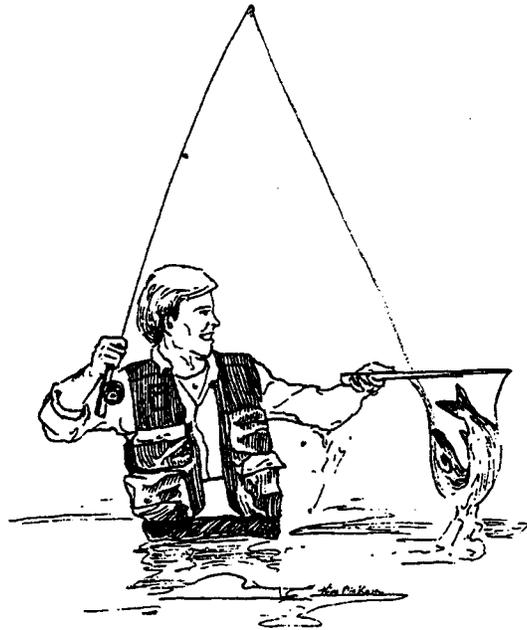




FORMAT AND STYLE GUIDELINES

For Preparation of Fishery Technical Reports



Bureau of Fisheries

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INTRODUCTION

The following guidelines for the preparation and publication of fisheries research, management, and hatchery reports have been prepared for authors and clerical personnel. These guidelines will provide a more uniform reporting of projects and enhance the quality of those reports.

ORGANIZATION

The Idaho Department of Fish and Game urges research, management, and hatchery personnel to prepare reports to conform with standards of correct biological writing and style. The author will use the Council of Biological Editors style Manual and the North American Journal of Fisheries Management style for style and format.

Report Divisions

The major divisions and sequence of the report are as follows:

1. Cover or Title Page
2. Table of Contents
3. List of Tables
4. List of Figures
5. Abstract
6. Introduction
7. Objectives
8. Description of Study Area (optional)
9. Methods
10. Results
11. Discussion
12. Recommendations
13. Acknowledgements
14. Literature Cited
15. Appendices

Management and hatchery reports might not follow this sequence exactly. For example, management reports might repeat divisions 7 through 12 if they are reporting on two or more drainages or lakes in a section of their report. Hatchery personnel might not report on every division depending on what their hatchery did during the year. There is also a separate "Brood Year Report Outline" for anadromous hatcheries to follow when doing their reports.

Cover or Title Page

The title of your report indicates the subject of your research/project rather than its results. The title will usually be the same as formally established in contract documents. The authors' name must appear in full and be followed by the position title (Appendix A). The date shown is the date of publication. Most research and hatchery reports have 3x5-inch photos on the cover. Submit a slide, print, etc. with your report and we will have it processed to look and fit right on the cover. Any cooperator's logo, such as Idaho Power Company, is placed in the upper right hand corner. Cover pages will be different depending on whether they are research, management, or hatchery reports.

Table of Contents

The Table of Contents include major headings and all subheadings in outline form and the pages on which they begin. The Table of Contents is double spaced, but it is permissible to single space subheadings.

Leader lines (spaced periods) from heading to page numbers are set every third space and aligned vertically and horizontally. Headings in the Table of Contents must appear exactly as in the text.

List of Tables

The List of Tables follows the Table of Contents. All tables are listed consecutively, with pagination, and table titles are worded exactly as in the text.

LIST OF TABLES		<u>Page</u>
Table 1.	Water chemistry parameters for Big Springs Creek (Bjornn 1966) and Bear Valley Creek (Gibson 1970)	8
Table 2.	Numbers of each species of fish removed from a 2.5 km section of Big Springs Creek by electrofishing during 1976	12

List of Figures

List of Figures is formatted as the List of Tables, with consistent wording between the text and the list, and listed with consecutive numbers and pagination. Include all line drawings, graphs, photographs, and illustrations.

Abstract

The Abstract is a summary of the results, interpretation, and conclusions of your research/project and is to be complete in itself, without reference to the text or to the literature. The Abstract is on a separate page from the rest of the report. The author's name and title follow the Abstract (Appendix B).

Introduction

The Introduction briefly establishes the general objectives and significance of your study. State your hypotheses or clearly define the problems your research was designed to study. Explain the reasons for the research and point out the timeliness and scope of the study. The Introduction is not the place to convince the reader your study is important.

The Introduction should be long enough to thoroughly acquaint the reader with the nature and extent of your study, but not so long that it rewrites the entire history of your topic. Acquaint the reader with previous research conducted on the subject of your report, but avoid a lengthy review of the literature. Review only those publications that are most relevant to your study and that are necessary to familiarize the reader with the discussion that follows. A comprehensive literature survey may be deferred to the Discussion Section, if appropriate.

Any misleading conclusions or errors you discover in the literature review that affect your study should be discussed in detail. All quoted materials must be accurately transcribed and cited. Whether you paraphrase material or quote an author directly, literary ethics require that you give credit to the source of information.

Study Site

You may include a detailed description of your study site, but limit your discussion to that information needed to understand and interpret your results. Maps can be useful in some cases, especially "staged" maps which sequentially take the reader from a very general location to a small localized area.

Objectives

Objectives are specific and written clearly and concisely. One sentence usually is sufficient to describe an objective. Objective statements will usually start with the word "to," plus an action verb.

Methods

Methods and Results follow the same outline form. The procedures you used to gather information are clearly explained. Be brief, but include enough detail so that another researcher could duplicate your experiment. This means describing your methods, equipment, and instruments used and exact procedures. For example, tell how you assessed population abundance--explain the specifics of your techniques. It is often helpful to display complex or detailed equipment in a figure. If your procedures have been well documented elsewhere, or are commonly used in research, it is usually sufficient to cite a few relevant and current sources in the literature. Include any comments you feel are necessary for clarification if your methods deviate from published procedures or if your techniques are new or unique. The Methods Section should focus on the subject matter of your research and be followed logically in the Results.

Results

This section includes only the results obtained from your research. Include only the data pertinent to your research and report the most important results first. (Tabular material too lengthy for the text can be included in the Appendices.) Present your results in a logical, sequential order to accept or reject your hypothesis. Do not use exhaustive prose to explain something that can be presented clearly and simply in a table or figure--an imaginative figure and a few supportive statements are usually easier to construct and to understand. Present the data that validate methods used in the study in the Methods Section, not in the Results Section, if the validation was an incidental product of the study, not its major object.

Although long lists of raw data are undesirable, basic data should not be pre-refined to the degree that a reader can neither verify the analysis nor use the information for other purposes. Statistical testing is an important part of some analysis but should not obscure biological insight. Although most scientific decisions are based on statistical probability of error of 5% or less, there are no requirements regarding significance levels.

Discussion

The Discussion Section can be the most important part of your report. The strongest discussions are true essays that materially advance the science of fishery management. Use this section to interpret and comment on your data, i.e., what does it all mean? Discuss the most important aspects first. Point out any relationships between your findings and those of other authors. If other research results disagree with yours, discuss the differences and possible reasons. Point out the significant aspects of your findings and any logical implications for future research.

Your discussion should synthesize previous work with your research to help support basic principles in your respective field. Be concise in your presentation; beware of redundancy, excessive wordiness, and unsubstantiated speculation.

Recommendations

List recommendations for fishery management actions or approaches that are indicated by your work. Do not use Recommendations as a self-serving justification for further research. Recommendations may be covered in the Discussion Section but should be listed separately for ease of use.

Acknowledgements

Acknowledgements should identify those persons and agencies who helped you directly in research or report preparation.

Literature Cited

Only those references cited in the text may be included in the Literature Cited Section, including all sources quoted directly or indirectly. References to unpublished documents held in a library or archival collection accessible to the public may be listed in this section. Other unpublished materials that are inaccessible (such as letters, unpublished data, preliminary drafts, or reports) are identified in footnotes to the text or within the text (preferable). Take the utmost care in citing all literature referred to in the report.

Accuracy is paramount. When possible, personally examine original sources rather than secondary sources. Do not cite sources you have not personally examined. Citations must contain all the information necessary for the reader to locate the source. **Spell out all words**, i.e., North American Journal of Fisheries Management; - **NOT** - N.Am. Journ. Fish. Mgmt.

