Standardization of Missouri Angler Surveys

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Abstract: One component in evaluating the need for or the result of a fishing regulation is an angler survey. In recent years, efforts have advanced the way an individual survey is designed, conducted, and analyzed. However, managing approximately 30–40 on-site angler surveys each year led Missouri to develop and implement stringent data processing guidelines. These guidelines ensure survey objectives are addressed; appropriate survey methodologies are used; clerks are properly trained; survey forms, questions, and coding are standardized; and data entry and analysis results are completed in a timely manner. The standardization techniques used in Missouri and the improvements generated as a result of these guidelines are discussed.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 49:69–77

One component in evaluating the need for or the result of a fishing regulation is an angler survey. In recent years, fisheries professionals have explored the need to conduct statistically sound angler surveys (Malvestuto 1983, Guthrie et al. 1991, Pollock et al. 1994). Four important duties of the researcher conducting an angler survey are: designing a statistically sound survey, designing a survey to address the proposed hypotheses, training clerks properly, and developing a questionnaire with detailed guidelines on how each question is to be asked (Malvestuto 1983, Pollock et al. 1994). To expedite processing of survey questionnaires, new technologies such as machine-readable forms and field recorders have been tested (Hammarstrom 1991, Heineman 1991). All these technological advances and researcher efforts have advanced the way an individual survey is designed, conducted, and analyzed.

In Missouri, approximately 30–40 on-site angler surveys are conducted annually. To ensure that this many surveys can be analyzed in a timely manner, stringent data processing guidelines have been implemented. These guidelines were established in 1992 during a 2-day angler survey workshop given by the Fisheries Biometrics Unit (FBU) of the Missouri Department of Conservation

to biologists interested in angler surveys. Prior to implementing these guidelines, inconsistencies, delays, and errors in survey data existed for the biologist conducting the creel and the FBU. The objective of this paper is to describe the guidelines and forms used in designing, conducting, and processing on-site angler surveys and survey data in Missouri. These guidelines encompass 3 temporal periods: pre-survey, survey collection, and post-survey periods.

The authors acknowledge Martha Tomlin-McCrary and Linda Williams who are responsible for carrying out the survey procedures that follow. We thank all the field and research biologists who have helped make this system work and tolerated all the growing pains from implementing the procedures.

Pre-survey Forms and Procedures

The pre-survey period uses 2 instruments to identify the objectives and the specific design characteristics of each survey. These are the angler survey proposal and the survey parameter form. The angler survey proposal is completed prior to budget approval. The survey parameter form is completed each year prior to the starting date of the survey.[1]

Angler Survey Proposal

This document helps the field biologist identify survey objectives, describe survey characteristics needed to determine the most appropriate sampling design, and outline any limitations in personnel or equipment available to conduct the survey. The completed proposal is approved by the biologist's supervisor and mailed to the FBU. Prior to developing this proposal, there was no standard protocol for designing new surveys. Using this form has several advantages. First, it forces the field biologist and the creel coordinator to discuss survey objectives. Second, better survey designs are developed because the field biologist contributes survey area knowledge and the creel coordinator contributes survey methodology expertise. Third, personnel and costs associated with conducting the survey are considered. Usually, limited funding or personnel time is available for conducting surveys; therefore, discussions about samples per month vs. number of months to sample need to be addressed. For example, in 1995, a survey was designed for a small lake accessed by a single road that circled the lake. This seemingly would have been a perfect place for an access point survey. However, after talking with the field biologist, the creel coordinator decided to conduct a roving survey because more samples with shorter time periods could be conducted and more anglers per sample could be contacted. Also, measuring fish would have been difficult because the clerk would have been stationed approximately 1.6 km from the lake and would be contacting anglers that had already packed up their gear and were leaving the lake. By discussing several survey methodologies, a better design was implemented. Fi-

[1] To receive a copy of any forms or instructions discussed in this paper, contact John S. Stanovick, Missouri Department of Conservation, 1110 South College Avenue, Columbia, MO 65201–5299.

nally, it helps the FBU plan their work load for any given year, thus enabling FBU personnel to shift job duties in heavy survey years.

