

# Independent Scientific Advisory Board

for the Council, Columbia River Basin Indian Tribes, and NOAA Fisheries

## Independent Scientific Review Panel

for the Northwest Power and Conservation Council; 851 SW 6<sup>th</sup> Avenue, Suite 1100; Portland, Oregon 97204

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**Memorandum (ISAB&ISRP 2007-5)**

**September 28, 2007**

**To:** Tom Karier, Chair, Northwest Power and Conservation Council  
Olney Patt, Jr., Executive Director, Columbia River Inter-Tribal Fish Commission  
Usha Varanasi, Science Director, NOAA-Fisheries Northwest Fisheries Science Center, and Bob Lohn, Regional Administrator, National Marine Fisheries Service, Northwest Region

**From:** Nancy Huntly, ISAB Chair, and Eric Loudenslager, ISRP Chair

**Subject:** Review of the Salmonid Field Protocols Handbook

### **I. Review Background and Questions**

On April 18th, 2007, the Council asked the ISAB and ISRP to determine whether the Salmonid Field Protocols Handbook furthers the Fish and Wildlife Program's goal of developing an effective regional monitoring and evaluation plan by establishing standard protocols for collecting salmonid population and habitat data. The Handbook was assembled under the aegis of several agencies and institutions and has been published by the American Fisheries Society.

It is our understanding that the Council was asking not for an in-depth review of the Handbook – it has already been peer reviewed – but rather only a review of the Handbook's general applicability to the Council's program.

The Handbook provides a compilation of recommended field protocols for monitoring and collecting fish population data. It is intended to be a reference guide that offers the potential for some standardization of methods and aid to the training of aquatic scientists and technicians. A primary goal is that, if used, the protocols will improve the accuracy and utility of aquatic data sets.

The Council asked the following specific questions to guide the review:

1. Will the use of these protocols significantly improve the accuracy and utility of aquatic data sets?
2. How will these protocols build on current data? Will we be able to maintain the value of our past data sets?

3. Are these protocols practical - will they be more costly or take more time?
4. One value of a standardized protocol is to be able to aggregate data. Will these protocols make aggregating data easier?

The Handbook itself was not intended to answer these specific questions and does not attempt to do so in any direct way.

## **II. General ISAB and ISRP Comments and Recommendations**

The ISRP and ISAB have on numerous occasions recommended that the Fish and Wildlife Program needed coordinated and cooperative monitoring programs to evaluate the trends and changes in habitats (tributary and mainstem) and the status and trends of naturally produced salmonids. One of the elements of an effective monitoring program is the application of common/standardized protocols for (1) selection of study sites in the field, (2) different methods for collection of samples or data, and (3) common formats for storage of electronic data. Ideally, the approved or agreed upon protocols would be available in one document or Handbook.

This Handbook begins to fill that important void. It is a compendium of useful advice and bibliographies reflecting the practical experience with these methods of the large number of persons who contributed to it. Numerous specific protocols are described, facilitating their study, refinement, and, where appropriate, adoption by appropriate agencies, research groups, and projects. Descriptions of protocols are quite variable in coverage of their respective topics, both in depth and breadth.

Though we were not asked to provide an in-depth review, we do offer an abundance of commentary, both general and specific, on the Handbook. We believe that will be more constructive and useful than merely offering a “broad brush” overall evaluation of the entire Handbook. Our specific comments and references are provided in an appendix to this memo that is available at [www.nwcouncil.org/library/isab/isabisrp2007-5.htm](http://www.nwcouncil.org/library/isab/isabisrp2007-5.htm).

### **A. The Four Questions**

The short answers to the four questions posed to the ISAB and ISRP are:

*1. Will the use of these protocols significantly improve the accuracy and utility of aquatic data sets?*

The “accuracy and utility of aquatic data sets” will be improved slightly in the short run, and potentially appreciably in the long term, if the Handbook recommendations are refined and incorporated into project planning. This tempered appraisal is less a consequence of the quality of the Handbook than it is of the monumental nature of the task undertaken – increased standardization of multiple methodologies across numerous agencies, research groups, and types of projects.

The protocols are general and provide descriptions of the various methodologies and could be useful for those who will employ one or more of these methods. For field scientists already using

a method, the manual will have limited use.

Even for its core subject matter of capture and counting methodologies, the Handbook does not recommend a preferred technique, or set of them, for estimating any particular parameter. Rather it provides a list of multiple techniques that could be employed to estimate various aspects of population status. The method selected and the manner in which it is implemented will have to be matched to the objectives and the logistical and financial constraints of a particular project. Each technique has advantages and disadvantages relative to the others, just as will different approaches to study designs and the data analyses. Therefore, there will continue to be a considerable amount of variation in the methods being employed across the region, even if this volume is designated as the regional standard.

*2. How will these protocols build on current data? Will we be able to maintain the value of our past data sets?*

Most of the general protocols are practical, have been used successfully for many years, and thus represent continuation of current practice. Future and past data sets will likely remain comparable for a specific study or project, but comparability of data from studies conducted by different agencies or research groups will still often be problematic.

The protocols that suggest a change in sampling design to improve the accuracy and utility of future aquatic data will need special strategies to maintain the value of previously collected data.

*3. Are these protocols practical - will they be more costly or take more time?*

Most protocols continue current practice so their practicality, cost, and time demands have not changed. Some such as hydroacoustics or aerial counts are more expensive than others. No new methods are proposed that would be more costly.