Appendices

Anything that is not absolutely necessary to the text, but that will make your study more understandable, can be included in the Appendices Section. Such materials include long, detailed tables; questionnaires; maps; graphs; charts; data collection forms; raw data; and data too lengthy for footnotes.

Number all tables and pages continuously through the Appendices Section. Use the same margins in Appendices as in the text.

The heading APPENDICES should be typed in caps, centered, on a separate page preceding the Appendices contents. Appendix captions should be typed at the top of the page and designated Appendix A, Appendix B, etc. (See Appendices for format.)

REPORT PREPARATION

Word Processing Guidelines

Divide reports into individual files for each of the following sections: text, table of contents, vertical tables, horizontal tables, and figures (each in a file). Documents are difficult to edit when tables are included in the document with the text, especially if the document is originally typed for double spacing and needs to be converted to single spacing. The only time the tables should be included in the text document is when the author wants the table printed on a page that also contains text. Do not insert blank pages in the text document for tables or figures. Tables and figures can be hand inserted into the text and the pages numbered after corrections are made.

All text pages should be numbered even if the numbers do not indicate that tables and figures are to be inserted later. This way, if the report is dropped, it can be reassembled.

Use tabs and centers instead of spaces whenever possible. Hard returns should only be used at the end of a paragraph and to create blank lines. Place "hard page breaks" at the end of pages that will be shorter than the average page length, not returns. To insert a hard page break, use CONTROL ENTER.

FORMAT

Standard paper size is 8.5 x 11 inches. Minimum margins are 1 inch on the left, right, top, and bottom.

Center page numbers (Arabic numerals) at the bottom of each page. Pagination begins with the first page of the Abstract and continues consecutively through the end of the report, including pages with figures, tables, and the Appendix. When using wordprocessing equipment, do not type page numbers, let the computer insert the numbers during the printing process.

Preliminary pages (Table of Contents, List of Figures, List of Tables) are numbered consecutively at the bottom of the page with small Roman numerals. The Table of Contents page should be numbered "i".

Type size and style should be 11 point or equivalent. You can use a smaller point size if needed to make sure a table fits on one page. Use the same type of font in text, tables, figure captions, appendices, etc. (i.e., Universal, CG Times, etc.).

Text in draft reports is to be double spaced; final reports are to be single spaced. The first line in each paragraph is indented five spaces using the TAB key.

The following major sections should begin on separate pages: Abstract, Acknowledgements, Literature Cited, and Appendices. Subheadings may begin immediately after preceding material but are not to be placed at the bottom of a page unless the subheading and at least two lines of text can fit within the required margins.

Edit your manuscript carefully before giving it to the typist. Check it for accuracy and consistency of style and format. Try to give your typist the entire report at one time--it is harder for a typist to recognize inconsistencies if the manuscript is typed piecemeal. Supply the typist with a clear, readable, double-spaced copy. Do not expect speed and accuracy from a typist who has to read through lines, arrows and erasures. The final responsibility of proofreading is not the typist's--**it is yours!** Explain on a separate page any unusual or confusing typing directions.

Headings and Subheadings

Up to four levels of headings may be used in the text; the first level will be all capitals, and the other three levels will be initial capitals and lower case:

- (a) first-order: all capitals, centered, not underlined;
- (b) second-order: initial capitals, centered, underlined;
- (c) third-order: initial capitals, flush left, not underlined;
- (d) fourth-order: initial capitals, run into paragraph, indented 5 spaces, underlined, use dash after heading and before paragraph (no spaces before or after dash).

Triple space after first level headings and before and after second- and third-level headings. Double space a two-line first- or second-level heading. **Bold all headings.**

FIRST ORDER

Second Order

Third Order

Fourth Order-This should be placed here and

Figures

The type of information to be conveyed will often determine the medium to be used. Properly constructed graphs, like tables, are the best way to present statistical comparisons of data sets, but graphs are especially effective for illustrating trends and the relation between

variables in experimental data. Tables, on the other hand, are preferred when precise numerical information is required. Drawings may be used to emphasize, subtract, and combine selected details of the subject.

All illustrations, graphs, photographs, charts, maps, and diagrams are considered as figures and are numbered consecutively in Arabic numerals. Different parts of the same figure are labeled A, B, C, etc. The word "figure" is spelled out in the text and figure captions, i.e., Figure 1. Each figure should be prepared on a separate page (8.5 x 11 inches) and have the same minimum margins as the text (see Format, page 9).

Original artwork or glossy photographic prints have the best reproductive quality. Avoid placing typewritten lettering, labels or numbers directly on a figure. Instead, all labeling should be done neatly with mechanical drafting equipment, lettering machines, or computer graphic software. Transfer letters often become detached. All figures should be of publishable quality. If you are using a figure that is not an electronic document, you need to send in a very good quality original to use--not a copy of a copy of a copy, etc!

Graphs and line drawings should be drawn black on a white background. Black-on-white diagrams are often useful to illustrate a procedure, the structure of an apparatus, or details that would not be clear in a photograph. Use no colored materials in the preparation of figures. Keep all diagrams simple and clearly labeled.

Graphs appearing in print should contain the title information in a legend.

Axes end at the level of the final data points, or one increment beyond, and should be drawn cleanly with an evenly weighted line. Interval marks along the axes should be accurately placed and should not cross the axes. They may extend into or out of the data area but should not crowd the data within the graph. Intervals should not be too numerous and each one need not be numbered.

Line weights are to be selected according to the importance of the information in the graph. Curves and data points are most prominent, with the boldest lines. Axis labels are next in importance and slightly less bold, interval numbers and curve labels or keys still less bold, and axis lines and intervals even less bold. As a rule of thumb, the curves should be about twice as wide as the axis lines. Lines indicating the mean of a number of observations are the least bold of any on the graph. They are drawn vertically through the centers of the points or bars and a very short line is drawn horizontally at each end to indicate the magnitude of the variable. The legend states whether the variability indicated is standard deviation or standard error.

Use of photographs is discouraged unless they contribute meaningfully to understanding the content of the report. Photos must be of the proper size to conform with margin requirements on 8.5 x 11-inch paper.

Figures are placed on the page following first mention in the text. Figure captions appear below the figure; short captions may be centered. Incorporate most of the explanatory material in the caption. Remember that each figure must be self-explanatory and descriptive enough to stand alone without reference to the text (see Appendix C).

Tables

Table sections should have four main parts: (1) table number and title, (2) box heading, which identifies the entries in the vertical columns, (3) stub heading, which identifies entries in horizontal rows, and (4) the data field. Tables may also have one or more footnotes (Appendix D).

When data are in a table, do not repeat in the text unless to summarize or highlight important aspects. Tables should be centered on the page and placed on the page following first mention in the text (Appendix D). Short tables may appear on a page with the text, but do not start a table on a text page unless there is room to complete it on the same page.

Long tables should be typed on separate pages, preferably with the complete table on one page. If it is necessary to continue a table to a second or subsequent page, repeat only "Table 7. Continued." and all column headings. Extra-long tables should be avoided in the text in favor of the Appendix, but may be photo-reduced to fit on the page horizontally or vertically. Be sure that all numbers and letters will be readable when reduced. Ideally, tables should appear vertically on the page unless the quantity of data requires that the table be placed horizontally. Table titles should be brief and clear yet show the source of the data (location), when collected (date), and units of measurement.

Be consistent when capitalizing column headings. Use single spacing unless you have a very short table. You can use the "Table" option in WordPerfect and leave all lines in the table or just have the box heading between lines and a line at the bottom of the table--but make sure all the tables in the document are done the same way.

Tables are numbered in Arabic in the order of their citation in the text. The title describes the topic or the general trends shown in the table. The species of experimental organisms and a brief description of the experimental conditions can often be put in the title instead of in the headings or footnotes. The title should be succinct, but not so terse that it is uninformative. The terms used in the title should correlate with the column headings, but the title should not consist solely of a list of the column headings if a general descriptive term can be used.

Some journal editors prefer that experimental conditions relating specifically to the data in a table be described in detail in its title, headnotes, or footnotes.

The units of measure for the data in the field are usually best put with the box headings, not repeated in the columns or placed under the second rule just above the data. Sometimes the units are best put in the stub headings. Units can be supplied in footnotes to headings if the words are large and space is limited; do not cite such footnotes to the data in the field.

Data columns should not contain blank spaces. If there were no measurements taken or no data available, use two hyphens (--). Use zero (0) only to signify success, mark the entry ND (no data) or note it in a footnote. Where decimal fractions occur in the data field, always use a zero to the left of the decimal point (0.7). Never use 0.0.

