centimeters.

2 Select one method only, complete and hand in (**paper**) at the tournament or text in (**Rectext**). See orange card and note at bottom of page.

or

Completed paper surveys are eligible only for the $125 cash drawing.
To qualify, completed questionnaires must be given to a Sea Grant staff member (green shirts) anytime prior to the start of the awards ceremony. We will be at the weigh in on fishing day(s) and at the awards ceremony. Submitted paper surveys are eligible for the single $125 drawing at the awards ceremony.

Completed "Rectexts" are eligible only for the $325 cash drawing.
To qualify, "Rectext" text messages must be submitted and received by us (see orange card in this packet) anytime day or night prior to the start of the awards ceremony. Once "sent" from your cell phone – we will receive it immediately. We will be at the weigh in on fishing day(s) and at the awards ceremony. All Rectexts are eligible for the single $325 drawing at the awards ceremony.

Other Rules = One entry (paper or "Rectext") per boat number. Boats submitting more than one survey will be removed from the prize eligibility pool. To gather additional feedback for this project, we may contact you for a follow-up survey during and/or after you submit the survey. We are happy to answer any questions.

NOTE: Please make an effort to send in your "Rectext" from the boat *prior* to unloading OR your paper survey *when* you enter fish. Look for us (green shirts) at weigh-in.

Figure 8. Percentage of trips that submitted surveys but did not weigh-in fish.

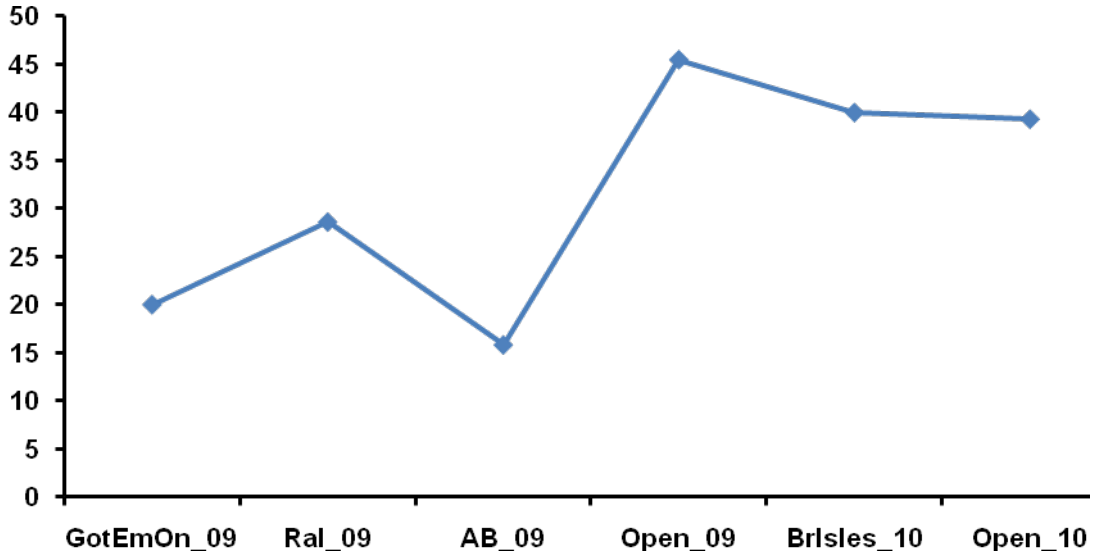


Figure 9. Length frequency of all king mackerel (N=722) weighed-in at 5 tournaments surveyed in this study.