Survey Parameter Form

The survey parameter form is completed by the field biologist for approved surveys and mailed to the FBU before the start of the survey season. The survey parameter form is more detailed than the new angler survey proposal, and describes survey methodology, daily and yearly sampling regimes, major sport fish caught, existing area regulations, and if any survey-specific questions are being asked. Using this form, the field biologist makes all stratification and probability weighting decisions for the survey year. Stratification and probability weighting procedures are used to select sampling days and generate weekly or monthly estimates. The survey parameter form is generic so information from any survey methodology can be entered. The information is checked for accuracy by the FBU staff and any inconsistencies are discussed with the field biologist. Once this information is approved by the field biologist and the resources analyst, the member of the FBU that is responsible for the day-to-day operation and analysis of angler surveys, the information is entered into a database and checked for data entry errors. This database is brought into the analysis program and estimates are generated based upon the probabilities assigned to each survey.

Using the survey parameter form has several advantages. First, this form is completed before the start of the survey season. Any inconsistent probabilities or stratification procedures are discussed before survey sampling days are picked and data are collected. Prior to implementing this form, inconsistent probabilities were found after analyzing data from the first survey month, thus estimates were not as precise. Second, a written record is kept for each survey which facilitates communication between the field biologist and the resources analyst when questions arise about survey information. Third, this information is entered into the database before the survey season starts which improves turnaround time because the resources analyst can concentrate on running data edit checks and monthly analyses rather than entering survey parameters. Previously, the resources analyst would enter the appropriate survey probabilities as part of the analysis program rather than pulling the information from a database. It took staff longer to set up a particular analysis which had the potential to produce erroneous output if incorrect probabilities were accidentally entered. Obviously, both problems could increase turnaround time.

Survey Collection Forms and Procedures

During the survey collection period, we use a generic creel form and a statewide species-location coding sheet. These forms help standardize and clarify data collection and data entry, thus lowering the number of survey clerk coding errors and providing a common database structure for entering the information.

Generic Creel Form

We have developed a generic creel form that is used for all creel survey interviews, regardless of survey methodology. This form covers 6 survey categories (Table 1). The daily sampling information includes where and when a particular survey is conducted. These variables define which selection probabilities are used from the parameter database to extrapolate daily estimates to weekly or monthly estimates. Environmental data includes information on the weather and water conditions during the sampling period. The angler count box is where the clerk records the times and numbers of various area users when instantaneous counts are conducted for roving surveys. Also, this box is used to record the starting and ending times for access point surveys and the number of interviews that were conducted. The angler information details specific characteristics associated with each angler. The catch information details the number and sizes of each fish species caught by each angler and whether each fish was har-

Table 1. General categories of information and specific questions asked on the generic creel survey form, Missouri Department of Conservation.

Category	Variables	Category description
Daily sampling information	Sample identification number, lake name, survey type and methodology, day of the week, month, day, year, area, site, survey period, clerk's initials	Information collected for a specific sampling day. Includes what area was sampled, what time of day was sampled, where the survey was conducted
Environmental information	Secchi, water temperature, water level, weather	Information collected on the type of weather and water conditions when the sample was conducted
Angler count box	Times instantaneous counts were taken or creel was conducted, number of boat, bank, and pleasure boat people counted	Information collected on the number of boat anglers, bank anglers, and pleasure boaters that were counted during instantaneous counts or contacted during the sampling period
Angler information	Time started and contacted, hours fished, zip code, trip type, race, fishing type, lure type, angling method, angler preference	Information collected on each individual angler contcted
Catch information	Species caught, category (harvested or released), number and length of each fish	Information collected on the species, weights, and lengths of fish caught, whether the fish were harvested or released
Optional information	Variable depending on what information the field biologist needs	Survey-specific information

vested or released. Finally, room for 6 optional questions is provided. Optional questions are used to accommodate any survey-specific attitude or opinion questions. This allows the field biologist flexibility in collecting survey-specific information. Each optional question is formatted to 3 characters to standardize data entry. Along with this form, a detailed instruction book is available to clerks on how to conduct an angler interview. This instruction book helps clerks become accustomed to the order and wording of the questions, provides consistency from one survey to another, and helps reduce the number of potential questions from the clerk. Field biologists use these instructions to train clerks.

Several advantages exist by using a generic interview form. First, there is only 1 form, regardless of methodology. Previously, there was a form for each methodology. Having several forms slowed data entry because several database structures had to be developed and the data entry operator had to switch between database structures for each survey type. A generic form also makes it easier to compare estimates among surveys because all questions were asked and variables were coded and analyzed similarly. Flexibility in analysis remains by allowing the field biologist to request additional outputs besides the standard analysis that is produced; however, these requests are not processed as timely as the regular analyses because additional programming is required. Finally, a generic form requires a clerk to learn only 1 interview protocol. For example, we have had several clerks take another survey position at a different area. In these cases, the field biologist does not have to retrain the clerk on the interview protocol. The training is limited to learning the new creel area and what optional questions are being asked.