If the word "Total" is used in a stub heading, no horizontal line is needed under the vertical column of figures--just add extra space (line return) between the figure column and the total figure.

Use standard abbreviations (see Abbreviations and Symbols, p. 16) in the column headings only when space does not allow headings to be spelled out. Any abbreviations or symbols that are not standard units of measure, or are not readily recognizable, are explained in the table caption or footnotes. As an example, abbreviation of fish species should be footnoted: RBT-rainbow trout.

Table footnotes use lowercase superscript letters (not numbers), alphabetically, immediately below the table, indented three spaces from the left margin. Footnote references are labeled left to right, then top to bottom (Appendix D). Use asterisks for probability levels. Be sure that each footnote character in the table matches the explanation below. Use footnotes to reduce cluttering tables and table headings with fine details.

The most important part of a table is the data field. Years of important information can be summarized in a few short columns. Do not overlook the importance of accuracy in tables. Double check your original data with the typewritten version. The best way to ensure accuracy in tables is to proofread each typewritten column out loud with another person reading the original.

References in the Text

Any material taken from the works of other authors must be given proper credit in the text and literature citations. Avoid referencing common knowledge, particularly conventional tests of probability.

Literature citations in the text take one of two forms, each with different punctuation, depending on the way they are used in the sentence (North American Journal of Fisheries Management style).

In theory, LAN is found mainly in the lysosomes (DeDuve 1959; Kaulen et al. 1970), but McCabe and Cayen (1965), Kaulen et al. (1970), and Smith (1971) reported both bound and dissolved forms of LAN.

Cite both last names of two authors, but use the first author plus "et al." for three or more authors. Citations are listed chronologically in a text sentence, e.g. (Terr 1972, 1976; Applegate et al. 1974; Hall and Jones 1975). Institutional authors may be referenced by acronyms (initials) in the text but must be defined in the list of literature citations. For example, "NOAA (1962)" in the text would appear "NOAA (National Oceanic and Atmospheric Administration). 1962." in the Literature Cited Section.

If you are citing a direct quotation, specific figure, or table, accurate page numbers must be given:

According to Griffin (1974:229), "this is not universally true." Griffin's data (1974: Table 6) support his conclusions.

Give page numbers when paraphrasing from lengthy publications or books:

(van de Berg 1973:214-217)

If the same author(s) has more than one citation in the same year, the year is referenced with lower case letters:

Smith and Jones (1972a, 1974)
(Smith and Jones, 1972a, 1972b, 1973; Anderson 1974)

Sources of information not in the open literature, such as personal letters or unpublished research results, are cited in the text, not in the Literature Cited Section:

(G. Taylor, U.S. Fish and Wildlife Service, personal communication)

Johnson et al. (University of Idaho, unpublished data)

(Gates 1973; Anderson et al. 1974; G. Taylor, U.S. Fish and Wildlife Service, personal communication)

A citation of an unknown author may be referenced "Anonymous" in both the text and literature citations:

(Anonymous 1978)

The need to cite references not readily available, or no longer in existence, presents a problem to some biologists, particularly taxonomists. If you must cite such a reference, indicate in some way, possibly in a footnote or a notation in parentheses, that you have not read the reference in the original. The citation "Powell (1858, cited by Forbes, 1872)" would indicate that you have depended on an article written by Forbes and published in 1872 for information originally in an article written by Powell and published in 1858. You should include both articles in your list of references and add in parentheses at the end of the Powell entry (1872) for the information from Powell. Similar candor is desirable in citing articles published in foreign languages. Indicate either in the text or in the list of bibliographic references whether you are citing the original article, a translation, or an abstract.

It is your responsibility to double check author's names and publication dates with those in the literature citations. Inconsistencies between these items are prevalent in research papers and are often overlooked in the proofreading stage. If you fail to supply your readers with accurate reference information, your credibility is reduced.

Sentence Structure

Voice

Use the first person (personal pronoun "we") and the active voice (active verbs) when it is logical to do so. The active voice is a simpler, more direct form of expression and is less likely to lead to ambiguity than the passive voice. However, the passive voice is useful to emphasize something other than the agent, such as when the subject of the verb is the recipient of the action:

Catchability was determined by angling with four different types of lures and baits.

or to emphasize something or someone other than the agent:

The study was designed to evaluate the grass carp as a sport fish.

Tense

As a general rule, observations and procedures that have been completed are described in the past tense (was, were):

We used a dissecting microscope to observe eggs each day and development was noted.

Directions, conclusions, generalizations, and references to stable conditions are usually given in the present tense (is, are):

Increased production is often accompanied by increased incidence of fish disease.

Events completed before a time in the past take the past perfect tense:

Smith's (1962) study on adult female mortality had been completed before Jones (1966) began his research on juveniles.

Scale formation had begun in 13-mm metalarvae 14-15 days after hatching.

Events continued from the past to the present are described in the present tense:

The adult mortality has been rising since 1978.

Do not shift from one tense to another without good reason. General statements of accepted fact are stated in the present tense, but the literature review, description of experimental procedures, and presentation of findings should be in the past tense. In your Discussion Section, use the past tense when commenting on the implications of your data. Specific conclusions are usually stated in the past tense.

Subject-Verb Agreement

Be sure that verbs agree in number with their subjects. Collective nouns are especially confusing when they are singular in form but may be either singular or plural in sense (e.g., percent, total, number). The verb is singular when the subject acts as a unit; the verb is plural if the subject is considered as individuals. A collective noun modified by an of-phrase with a plural object is usually treated as plural:

Twenty percent is the minimum amount we can accept.

Twenty percent of the walleye were caught in June.

Use the singular noun, usually preceded by a definite article, for collective species:

The walleye is an ubiquitous species.

Use the plural for a collection of individual fish:

Walleye occur in Lake Erie.

When the plural forms of common names differ from the singular forms, use the singular noun.

Many authors avoid using the words "percent" and "total" because they are unsure of their usage. Follow these general rules:

Percent--the number of the verb is determined by the noun following the word "percent":

Eighty percent of the population was susceptible, but only 15% of the fish were stunted.

Total, number--if preceded by "the", the verb is singular; if preceded by "a", it is plural.

A total of 9,327 emerald shiners were seined from the Mississippi River.

A number of emerald shiners were seined from the Mississippi River.

The number of emerald shiners seined was 9,327.

Data--this plural form of the word "datum" always takes a plural verb.

The data were arranged by year of collection.

Sentence Length

Your first opportunity to compose sentences will be when you organize topic sentences in the outline. These are probably the most critical sentences in your report and require the most organization. If your data and objectives are not clear in your mind at this point, take some time to compose your thoughts on paper.

Excessively long sentences make it hard for the reader to make a connection between the opening and closing words. Such verbiage may require that the sentence be read a second or third time. This detracts from the continuity of your presentation and you risk losing the attention of your readers. Long sentences (four or five typed lines) should be rewritten to form two shorter sentences.

Dangling Participles

A common error in reports is use of dangling participles, i.e., participles that modify the wrong word. This results from failure to put modifiers in close contact with the elements they are intended to modify:

Speeding down the highway, the car suddenly veered into the ditch.

While looking in the tank, the fish seemed to multiply.

To correct these illogical sentences, change the present participle to the past participle and bring the subject forward in the sentence.

As we sped down the highway, the car suddenly veered into the ditch.

The fish seemed to multiply while we looked in the tank.

Split Infinitives

The two words, split infinitives, probably strike terror in the minds of report writers more than any other grammatical term. Ironically, most writing authorities believe there is no logical justification for the "never split infinitives" rule and find it amusing that so many authors become upset over something so trivial.

What the old rule means is that you do not split an infinitive phrase by inserting a modifier between "to" and the verb (NO: to completely understand, YES: to understand completely). Although split infinitives are used in everyday speech, they look wrong in print because writers so regularly avoid using them. To avoid being considered grammatically ignorant, refrain from splitting infinitives until the rule is changed.

NO: *The program was redesigned to immediately counteract budget cuts.*

YES: *The program was redesigned to counteract budget cuts immediately.*

Style

Scientific Names

For taxonomic and common names of North American fishes, follow [A List of Common and Scientific Names of Fishes from the United States and Canada](#), 5th edition, 1991 (Appendix E). Common names may be used freely in your report, but they should be accompanied by their scientific names in the title and when first mentioned in the Abstract and text. Always use full common names: "rainbow trout" or "brook trout" not "trout" or "rainbow."