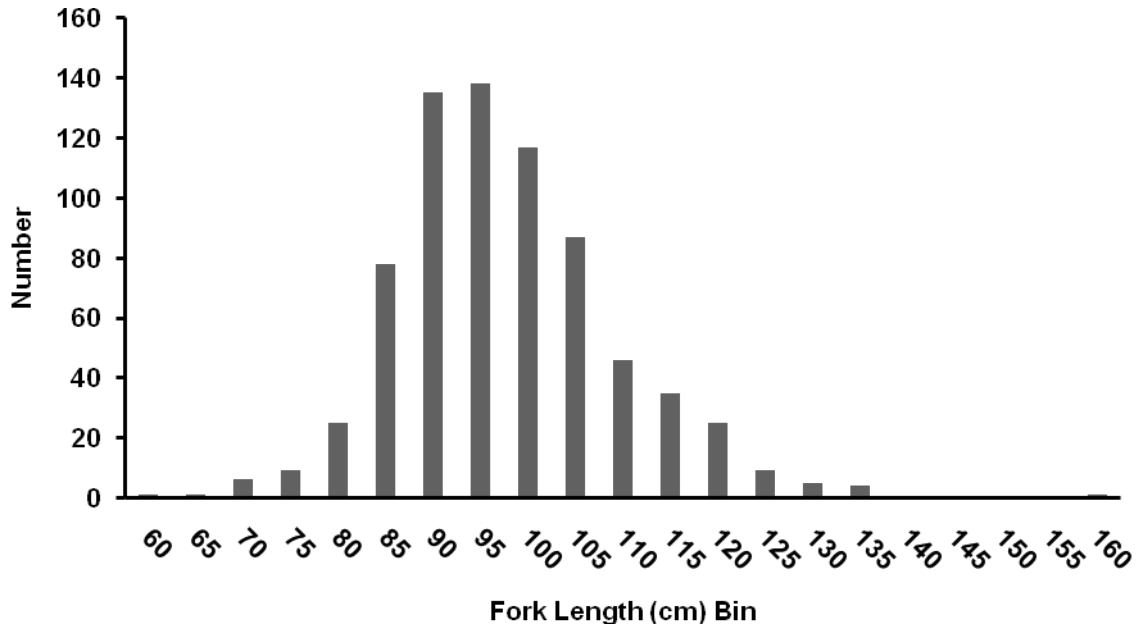


Figure 10. Percent length frequency of kept and released king mackerel as reported by volunteer anglers at five tournaments. Measurements in the “kept” category also include those fish that were entered into tournaments.

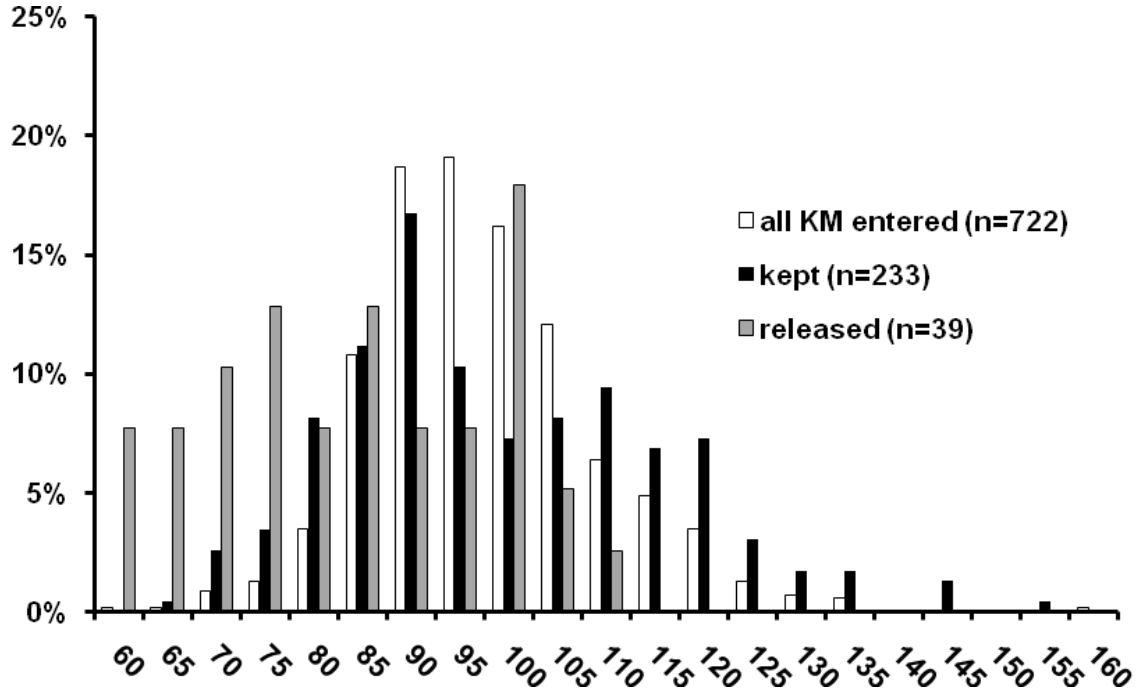


Figure 11. (Top Percent difference of angler reported measurements compared to DMF measurements of same king mackerel taken after weigh-in. All observations, including obvious outliers are included. Sample numbers 1 – 65 represent non-SKA tournament measurements (Open 09, Open 10) and sample numbers 66 – 108 represent SKA tournament measurements (GotEmOn, Raleigh, AB, and BrIsles). (Bottom) Same percent difference data in the same order but with values in ascending sequence to discern differences between SKA and non-SKA events.