

Discussion of Session 2

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Nick Caputi, the session chairperson, opened the session with an introduction to measuring catch and fishing effort. Three panel presentations followed, each with a short question and answer period. Following the concluding paper, the chairperson opened the floor for more general discussion and questions.

In his introduction, Nick Caputi spoke of the difficulties in obtaining recreational fisheries catch and fishing effort information as compared with commercial fisheries information. Much of the difficulty is due to the unregulated nature of recreational fishing. In Western Australia, several methods are employed or will be employed in the near future, to generate information on recreational fishing. These methods include: an Australian salmon and herring creel survey, fisheries officers' creel surveys, Volunteer Fisheries Liaison Officers' creel surveys, anglers' logbooks, mail and phone surveys, Australian Bureau of Statistics population surveys and angling club competition day records. Each of these programmes was detailed with the benefits and potential drawbacks discussed.

Stephen Malvestuto of Fisheries Information Systems, Inc., Auburn, USA, presented information on the estimation of angler

harvest rates for recreational fisheries, using creel surveys. Measuring harvest rate (hpue = the number of fish harvested per hour of fishing,) has been difficult from creel surveys alone. This results from the sampling biases associated with various types of creel surveys. The author made four comments on sampling design: 1) sample at least 50–70% of the days within time blocks, 2) division of survey period into time blocks is important and will improve precision of the estimators, 3) day-type stratification is of little advantage to hpue. Within-day stratification might be optimum for ratio estimators, and 4) optimum allocation of samples across monthly time blocks is difficult because weather and fishing patterns change from year to year.

To Aldo Steffe's question as to whether his data were based on multi-species fisheries, Stephen Malvestuto replied that the data are from a multi-species lake fishery. Colin Buxton asked why the day-type stratification did not improve effort estimates. Stephen Malvestuto explained that while weekday fishing effort is less than weekend fishing effort, there is not a systematic difference. The ratio estimators were not always consistent between weekday and weekend day. Richard Tilzey asked if he

had considered environmental factors such as wind strength and rain. Stephen Malvestuto indicated that he had not measured those variables during the present survey; however, environmental variables should be measured and examined as covariates, as well as characteristics of the anglers. Nick Caputi mentioned stratifying by 'good' vs. 'bad' weather days. Stephen Malvestuto acknowledged that he was interested in this technique, and historic weather information may provide the basis for predicting the number of bad weather days per month.

Jodie Woolcock and Martine Kinloch presented the theory and application of the bus-route sampling method for estimating angler effort. Jodie Woolcock began by describing theoretical aspects of the design, which was developed by Robson and Jones in the USA for large recreational fisheries covering a wide geographic area, with many access sites. The basic design includes an interviewer who travels around the survey area in a predetermined cycle, stopping at fishing access sites along the way. The survey agent waits at each access site for a predetermined amount of time and records the amount of time each trailer is present. This information is used to estimate fishing effort. The survey design can be customised for better results.

Martine Kinloch described the creel survey currently underway in South Australia. The Gulf of St. Vincent has an area of more than 7000 km² and a perimeter of about 500 km with 35 major boat ramps. This large area was subdivided into 4 units, with each bus-route approximately 200 km. The fishing day length and the number of survey days varies by season. The waiting times vary for each bus-route.

Computer simulation of estimates of fishing effort using bus-route formulation were based on 12 000 records and indicated that the method was accurate, precise and unbiased. This research is in the early stages and will continue in the Gulf of St. Vincent through 1994 and commence in Spencer Gulf in 1995.

Murray MacDonald pointed out that there was no way to get precision around estimates unless independently derived. Martine Kinloch replied that we can look at accuracy using computer simulations. In South Australia, surveying was undertaken for a certain number of days within each stratum; if another body of water was to be sampled you could extend the estimates. Stephen Malvestuto inquired whether the short waiting time was a limitation to the adequate collection of data. Martine Kinloch replied that the 1 and 1.5 hour waiting times provided sufficient opportunity to collect information. During the winter months the number of trailers was low, but so was the fishing effort.

The third speaker in the session, Laurie West, addressed customising survey design to suit the information requirements of the survey. He pointed out that recreational fishing surveys stand out as the most difficult type of survey to organise. This is usually due to modest funds, the mobility of fish and anglers, the difficulty of angler recall information and the fact that the survey often has to be designed before the funding is received which makes it difficult to know how much to budget for. To circumvent some of these difficulties, he suggested the following key design components: 1) prioritised output specifications which enable a cost-benefit analysis of research options, 2) desk research including literature searches

and secondary data sets (some may be qualitative and highly seasonal), 3) develop a broad approach and keep your options open when first designing the survey—do not be technique-driven, and 4) initial testing and fine tuning required to validate against output specifications.