Abbreviate generic names (e.g., *O. mykiss*) when they are repeated within a few paragraphs if the meaning is clear. Italicize scientific names of genera, species, subspecies, and varieties. Generic names used as common names are not italicized.

Footnotes

Avoid using footnotes whenever possible. Inserting this material directly in the text makes reading, typing, and future reproduction easier. Consider whether the footnoted material is even necessary. Typical footnotes used in reports give laboratory contribution numbers, availability of supplemental data, disclaimers of product endorsement, and credits to sponsors.

Footnotes should be consecutively numbered from the beginning to the end of the report. They should be single spaced above the bottom margin of the same page on which they are referenced. Separate the footnote from the text by three line returns and horizontal line approximately one-third the width of the text.

Identify the reference in the text and corresponding footnote with an Arabic numeral superscript. Information too lengthy for a footnote should be placed in the Appendix.

Abbreviations and Symbols

The following symbols and abbreviations are to be used without definition. Any others must be defined in the text at first mention, in the captions or footnotes of tables, or in figures or figure captions. Use spelled-out words to start sentences.

Weights and measures (metric)		Weights and measures (English)	
centimeter (0.39 in)	cm	calorie	cal
degrees Celsius	°C	cubic feet per second	ft ³ /s
gram (0.03 oz)	g	degrees Fahrenheit	°F
kilogram (2.2 lb)	kg	feet (30.48 cm)	ft
kilometer (0.62 mi)	km	gallon (3.78 liters)	gal
liter (0.26 gal)	L	inch (25.4 mm)	in
micro (10 ⁶)	μ	mile (1.61 km)	mi
meter (39.37 in)	m	ounce (28.35 g)	oz
millimeter (0.039 in)	mm	parts per million (mg/liter)	ppm
milligram	mg	pound (453.6 g)	lb
parts per million	mg/L	ton (907.18 kg)	ton
tonne (2,204 lbs)	t	yard (91.4 cm)	yd
milliliter (.338 fluid oz)	ml	acre (.405 hectares)	acre
hectare (2.47 acres)	ha		

Time	
Day	d
Hour	h
Minute	min
Second	s
Spell out year, month, week	

Mathematics and statistics

Restricted use (as indicated)

All standard mathematical signs, symbols, and abbreviations

base of natural logarithm e

coefficient of linear correlation r

degrees of freedom df

exponential exp

logarithm log

not significant NS

percent %

probability P

sample size N

relative weight w_r

standard deviation SD

standard error SE

Specify the base for each logarithm: $\log_{10}X$; $\log_c Y$.

Commonplace statistical tests (Student's t, F, chi-square, et cetera) require no formal definition or reference.

sex (tables, figures, hybrid crosses)

male

female

Union of Soviet Socialist Republics

(references) USSR

United States of America

(references) USA

Compass direction (maps and coordinates)

east E

north N

south S

west W

et alii (author citations) et al.

months (tables, figures)

January Jan

February Feb

March Mar

April Apr

May May

June Jun

July Jul

August Aug

September Sep

October Oct

November Nov

December Dec

Use the abbreviations in the text only with numerals, e.g., 10 mg, 27 m. Spell out measurements if they are not preceded by numerals and if a measurement is at the beginning of a sentence (Seven milligrams). When an abbreviation is used in a sentence, the verb should agree with the quantity measured (6 cm were, 1 cm was). The same abbreviation is used for both singular and plural forms (1 mm, 17 mm).

A list of internationally standard fisheries symbols is given in Appendix F. The North American Journal of Fisheries Management guidelines should be used in cases of discrepancies.

Whenever you introduce an unconventional or unfamiliar abbreviation in the text, be sure to define it the first time it is used. Always define these abbreviations in tables and figures.

Punctuation

Detailed guidelines for punctuation can be found in the [CBE Manual](#). The following are examples of the most common punctuation problems encountered in report writing.

Use periods:

- inside closing quotation marks."
- inside closing parenthesis if the parenthetical material is an independent sentence. (This is an independent sentence.)
- outside closing parenthesis if the parenthetical material is a subordinate (dependent) part of the main sentence (such as this phrase).

Use it here:

ed.
i.e., e.g.
et al.
Jr.
Ph.D.

Do not use it here:

USA
USSR
Jun, Aug (in tables)
SE, N (compass direction)
m, mg, cm (measurement)
USFWS, USDA

Use commas for:

- introductory clauses:

Although the spawning season begins late,

Do not use a comma after short introductory clauses unless necessary for clarity or readability:

In 1972 the tests were begun.

During summer, salmon were

- nonrestrictive appositive:

James Fairborn, a limnologist, described the species.

Flounder, herring, and trout were examined.

- numbers:

1,000 27,000 1,200

In 1975, 43 species were recorded.

- Place commas inside closing quotation marks and outside closing parentheses, but never immediately preceding opening parentheses. Also, use commas in simple series:

Founder, herring, and trout were examined.

Use ellipsis marks (three spaced periods):

- to indicate that words have been omitted within a quotation:

"Student's tests . . . revealed similar results in all samples."

- or at the end of a quotation (include the period):

"Decreased reproduction is one result . . . "

Do not use ellipsis marks if quotation marks imply that words have been omitted:

Johnson observed that mortality in the control tanks "appeared to be somewhat higher" for herring.

Use semicolons:

- in a complex series when the elements contain internal punctuation and to separate clauses not joined by a conjunction:

Steelhead trout fry were preyed on by several species: three bull trout chased and ate fry; three cutthroat trout, all longer than 150 mm, did not pursue fry farther than 50 cm.

Do not use a semicolon immediately before or after a dependent clause. Do not use a semicolon in a simple series of words just because the series is preceded by a colon.

Semicolons appear outside closing quotation marks and parentheses.

Colons are most commonly used:

- to introduce a long quotation
- to introduce a list not immediately preceded by a verb or preposition:

The list of elements follows:

- to separate the parts of a ratio:

10:1

Colons belong outside closing quotation marks and parentheses.

Parentheses are used:

- to enumerate items in a paragraph when necessary for ease of reading:

Our objectives were to (1) ..., (2) ..., (3) . . ., and (4)

- to enclose a thought that is structurally independent of the sentence (implying greater independence than commas)
- to enclose literature citations in the text
- to enclose references to tables and figures in the text

Use these sequences for fences: ([]) in ordinary sentences, {[()]} in mathematical sentences, and [()] only in special cases such as names of chemicals. Use brackets [] if you insert words into a quotation.

Use two hyphens:

- in a typewritten manuscript, with no space before or after to indicate an abrupt break in thought in a sentence:

After 1 week of intermittent exposures- -the tests were run for 6 weeks--he found that mortalities occurred more rapidly at higher temperatures.

Use one hyphen:

- to indicate a range:

6-10 m Pages 272-279 1972-76 4-6 days

NO

from 1973-1976
-6 - -8°C

YES

from 1973 to 1976
-6 to -8°C

Hyphens that divide words at the end of a typewritten line are not permitted in manuscripts submitted for publication in a journal and should be avoided in Department reports. Do not hyphenate prefixes, suffixes, or combining forms unless necessary to avoid misreading. Consult your dictionary for guidance in determining which compounds require hyphenation.

Common usages of hyphens:

mono- and dichloramine	short-term study
mid-March	microgram-per-gram basis
15- and 20-m-long segments	12-week-old larvae
2-m enclosure	larval-juvenile survival
48-hour period	snout-to-vent length
ninety-six percent	well-differentiated heads
11-fold change	highly debated technique (no hyphen)
B-values	postmortem (adjective)
age-class	post-mortem (noun)
log-probability paper	nose-tagged

Use double quotation marks:

-- for a direct quotation

Do not use quotation marks for emphasis or for commonly used technical terms. They may be used for a new technical term or for one that is being applied in a new or unusual sense. Place quotation marks outside any punctuation that is part of a quote.

The slant line, or slash, currently has a high rate of misuse.