If the Handbook encourages users to improve sampling designs, then cost and time demands may be higher or lower, but the expectation is that the utility of the data would improve. Similarly, improvements will result if the descriptions and recommendations relating to use of different types of field gear lead to greater care and more standardized use of such gear.

*4. One value of a standardized protocol is to be able to aggregate data. Will these protocols make aggregating data easier?*

The protocols again do not specify common sampling designs or common metrics or reporting procedures that facilitate data aggregation among different surveys or agencies. Many of the methods are used to answer specific questions and would be difficult to standardize. However, those commonly used to assess salmonid abundance are more amenable to reasonable aggregation of data among studies and agencies. For these, the ISAB encourages the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) and other agencies to conduct comparative studies across protocols to allow inter-calibration and integration of data. Aggregation of data would be especially useful for those methods that are commonly used to assess salmonid abundance, such as redd and carcass counts; spawning and snorkeling surveys; and weir counts.

Common designs that consider sampling variability and use EMAP protocols are recommended for each of these common methodologies.

Adoption of common, standardized protocols will eliminate one barrier to aggregating data. Other barriers such as incompatible data storage, lack of communication among practitioners, and inconsistent sampling designs may still make data aggregation difficult. These barriers can be overcome. For example if new sampling designs are implemented, such as the Generalized Random Tessellation Stratified (GRTS) design, then aggregating data resulting from application of a technique presented in the Handbook may be easier.

## **B. Capture/Counting Techniques versus Study Design and Data Analysis**

The focus of the compendium is on field methods for capturing and counting fish. That seems proper and necessary. Given the great variety of studies that use these methods, it would be impossible to try to offer any guidelines on study design much more specific than those in the excellent early chapter on “The Role of Sample Surveys.” In addition to giving a clear, concise introduction to the topic, this chapter also guides the reader to the most useful technical treatises on the topic.

The same applies to data analysis. The authors were wise in not attempting a summary chapter on this topic. The topic is too broad to be amenable to useful treatment in a compendium such as this. There might be value, however, in a very general chapter on data analysis that does three things. One would be to present a judicious assessment identifying the best available treatises on statistical analysis. A second function of such a chapter could be to summarize the most common statistical errors made by fishery biologists; e.g., fixing alpha, the probability of a type I error. A third function could be to guide the reader to the best literature on the graphical presentation of results, a critically important topic but one ignored by most statistics texts.

## **C. Mark-Recapture Methods**

As most of the field methods described are employed in the study of salmonid population dynamics and as various types of mark-recapture methods are commonly used in such studies, a separate chapter on the statistical principles of mark-recapture methodologies would be an important addition to the early part of the volume.

The method of attaching tags to fish or marking them has been used for over a century. Petersen (1896) used marked fish to compute the rate of exploitation and the population size of fish in enclosed bodies of water. According to Ricker (1958; see also Ricker 1975), the main estimates that can be obtained for mark/recapture studies are:

1. the rate of exploitation of a population
2. the size of the population
3. the survival rate from one interval to the next
4. the rate of recruitment to a population.

Censuses to assess these factors can be either from a single census or multiple censuses, and protocols for making these estimates are described by Jolly (1965), Seber (1965), and Cormack

(1969). For all, data are needed on the number of fish marked, the sample size for the census, and the number or recaptured fish in the sample. Assumptions are made about loss of marks or tags; mortality rates of marked and unmarked fish between tagging and recovery; distribution and movement of marked and unmarked fish; recognition of marks; and amount of recruitment to the population over the time recoveries are made. These assumptions may vary among age or size groups of fish (see Ricker 1958, 1975, for complete explanations and examples from fisheries). A review of the capture and recapture models for estimating the demographics of fish populations is provided by Pollock (1991) and should be included in this section of the Handbook.

Several chapters in the Handbook on particular types of gear make use of how that gear can be employed in mark-recapture studies and also provide some commentary on the statistical principles and assumptions underlying the method. Unfortunately, in several cases the assumptions are imprecisely stated (see Appendix for specific instances), as is the case in many other manuals and textbooks as well.

Providing a single chapter at the beginning of the Handbook summarizing the assumptions and calculations of mark-recapture methodologies seems a better approach. The separate chapters focusing on field methods would then not have to repeat any of these basics. Where appropriate, they could focus instead entirely on how the particular gear under discussion is best employed in the field to minimize the likelihood of large violations of mark-recapture assumptions.

#### **D. Additional Methods for Next Edition**

Several methodologies are not included in the Handbook that have application in the Columbia River Basin. These include capture methods such as trawling (e.g., Kodiak, two boat, etc.), purse seining (deep and shallow), and the portable beach.

Also, major portions of the Fish and Wildlife Program use mark-recapture information to assess status and trends of hatchery and wild salmonids (e.g., SARs, mainstem survival estimates, in-river/transport comparisons, travel time estimates, etc.). Many types of tags (PIT tags, radio tags, acoustic tags, etc.) are used to make these estimates. A chapter describing the nature of, and protocols for, these different tags would be valuable. Fish tagging has also been an important tool in the study of salmonid migration routes. That topic could also be treated in this chapter, or it could be treated in a chapter of its own.

#### **E. Translation: Now or Later?**

We have been informed that the Handbook is scheduled to be translated into other languages. PNAMP may wish to consider whether that translation would be better done after a revised edition is produced that responds to some of the suggestions and critiques offered here.