General discussion followed the presentations by the panel speakers. Problems and solutions were presented by Dennis Reid, Julian Pepperell and Roland Griffin for three recreational fishing case studies around Australia. The recreational prawn-fishing survey detailed catch and fishing effort in four New South Wales estuaries for three summers between 1991–1994. The problem was the lack of secondary data to identify effort concentrated in time and space. This was a particular problem as it was difficult to get accurate counts from this predominantly night fishery. The solution was to combine field observations, pilot testing and qualitative data to provide a more detailed assessment of the fishery. Game and sportfishing surveys were conducted on the east coast of Australia in 1993–1994 in conjunction with Pepperell Research. The data to be collected included the number of anglers, socio-economic background and attitudinal data. The problem was cost effectiveness in accessing and quantification of non-angling club members from a comparatively rare event fishery. The solution was to develop a tackle shop survey which was placed in shops specialising in game fishing. Interviewers were also enlisted to question anglers at tackle shops. Subscription lists to angling magazines were accessed and some boat ramp studies were conducted. The limitations of the survey design were acceptable. Lastly, Fishcount 1995 is a general population survey being conducted in

the Northern Territory between 1994–1995. The participation rate, catch, fishing effort, expenditure and attitudinal details will be collected from residents and visitors to the Territory. The problem is the geography of the Northern Territory which makes normal creel survey methods and costs prohibitive. Reliable catch and fishing effort data will be required from household survey methods, though difficulties with recall information remain a problem. The solution to the Northern Territory's survey is to develop a multi-faceted design with a second-stage diary system for anglers. This will be a minimal burden to the angler to fill out and will maximise the value of the data for the survey.

Kim McClymont pointed out that you need to explain to anglers what you are doing and impress the need to provide honest answers to catch and effort questions. Training for the interviewers is critical to get the cooperation of the anglers. This sort of training and research has not been traditional in fisheries. Laurie West replied that Kim McClymont was quite right and quipped that we didn't need a Dirty Harry training of field crew.

Dennis Reid asked about the use of fisheries officers for survey work. Can the role of research be separated from enforcement? Nick Caputi answered by stating that research and enforcement roles were separate and that the fisheries officers are on the beaches observing the recreational fishery and the provision of information from the enforcement group to research was not a problem. However information flow in the reverse direction may be a problem. Because the enforcement division in WA is beginning to collect information on the number of officer-angler contacts as a per-

formance criterion, we can not afford to miss the opportunity of collecting additional data. Laurie West added that the fisheries officers' data have proven useful to validate data for the unrecorded sector.

Nick Caputi asked Stephen Malvestuto if computer simulation data could be used to check hpue data. Stephen Malvestuto replied that he had not done this, nor had he seen anyone else check these estimators. Frank Prokop asked Stephen Malvestuto if he had taken into account the fact that hpue estimates include angler-induced mortality of released fish. Stephen Malvestuto replied that was not necessary for crappie because it is a food fish. There is, however, catch and release information for largemouth bass. In tournaments great care is taken to return the fish live and in good condition. This may not be the case with the general angling population and there would be mortality associated with catch and release.

Murray MacDonald enquired whether anyone from the panel could comment on estimates of total catch instead of using hpue estimates. He referred to Bob Kearney's reference to generating estimates of catch by multiplying by other estimators which themselves have error rates. This compounds errors associated with the estimates given that effort may be more variable than catch rates. Wouldn't it be better to improve the precision of the effort estimates? Stephen Malvestuto replied that he gets quite precise estimates of fishing effort, so he is trying to get good rate estimators. The real issue is how to obtain more precise rate estimators and if we can do that we are likely to see better precision on the harvest. Murray MacDonald asked a related question of Martine Kinloch and Jodie Woolcock about the bus-route method.

Here you are generating estimates of effort, but to get to estimates of total harvest you need to multiply those estimates by cpue, with no precision estimate around the effort value. How do you end up with some sort of precision estimate for your harvest value, and does that provide a significant improvement over estimates from roving creel survey method? Martine Kinloch suggested that precision estimates could be generated from the sample data and you have the same kinds of problems for harvest. She did not know how this method would perform compared with the more traditional access point survey, but imagined it would be very much the same for both methods.

Richard Brumley asked Martine Kinloch to comment on the underlying assumption of the bus-route method, that every boat has gone out to fish. Martine Kinloch replied that of course, not all boats are out fishing. The interviewers note whether launched and retrieved boats are recreational or commercial fishers or not fishing, and this is used as a basis to estimate the number of boats fishing. This problem can be magnified if the waiting times at the access points are short.

Ted Loveday asked Stephen Malvestuto who paid for recreational fishing research in the United States? Stephen Malvestuto replied that traditionally there were several avenues for funding including licence sales revenue, and sales tax on fishing gear. The federal government receives this money and reallocates it to the states. The individual states can then appropriate the funds according to their research or educational needs. Some states (e.g. Missouri) have diverted tax revenue from specialty items, like softdrink, to recreational fishing.