-- means "divided by" or is a substitute for "per" in measurements:

*Fish were stocked at 63 and 100/hectare
67 mg/L
0.5 fish/h*

-- but is written out in cases not involving measurements:

*two fish per duplicate
27 subsamples per experiment*

Word Usage

Verbiage

Excess verbiage can be as distracting as bad grammar. Using unnecessary words and phrases is a common fault of writers. The following are examples frequently found in scientific writing:

Wordy

at the present time
due to the fact that
in order to
subsequent to
prior to
large numbers of
during the summer of 1976
at the conclusion of
in the event that

Better

now
because
to
after
before
many, more
in summer 1976
after
if

Misused Words

Many words are used improperly because they resemble other words with similar meanings. Some words have been used improperly for so long, their misuse has become commonplace in writing. If you are not sure how to use a word, look it up rather than obscure the intended meaning of your sentence.

That and **which** are probably the two most frequently misused words in writing, even though they each serve a distinctive function. **That** is used to introduce a restrictive clause; **which** introduces nonrestrictive clauses, which are usually set off from the rest of the sentence by a comma or commas. Nondefining **which** clauses merely give additional information about the subject and can be deleted without altering the clarity of the sentence:

The population count, which was started in 1927, was postponed due to bad weather.

Restrictive **that** clauses are needed to identify or describe the subject:

The fish that were anemic were used as the experimental group.

The fish that were removed from the experimental group were anemic.

Since implies some time past until the present and should not be used as a synonym for **because** or **due to**. **While** is also used to express time relationships (during the time that), but not as a synonym for **although** or **whereas**.

The species has been recognized since its discovery in 1971.

Only the large streams were studied because the rate of infection in the small streams reached a high level.

Affect is a verb that means to cause a change or an effect. **Effect** is most often used as a noun that implies the result of an action. Effect can also be a verb meaning to bring about or cause to come into being.

Migration was affected by the late summer.

The late summer had an effect on migration.

The late summer effected a change in migration.

Confusing word usage has no effect on me.

Among compares more than two things; **between** compares only two things.

Continual implies something going on in time with no, or only brief interruption; **continuous** goes on in time or space without interruption.

Enable makes something able or possible; **permit** allows or gives consent.

Insure assures against loss (implies a monetary amount is paid, as with insurance premiums); **ensure** guarantees something or makes certain.

Farther is restricted to physical distance; it is usually safe to use **further** for everything else.

As a general rule, use **less** for a sum, total, quantity or period of time; use **fewer** for numbers.

Greater means larger in spatial dimension or size, larger in number, or more numerous; **higher** implies elevation above a foundation or base or continuing a relatively greater amount; **larger** reflects something more ample in quantity.

"For example" is designated e.g.; **"that is"** is noted as i.e.

Incidence implies the number of cases developing per unit of population per unit of time; **prevalence** implies cases existing in a population at a given time.

Various means different kinds; **varying** means changing or causing change.

Percent can be a noun, adjective, or adverb and takes the percent symbol with numerals (98%); **percentage** is a noun and is part of a whole expressed in hundredths, as in "percentage of cells." **Percentage** is not an adjective, i.e., "percent error," not "percentage error."

Mathematics

Equations and formulas-When preparing your manuscript for the typist, be precise in aligning numbers, letters and symbols. Single Roman letters in equations should be italicized (*N*, *t*, *P*, *x*). Chemical symbols and numbers, Greek letters and abbreviations of more than one letter (mas, avg, SD, df, min) are not italicized.

Insert one typewriter space on each side of symbols used as conjunctions ($\underline{P} = 0.05$), but close up when used as adjectives (> 12). A subscript precedes a superscript unless the subscript has more than three characters (\underline{X}_3^i).

Fences (brackets, parentheses) must be used consistently throughout the text and must be in pairs $\{[()]\}$.

Center equations in the text between the left and right margins. Each equation should be numbered sequentially in parentheses near the right margin:

$$\underline{y} + \underline{ay} = \underline{b} (\underline{x}); \underline{y_0} - \underline{y(x_0)}. \quad (4)$$

Numbers-Spell out one-digit numbers unless they are used with units of measure or time (three fish, 5 mm, 3 hours) or are in a series with other numbers:

The first sample was composed of 28 herring, 16 trout, 9 salmon and 14 bass; 3 salmon had previously died.

With two or more digits, use numerals (10, 250). Treat ordinal numbers the same as cardinal numbers (second, third, ninth, 32nd, 14th). Use all numerals in tables and figures. Use commas in numbers larger than 999 (1,000; 2,019) except for page numbers in books (page 1001), year dates (January 3, 1982), and 24-hour time (0200 hours).

Use the 24-hour time system, which is indicated by four digits. The day begins at 0000 (midnight) and ends at 2359 (the last minute in the day). For example: 0800 is the same as 8:00 a.m. and 2345 is the same as 11:45 p.m. Dates are designated November 19, 1980. Use the metric system unless the English system is more suitable for the subject or for the intended audience (e.g., ft³/s in reporting water flow data). Do not report in one system with the other system following in parentheses.

Literature Citations

We will follow the North American Journal of Fisheries Management style which requires **spelling out all bibliographic information**, including the names of journals. **Use only** the following abbreviations:

- (1) first and middle initials of authors,
- (2) abbreviations in original titles of articles and books,
- (3) numbers (2nd edition, 11th congress) other than those spelled out in tables, and
- (4) USA, USSR

Repeat authors' names completely rather than using a horizontal line if they have more than one reference in your citations section.

Sylvan, B. 1963. . .
Sylvan, B., and O. Snellman. 1964. . . .

Samples of bibliographic entries follow:

- (1) Journal article

Author(s), date, title, journal name, volume (issue), inclusive pages. Issue numbers are included only if each issue in a volume starts with page 1.

Mansueti, A.J. 1964. Early development of the yellow perch, Perca flavescens. Chesapeake Science 5:46-66.

Giesy, J.P., Jr., and J. G. Wiener. 1977. Frequency distribution of trace metal concentrations in five freshwater fishes. Transactions of the American Fisheries Society 106:393-403.

Linden, O. 1975. Acute effects of oil and dispersant mixtures on larvae of Baltic herring. Ambio 4(3):130-133.

(2) Book

Author(s), date, title, edition (other than first) or volume, publisher, state (USA only) or country if outside USA. Omit the number of pages.

Hubbs, C.L., and K.F. Lagler. 1974. Fishes of the Great Lakes region, 4th edition. University of Michigan Press, Ann Arbor, Michigan.

Steel, R.G.D., and J.H. Torrie. 1960. Principles and procedures of statistics with special reference to biological sciences. McGraw-Hill, New York, New York.

(3) Chapter, section, or part of book or publication

Author(s), date, title, pages, editor(s), book title, publisher, city, state (USA only), or country if outside USA.

Caswell, H. 1976. The validation problem. Pages 313-325 in B.C. Patten, editor. Systems analysis simulation in ecology, Volume 4. Academic Press, New York, New York.

Norris, L.A. 1967. Chemical brush control and herbicide residues in the forest environment. Pages 103-123 in Proceedings for the Herbicide and Vegetation Management Symposium, Oregon State University, Corvallis, Oregon.

(4) Dissertation or thesis

Author, date, title, thesis or dissertation, university, city, state (USA only), or country if outside USA. Omit page numbers.

Van Guelpen, L. 1974. Seasonal movements of the winter flounder, Pseudopleuronectes americanus, in two contrasting inshore locations in Newfoundland. Master's thesis. Memorial University of Newfoundland, St. John's Newfoundland, Canada.

Kendall, R.L. 1969. An ecological history of the Lake Victoria basin. Doctoral dissertation. Duke University, Durham, North Carolina.

(5) Bulletin, leaflet, report, government publication

Author(s), date, title, agency, type and/or number of publication. If necessary to identify the source, include city, state (USA only), or country if outside USA.

Templeman, W. 1966. Marine resources of Newfoundland. Bulletin of the Fisheries Research Board of Canada 154.

Snieszko, S.F., and G.L. Bullock. 1976. Columnaris disease of fishes. United States Fish and Wildlife Service Fish Disease Leaflet 45.

Priegel, G.R. 1969. The Lake Winnebago sauger. Wisconsin Department of Natural Resources Technical Bulletin 43.

Osborn, K. W, B. W. Maghan, and S.B. Drummond. 1969. Gulf of Mexico shrimp atlas. United States Bureau of Commercial Fisheries Circular 322.

Griffin, W.L., M.L. Cross and J.P. Nichols. 1977. Effort measurement in the heterogeneous Gulf of Mexico shrimp fleet. Texas A&M University, Department of Agricultural Economics Technical Report 77-5, College Station, Texas.