Species-Location Coding Sheet

Species and location codes were developed to allow the clerk to enter numeric codes instead of character data. Basically, this sheet lists the numeric codes for all fish species, lakes, and streams where surveys were conducted in the state. We also placed the most frequently used numeric codes in the upper right-hand corner of the generic creel form for quick reference.

There are several advantages to using this sheet. First, numeric coding of variables reduces data entry time and error rate by lowering the number of key stokes and eliminating misspelled words. Second, once the clerk learns frequently used codes, interview time is reduced. This coding scheme allows the clerk to complete an interview every 2–3 minutes depending on the number of optional questions and fish caught. Third, having the complete coding sheet provides the clerk a quick reference sheet should they have any coding questions. Finally, it is easier to add codes and send out coding updates.

Post-survey Forms and Procedures

The post-survey period uses forms and procedures to verify receipt of the completed interview forms and maintain a detailed log of what analyses need

to be run until the survey is finished. The 2 forms used in this period are a verification postcard and a survey tracking form. The verification postcard lets the field biologist know the FBU has received the creel sheets. The survey tracking form is used to track which steps need to be finished for each survey month to be considered complete.

Mailing Procedures and Verification Postcard

Before mailing the completed survey forms to the FBU, the sheets are reviewed for accuracy by the field biologist to ensure the data are collected according to the angler contact guidelines. Completed data sheets are mailed to the resources analyst monthly. This forces the field biologist and resources analyst to keep current with the creel data as it is collected. Monthly sets of data sheets helps keep an even flow of data coming to the FBU and eliminates the data glut at the end of the survey year. Also, monthly review yields quicker turnaround times as a survey progresses because coding errors are detected and emphasized to the creel clerk which eliminates repeated coding errors throughout the survey season.

After receiving the data sheets, the FBU mails a postcard to the field biologist. If the field biologist does not receive the postcard within 2 weeks after mailing in the sheets, it is their responsibility to contact the FBU so the package can be traced. The main advantages to using a verification postcard are to allow any lost data to be quickly recovered and to provide peace of mind that the data are being processed.

Survey Tracking Form and Procedures

A creel check list was developed to track the stages leading up to and including data analysis for each creel survey. This list helps resolve discrepancies between the field biologist and the resources analyst. The list is updated daily and sent out monthly to field biologists and supervisors. Several procedural steps are documented on this tracking form.

—Date received and entered. The dates when the data are received and keyed are entered on the list. As this information is collected, the field biologist can estimate data entry time for future data. Data are usually entered within 3 weeks of the date received.

—Data edit program run. A data edit program is run on each data set to identify common data entry errors. This program finds a large percentage of erroneous data, invalid codes, fish lengths, etc., that would otherwise go undetected until the monthly analysis is run. This program saves computer run time and resources analyst time by eliminating incorrect monthly analyses due to minor data errors.

—Data errors returned to field biologist. The resources analyst sends any data errors to the field biologist for correction. If no errors are detected by the data edit program, the monthly analysis program is run and outputs are sent to the field biologist.

—Data errors corrected. If errors exist, the field biologist makes corrections and sends the resources analyst the hard copy changes. Data corrections are received in writing to ensure proper record keeping and to avoid misinterpretations.

—Analysis program run. Once corrections are made, the monthly analysis program is run, reviewed by the resource analyst, and sent to the field biologist for approval.

—Analysis results accepted. The field biologist either accepts the monthly analysis or sends additional data corrections to be made. Again, this step is done in writing for record keeping purposes. If no additional corrections are made on the printout, the biologist accepts the printout.

This process is repeated for each month the survey is conducted. Several iterations between the field biologist and resources analyst may take place before a monthly printout is approved. After all monthly printouts are approved, an annual summary program is used to summarize data for the entire survey season. Monthly and yearly printouts allow flexibility for the field biologists when reporting survey results.

