Tailoring survey design to information requirements

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Abstract

Apart from studies to collect base-line participation rates, the design of truly cost-effective recreational fisheries surveys is a necessarily complex process. Where catch and effort data are required, conventional population survey methods are largely unsuitable and while on-location creel surveys better address such factors as species identification and recall problems, they represent an inherently more expensive method. In many widespread or less-popular fisheries, such costs can be clearly prohibitive.

However, an exhaustive approach to the design process can often produce alternative designs to maximise data utility from limited research budgets. Often this involves some compromise and occasionally, a study may not be proceeded with. But in all cases, such decisions should be made after a balanced review of data requirements, research options and available information.

Literature reviews, secondary datasets and pilot-testing are key components here. Qualitative information can also assist in determining sampling stratification factors and intensity—especially where innovative methodologies are concerned. Yet, operational factors such as staff recruitment, workload structures and travel options must also be considered in a total design approach.

Catch and effort data are essential prerequisites for fisheries research and management. Economic assessments and attitudinal data are also important. Typically, these data are more readily obtained for the commercial components of a fishery, due mainly to the substantially smaller and more accessible target audiences involved. (Note: when compared with research in many other disciplines, most commercial fisheries data collection is extremely inexpensive).

In the past, the comparatively high cost of recreational fisheries research together with modest budgets, have understandably resulted in a lack of detailed information for this sector—and therefore on a *total fishery* basis in many cases. As resource sharing and other management issues increasingly emerge over time, so does the need for *total fishery* data and therefore, more cost-effective research methodologies for the recreational sector.

Although 'screening' surveys of the general population can readily provide data such as participation rates, species targeting and broad measures of effort, more detailed information necessitates the use of more sophisticated research instruments.

On-location creel surveys are undoubtedly the preferred method where detailed catch and effort data are required, especially for precise species identification and size data. Respondent recall problems, response bias and other factors associated with *non-sample error* are also minimised.

Yet, as the focus of a potential study broadens in terms of time and space, the comparatively high component costs of creel survey fieldwork impact significantly on overall cost-effectiveness. The use of more efficient field methods (such as aerial head-counting of large/inaccessible areas) and careful stratification and refinement of sampling frames can offset these effects to some extent. However, in many widespread or less popular fisheries, these costs often remain prohibitive.

In the development of any innovative research methodology, a *total design* approach is clearly needed to achieve optimum cost-effectiveness and in many cases, the resource requirements of a rigorous development phase may seem excessive. Yet, invariably the value of this investment is realised in ultimate data utility and especially so, where large fieldwork budgets are involved in the survey proper. (Note: 'comparability breaks' can result from even minor modification to a research instrument after commencement of enumeration and are often the direct result of inadequate development work).

Although a sometimes tedious process, adherence to the following design strategy will optimise cost-effectiveness from any survey design:

Key design components

Initial output specification: having defined the study objectives, a more detailed list of potential data elements is then prioritised in terms of e.g: (1) essential; (2) highly desirable; and (3) desirable, if little or no additional cost is involved. Such priorities should also be attached to relevant cross-tabulation/disaggregation requirements to assist with later sampling frame development. However, where possible, methodological options should not be considered at this stage (i.e. to avoid being 'technique-driven').

Desk research: conduct literature searches and identify/review appropriate secondary datasets (principally for benchmarking/validation purposes). Where appropriate, explore methods employed in other subject matters for similar assessment purposes. Explore/conduct initial qualitative assessments to establish relevant hypotheses (e.g. discussions with various local 'experts' regarding effort concentrations in time and space).

Initial design: develop broad methodology options and review in terms of cost/benefit and output specifications. Select preferred option (sometimes after brief field testing) and apply a *total design* approach, including: staff recruitment, training and management; field and office quality controls systems; and data processing/analysis procedures.

Initial pilot-testing: conduct initial testing as appropriate, including: questionnaire length, comprehension and ambiguities; *sample-take* and field resource assessment; and operational/logistics problems. Maximise validation work in terms of 'ground truthing' new methods and hypotheses—especially from any qualitative work relevant to that particular season.

Re-design and further testing: review testing results and modify design as appropriate. Except for minor amendments, conduct appropriate re-testing. Validate design against output specifications and if necessary, conduct full 'dress rehearsal' testing before committing to enumeration. (Note: with many innovative survey designs, it is only at this stage that precise funding requirements can be determined for the study. The adoption of a two-stage approach to the development and implementation phases can therefore obviate many problems here, including extreme cases where a suitable methodology may not emerge from the development process and the study is to be discontinued).