(6) Agency or association as author

Agency, date, title, publication number, publisher, city, state (USA only), or country if outside USA.

American Public Health Association, American Water Works Association, and Water Pollution Control Federation. 1971. Standard methods for the examination of water and wastewater, 13th edition. American Public Health Association, New York, New York.

NYSDEC (New York State Department of Environmental Conservation). 1976. Hudson River PCB monitoring. Data summary, past, present, proposed. Division of Pure Waters, Division of Fish and Wildlife, October 26 (unnumbered), Albany, New York.

United States Forest Service. 1978. Vegetation management with herbicides, Volume 1. Final environmental impact statement. Pacific Northwest Region. Portland, Oregon.

APPENDICES

Appendix A. Examples of cover pages.



OXBOW HATCHERY

**1992 Steelhead Brood Year and
1991 Spring Chinook Brood Year Report**

by

**Brent R. Snider, Fish Hatchery Superintendent I
Julia Rensel Hislop, Fish Hatchery Superintendent I**

November 1993

IDAHO DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION
Job Performance Report
Program F-71-R-18



REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS SOUTHWEST REGION (Subprojects I-D, II-D, IV-D)

PROJECT I.	SURVEYS AND INVENTORIES
Job a.	Southwest Region Mountain Lakes Investigations
Job b.	Southwest Region Lowland Lakes and Reservoirs Investigations
Job c.	Southwest Region Rivers and Streams Investigations
Job d.	Southwest Region Salmon and Steelhead Investigations
PROJECT II.	TECHNICAL GUIDANCE
PROJECT IV.	POPULATION MANAGEMENT

By

Steven P. Yundt, Regional Fishery Manager
Dale B. Allen, Regional Fishery Biologist
Brian J. Flatter, Fishery Technician

February 1996
IDFG 96-3

FISHERY RESEARCH



**PEND OREILLE RIVER HABITAT SURVEY
F-71-R-16
Subproject VI, Study VI
Jobs 1, 2, 3, 4, 5**

By:

**David H. Bennett
Joseph M. DuPont**

**University of Idaho
Moscow, Idaho 83843**

**IDFG 95-17
April 1995**

FISHERY RESEARCH



**Annual Progress Report
Grant Number F-73-R-17**

**Project 8. Put and Grow
Hatchery Trout Evaluations**

By:

**Jeffrey C. Dillon, Senior Fishery Research Biologist
Charles B. Alexander, Senior Fishery Technician**

**IDFG 95-32
October 1995**

Appendix B. Abstract pages.

JOB PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-18

Project I: Surveys and Inventories

Subproject I-D: Southwest Region

Job: a

Title: Mountain Lakes Investigations

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

Eight lakes within the Baron Creek drainage (tributary to South Fork Payette River) within the Sawtooth Wilderness Area were surveyed between August 30 and September 4, 1993 to document fish populations present. Of the lakes surveyed, two appeared to be barren of fish, four contained only westslope cutthroat trout *Oncorhynchus clarki lewisi*, and two contained westslope cutthroat trout and brook trout *Salvelinus fontinalis*. No other species of fish were sampled.

Authors:

Dale B. Allen
Regional Fishery Biologist

Steve P. Yundt
Regional Fishery Manager

ABSTRACT

Clearwater Hatchery

Chinook salmon Oncorhynchus tshawytscha were raised at Clearwater Hatchery for the first time this year. All chinook were brought on station as either green or eyed eggs, then reared on station until they were transported to the satellite facilities or directly released.

Direct released fish from Lookingglass Hatchery eggs (Rapid River stock) were transported to Red River and released by helicopter into Meadow Creek (Selway River). A total of 54,100 were released in the upper drainage and 59,600 were released in the lower drainage. Helicopter planting was done by Nez Perce Tribe fisheries personnel.

Fish released from Powell stock during April 1994 included 80,000 pre-smolts released by helicopter into White Sands Creek, 40,875 pre-smolts released by helicopter in Big Flat Creek, 12,000 pre-smolts directly released into Pete King Creek, and 12,000 pre-smolts directly released into Squaw Creek. An additional 16,110 smolts were released into Papoose Creek in April 1994.

Red River

Red River weir was installed on May 18, 1992 and taken out of operation on September 16, 1992. The run total was 39 spring chinook salmon; 18 adult males, 16 females, and 5 jacks. Fish released during the trapping season to spawn naturally included 12 males, 10 females and 4 jacks; and 6 males, 6 females, and 1 jack were spawned by hatchery personnel.

Age class breakdown of this run was 5 jacks, 17 four-year-old males, 1 five-year-old male, 14 four-year-old females, and 2 five-year-old females. There were no pre-spawn mortalities of ponded adults.

A total of 22,246 pre-smolts were released in October 1993.

Crooked River

The Crooked River weir was installed on March 18, 1992 and taken out of operation on September 1, 1992. The run total was 228 spring chinook salmon; 121 adult males, 94 females, and 13 jacks. Fish released immediately to spawn naturally included 110 males, 86 females, and 10 jacks; with 10 males, 7 females, and 2 jacks ponded for later release. Trap mortality totals were 1 male, 1 female, and 1 jack.

Appendix B. Continued.

Since there is no adult holding at this site, ponded fish were transported 28 miles to the Red River facility. These chinook were held separate from the Red River stock. All ponded fish were held at Red River until June 25, 1992, then transported to Clearwater Hatchery because of high water temperatures (70°F or higher for three consecutive days). All fish were held at Clearwater Hatchery until ripe, then transported to a confined section of Relief Creek in the Crooked River drainage to spawn naturally.

Age class breakdown of this run was 13 jacks, 117 four-year-old males, 4 five-year-old males, 91 four-year-old females, and 3 five-year-old females. Pre-spawning mortality was six fish, or 40.9% of ponded fish.

A total of 273,766 smolts were released at Crooked River in April 1994.

Powell

The Walton Creek weir was installed on May 28, 1992 and taken out of operation on September 17, 1992. The run total was 270 spring chinook salmon; 131 adult males, 133 females, and 6 jacks. All fish trapped were ponded and held for spawning.

Age class breakdown of this run was 6 jacks, 118 four-year-old males, 13 five-year-old males, 131 four-year-old females, and 2 five-year-old females. Pre-spawning mortality was 15 fish; 5.6% of ponded fish.

A total of 261,628 smolts were released in April 1994. A total of 144,823 smolts were acclimated for 21 days, 61,060 were not acclimated, and 55,745 were released directly into Walton Creek.

Authors:

Jerry McGehee
Fish Hatchery Superintendent III

Brad George
Fish Hatchery Superintendent I

Doug Munson
Fish Pathologist

Appendix B. Continued.

ANNUAL PERFORMANCE REPORT

State of: Idaho

Grant No.: F-73-R-17, Fishery Research

Project No.: 4

Title: Wild Trout Regulation Studies

Subproject No.: 1, Barbless Hook Evaluations

Contract Period: April 1, 1994 to March 31, 1995

ABSTRACT

In this study we summarize results of past studies comparing hooking mortality of salmonids caught and released with barbed and barbless hooks. A review of individual studies produced equivocal results with barbed hooks resulting in greater mortality in six studies and less mortality in the remaining five. Only 1 of these 11 direct comparisons produced significantly different results. Combination of individual studies via meta-analysis yielded non-significant p-values for flies and lures. A significant difference was detected for bait. Calculated effect sizes, expressed as Pearson Product-moment r's for meta-analysis combinations, were quite small ranging from -0.001 to 0.060. Thus, the use of barbed or barbless hooks appeared to play little role in determining survival of fish in the past studies. Population simulations suggest the effect of all vulnerable trout being caught from 1 to 5 times annually with artificial barbed or barbless gear exclusively would have little effect on a wide variety of Idaho trout populations in terms of catchable sized trout or large trout available for anglers to catch. We conclude there is no demonstrated biological basis for barbless hook restrictions in artificial flies and lures fisheries for non-anadromous trout based on existing information. Rather, implementation of barbless hook restrictions for such fisheries appears to be a social issue. Managers considering or proposing new special regulation proposals to the angling public should consider possible social costs of implementing a restriction with no demonstrable biological gain. Further, we suggest existing barbless hook requirements should be considered for deletion on waters where socially feasible.