This tracking form has several advantages. Both the resources analyst and field biologist know the processing stage for each survey. The resources analyst can estimate the time it will take to complete the particular survey. The field biologist can estimate the amount of time they must spend reviewing and correcting data edit and monthly analysis programs and when to expect output. By keeping current with corrections and analyses, the field biologist has time at the end of the survey year to compare the new survey results with results from previous survey years so that management decisions can be made before the next fishing season. Typically, management decisions in Missouri must be evaluated, documented, and submitted to a regulations committee by 1 January. Most surveys conclude at the end of October so it is important that the yearly program be run in November or December. Having the tracking system in place helps a field biologist meet this deadline. Prior to using this form and procedures, survey data and monthly analyses piled up which meant hectic work schedules at the end of the survey year to complete all data analyses and comparisons or postponing management recommendations until the data could be analyzed or the results interpreted. Also, the data edit portion of this tracking system helps reduce the number of coding errors because the field biologist receives a data edit printout after data for the first month are collected. This printout alerts the field biologist to particular questions the clerk is miscoding. For example, one aspect that often causes confusion to a new clerk are catch codes used to designate whether a fish is harvested or released. Depending on area regulations, these codes can be different for each species of fish, time of year the survey is conducted, and survey location. The data edit check allows the field biologist to detect if the clerk is having problems knowing what catch code to use with each fish species; therefore, problems can be corrected before more erroneous data are received. Prior to implementing this data edit check,

data from a whole year might contain the same erroneous codes. This meant additional time to correct these errors. Finally, it is important to know which surveys have been completed. This gives the field biologist and the resources analyst a sense of accomplishment and closure. Prior to the tracking system, requests were made to reanalyze data that was several years old because data errors were found as the field biologist reviewed the analysis.

Discussion

After reviewing all the procedural steps and forms used to conduct angler surveys in Missouri, one may think this system generates excessive bureaucracy and paperwork, and it may for 1 or 2 surveys. However, we have found that developing forms and protocols for each step of the survey process is essential to keeping 30–40 surveys and analyses on schedule. Our system puts a greater burden on the field biologist and resources analyst to keep current with survey data which ensures constant feedback and approval of data printouts during the busy field season. Before these procedures were in place, the field biologist did not know when the data would be entered or analyzed, if the most appropriate survey design was selected, or whether the design had an associated analysis program. Also, the FBU did not receive survey data monthly, had to write analysis programs to fit unusual sampling designs, and never felt a survey was completed at the end of the year. All these problems contributed to inconsistencies, delays, and errors in completing survey analyses. These delays hindered the field biologist from making the best management decisions because all data were not analyzed prior to making regulations decisions, and these errors could actually lead to mismanaging the resource. By incorporating procedures and protocols for the pre-survey, survey-collection, and post-survey periods, we have produced data analyses that the field biologist can use prior to taking management options to the regulations committee.

A disadvantage to procedural standardization is the possibility of reduced flexibility in what questions the field biologist can place on the survey form. However, the generic survey form does allow 6 optional questions to be asked and in the 3 years since implementing this generic form, no field biologist has requested more than 6 optional questions. During the analysis stage, the FBU can provide additional data analysis if requested by the field biologist. However, these requests are processed only when all standard analyses programs and data edit checks are completed.

Although documentation exists to help a new field biologist know what survey responsibilities they have, it is still important to have a survey workshop every 3 or 4 years to teach new field biologists how the survey process works and why it was developed. A centralized clerk training workshop is needed before each survey year. Unfortunately, with the magnitude of surveys and the different survey starting dates throughout the state, centralized training is virtually impossible. We feel training the field biologists correctly means the clerks

they supervise will be trained correctly; however, this has never been evaluated. Also, it is important for FBU personnel to check clerks conducting surveys to ensure they are wording questions appropriately and following all survey guidelines. This type of feedback is an area that needs improvement in our procedural system.

We encourage any state with many angler surveys to implement standardized procedures and guidelines before surveys are implemented, as the data are collected, and as the analyses are performed. We feel other states can benefit from what we have learned even though they may not conduct the volume of surveys Missouri does. These standardization procedures help ensure the data are collected in a consistent manner. This allows better comparisons between surveys because all questions, except for the 6 optional questions, are administered the same way. These procedures increase communications between field biologists and the FBU through monthly discussions in person, in writing, over the phone, and through creel tracking updates. With the high cost of conducting each angler survey, it is imperative the data are collected and analyzed so summaries are produced prior to evaluating management decisions. We feel our system helps meet this objective.

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