Even in cases where a study is merely being repeated to measure change over time (e.g. a repeat creel survey of a particular estuary), certain elements within the above process are important. For example, options often exist in terms of sampling structure and intensity (e.g. 'peak' *vs.* full seasonal comparability; total harvest estimates *vs.* cpue comparisons only). Cost/benefit analysis of output options is therefore an important component of every survey design.

The following examples provide a brief summary of the design challenges and resultant solutions for three different recreational fisheries research projects:

Example 1: Game and sportfishing survey

East coast of Australia 1993/94—in conjunction with Pepperell Research & Consulting, to obtain data on total angler numbers, targeting, socio-economic and attitudinal data

Design Problem: cost-effective accessing and quantification of *non-club* members, from a comparatively rare-event fishery. (Note: no difficulties existed in terms of club members here.) Use of (otherwise) preferred 'screening' methods was cost-prohibitive, e.g. surveys of general population or boat registrations.

Solution: preliminary 'screening' surveys of: customers in known game/sportfishing tackle shops; subscribers to fishing magazines/mail order catalogues for game/sportfishing tackle; and some boat ramp studies to provide ratio of club member to non-club member anglers, and sampling source for the survey proper.

Example 2: Recreational prawning survey

Four coastal lakes—1991/94 for NSW Fisheries Research Institute, to obtain detailed catch and effort information, including size frequency data

Design Problem: as a first-of-its-kind study internationally, no literature or previous methodologies available to assist with design. Also no empirical secondary data available e.g. to identify effort concentrations in time and space. Night vision problems cause comparatively slow head-counting—especially on large expanses of 'open' water. Need to maximise field resource usage.

Solution: extensive qualitative research (interviews with local tackle shops, fishing inspectors, commercial operators and recreational prawners) enabled firm hypotheses to be formed for each estuary in terms of effort concentrations in time and space—especially regarding seasonal changes. Subsequent field observation and pilot-testing strongly confirmed these hypotheses (for that time of year), enabling confidence in hypotheses for other times. Substantial effort concentrations allowed for frequent count/ interview runs of very small survey areas on each estuary, without expense of military-grade night vision equipment. Less frequent 'whole estuary' count runs consistently confirmed effort coverage levels of virtually 100% on each estuary.

Example 3: Fishcount 95

General population survey—Northern Territory 1994/96, to obtain participation rates, catch, effort, expenditure and attitudinal data—for both residents and visitors

Design Problem: logistics of NT render conventional creel surveys cost-prohibitive. Reliable catch, effort and expenditure data needed from household-based survey method, covering the range of recreational fishing activities and seasons. Necessary compromises, such as lack of size frequency data, to be accounted for through other, parallel research.

Solution: multi-faceted design developed and tested with second-stage diary system for anglers. Combination of telephone and face-to-face interviewing techniques employed, using a monthly 'wave' sampling system covering a full twelve month period. Drawing on methods used successfully in other disciplines (e.g transport and household expenditure surveys), the diary system focuses on absolutely minimal respondent burden, by maximising the role/responsibilities of the interviewer. Through a range of additional research modules and validation work (e.g. parallel creel surveys of selected areas), utility and validity of data will be cost-effectively maximised. For the first time, *total fishery* data will be available for an extensive range of fisheries in the Territory. (Note: as at March 1995, five monthly 'waves' of enumeration have been completed with response rates in excess of 90% already achieved).

Conclusion

An exhaustive approach to the design of any recreational fisheries survey is critical to overall cost-effectiveness. In monetary terms alone, any resultant increases in development costs are offset by efficiencies gained in the implementation phase—especially where innovative designs and larger fieldwork budgets are involved. Even in the simplest 'repeat' survey, a brief cost/benefit analysis of sampling options will optimise outcomes from a limited research budget.

Detailed output specifications are a vital first step to the design process, as is a rigorous but 'open-minded' approach to identifying relevant secondary datasets, qualitative information and methodological options.

Particularly where innovative methods are concerned, a *total design* approach is critical to ensuring that all components of the design (including field management and quality control systems) are carefully integrated and tailored to specific needs. Comprehensive pilot-testing is also important to validate new methods, test hypotheses and provide accurate resource requirements for the study proper. Further to this, a planned two-stage approach to the design and implementation phases can obviate difficulties with advance budget estimation and funding.

By thoroughly tailoring a study design, true cost-effectiveness will be achieved. In many cases, the benefits are substantial—not just in terms of absolute cost minimisation, but importantly through improved data quality and utility.