Authors:

D.J. Schill
Principal Fishery Research Biologist

R.L. Scarpella
Senior Fishery Technician

REPOFORM

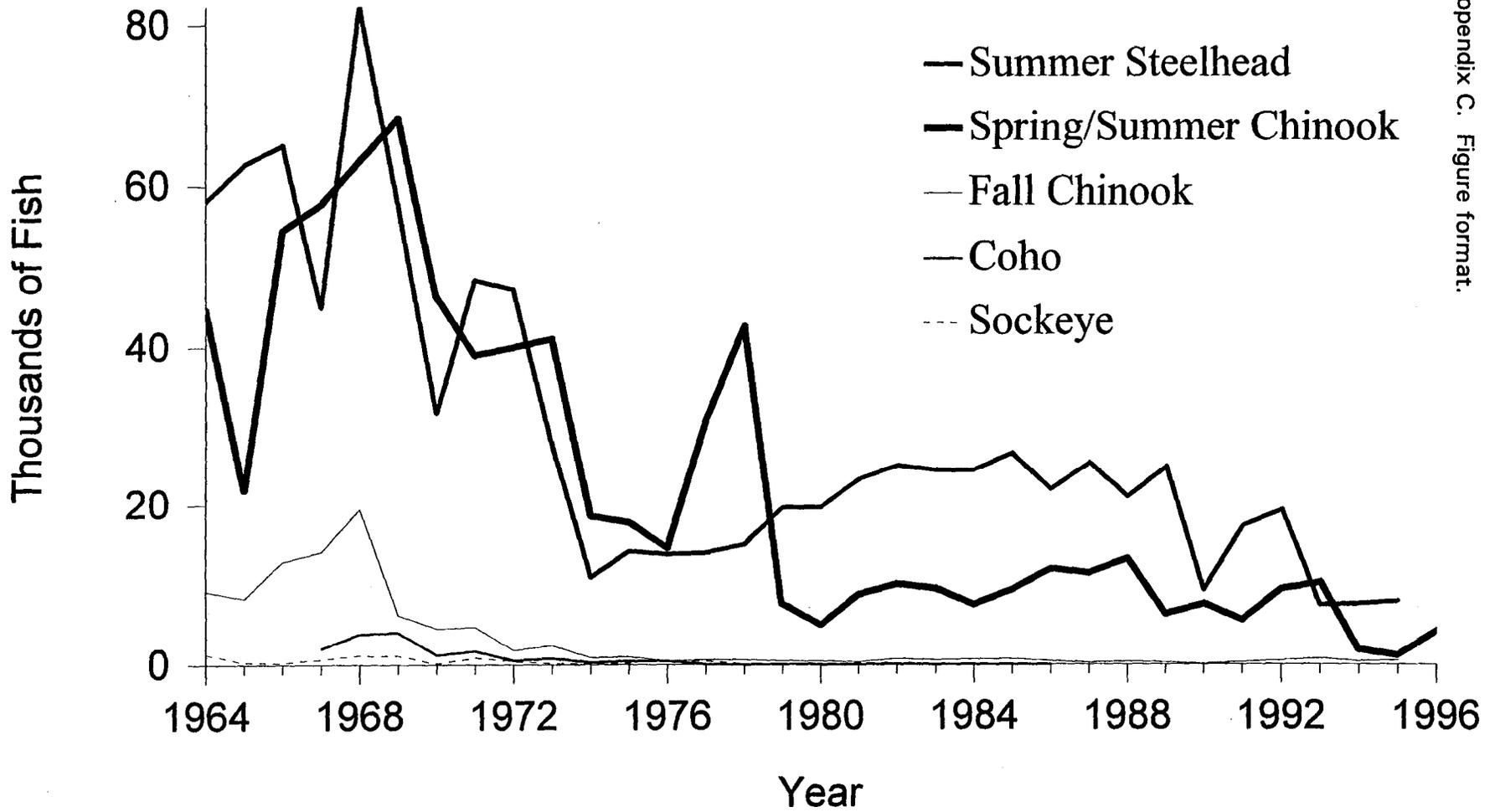


Figure 5. Adult returns of wild salmon and steelhead to the uppermost dam on the lower Snake River, 1964-1995. Uppermost dam was: Ice Harbor from 1964-68; Lower Monumental during 1969; Little Goose from 1970-74; and Lower Granite from 1975-95.

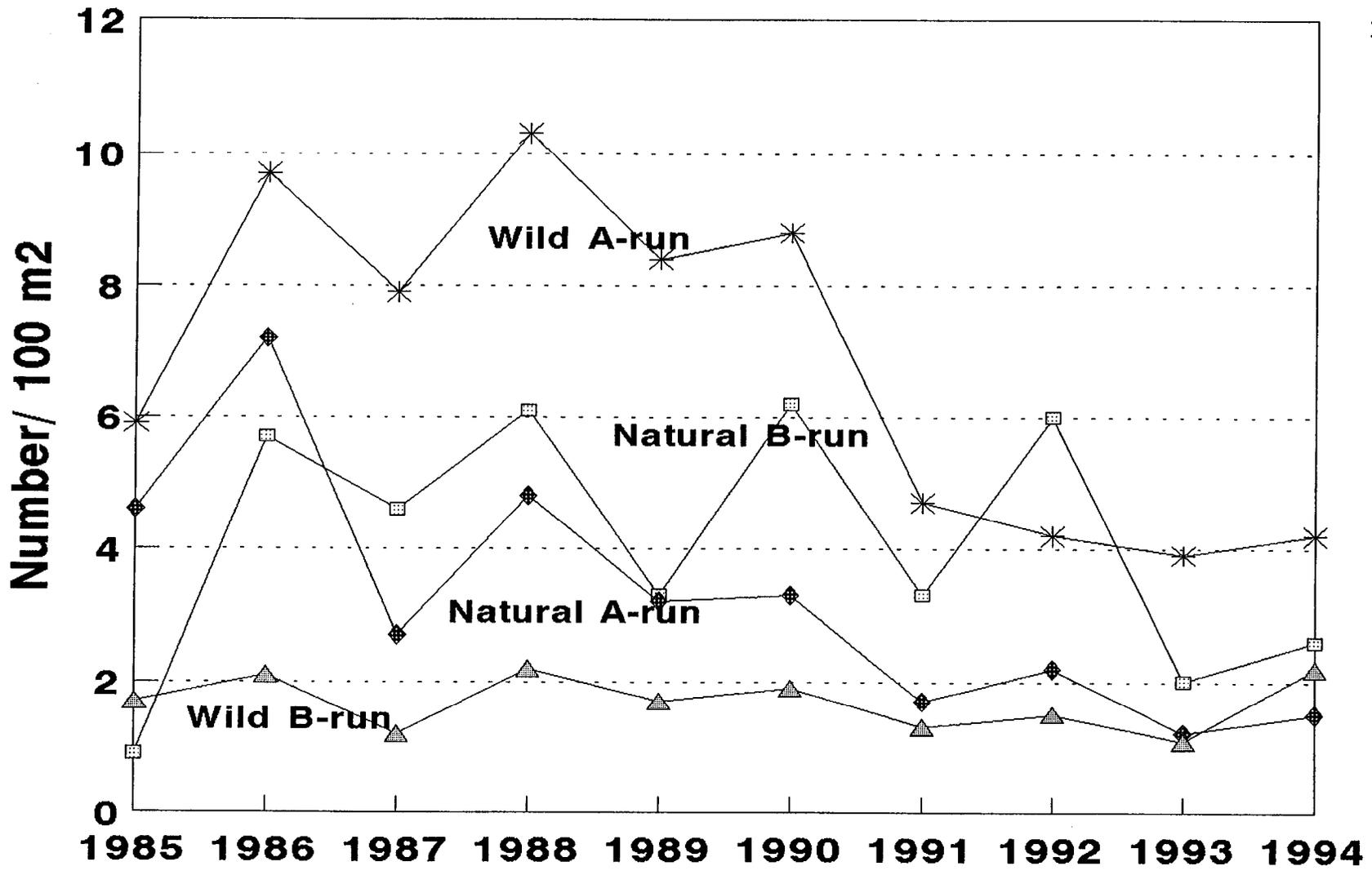


Figure 4. Mean annual density (number of age 1+ steelhead trout/100m² in B channels) of four classes of steelhead trout parr in Idaho, 1985-94

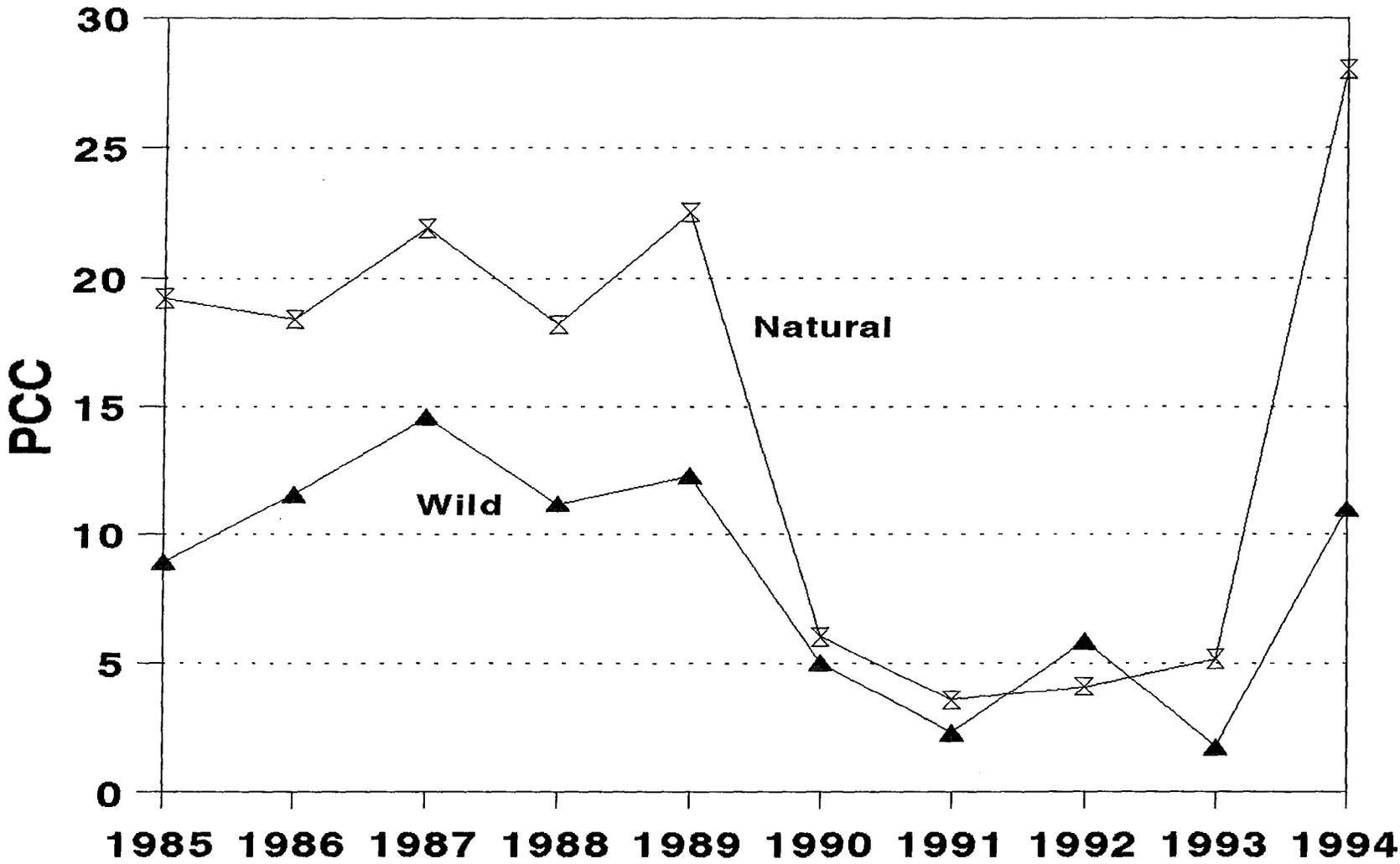


Figure 7. Mean annual percent of carrying capacity of two classes of chinook salmon parr (age 0+ in B and C channels) in Idaho, 1985-94.

Appendix D. Table format.

Table 8. Data used in estimating long-term potential fish yield in Smallwood Reservoir based on the Ryder (1965) morphoedaphic index (MEI) and the Gulland (1970) yield equation.

Species	Mortality rate (M _i)	Relative biomass (B _i)	M _i B _i	Yield (kg/ha/year) ^a
Lake whitefish	0.44	0.399	0.17556	1.303
Lake trout	0.20	0.396	0.07920	0.588
Longnose sucker	0.20	0.396	0.5217	0.387
Northern pike	0.44	0.054	0.02376	0.175
Brook trout	1.4 ^b	0.028	0.04115	0.305
White sucker	1.31 ^c	0.007	0.00917	0.068
Burbot	0.72	0.003	0.00216	0.016
Atlantic salmon	0.21 ^d	0.001	0.00021	0.002
Total		1.000	0.38410	

^a Estimated from (M_iB_i/M_iB_i) x 2.85. The value 2.85 is the predicted potential total fish yield based on an MEI of 4.13.

^b Jacobie Lake (Bruce 1974).
Ten Mile Lake (Parsons 1975).

^d Lower Churchill River (Ryan 1980).

Appendix D. Continued.

Table 8. Data used in estimating long-term potential fish yield in Smallwood Reservoir based on the Ryder (1965) morphoedaphic index (MEI) and the Gulland (1970) yield equation.

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^b Jacobie Lake (Bruce 1974).

^c Ten Mile Lake (Parsons 1975).

^d Lower Churchill River (Ryan 1980).

Appendix E. Common and scientific names of Idaho fishes.

Pacific lamprey	<i>Lampetra tridentata</i>
white sturgeon	<i>Acipenser transmontanus</i>
Bear Lake whitefish	<i>Prosopium abyssiicola</i>
pygmy whitefish	<i>Prosopium coulteri</i>
Bonneville cisco	<i>Prosopium gemmiferu</i>
Bonneville whitefish	<i>Prosopium spilonotus</i>
mountain whitefish	<i>Prosopium williamsoni</i>
lake whitefish	<i>Coregonus clupeaformis</i>
coho salmon	<i>Oncorhynchus kisutch</i>
sockeye salmon	<i>Oncorhynchus nerka</i>
kokanee salmon	<i>Oncorhynchus nerka kennerlyi</i>
chinook salmon	<i>Oncorhynchus tshawytscha</i>
golden trout	<i>Oncorhynchus aguabonita</i>
cutthroat trout	<i>Oncorhynchus clarki</i>
westslope cutthroat trout	<i>Oncorhynchus clarki lewisi</i>
Yellowstone cutthroat trout	<i>Oncorhynchus clarki bouvieri</i>
Bonneville cutthroat trout	<i>Oncorhynchus clarki utah</i>
Bear Lake cutthroat trout	<i>Oncorhynchus clarki ssp.</i>
Finespotted cutthroat trout (Snake River)	<i>Oncorhynchus clarki ssp.</i>
Lahontan cutthroat trout	<i>Oncorhynchus clarki henshawi</i>
rainbow trout	<i>Oncorhynchus mykiss</i>
redband trout	<i>Oncorhynchus mykiss gairdneri</i>
brown trout	<i>Salmo trutta</i>
Atlantic salmon	<i>Salmo salar</i>
blueback trout	<i>Salvelinus alpinus oquassa</i>
brook trout	<i>Salvelinus fontinalis</i>
bull trout	<i>Salvelinus confluentus</i>
lake trout	<i>Salvelinus namaycush</i>
Arctic grayling	<i>Thymallus arcticus</i>
northern pike	<i>Esox lucius</i>
tiger muskie	<i>Esox lucius x E. masquinongy</i>
chiselmouth	<i>Acrocheilus alutaceus</i>
goldfish	<i>Carassius auratus</i>
lake chub	<i>Couesius plumbeus</i>
carp	<i>Cyprlnus carpio</i>
grass carp	<i>Ctenopharyngodon Idella</i>
Utah chub	<i>Gila atraria</i>
tui chub	<i>Gila bicolor</i>
leatherside chub	<i>Gila. copei</i>
peamouth	<i>Mylocheilus caurinus</i>
spottail shiner	<i>Notropis hudsonius</i>
fathead minnow	<i>Pimephales promelas</i>
northern squawfish	<i>Ptychocheilus oregonensis</i>
longnose dace	<i>Rhinichthys cataractae</i>
leopard dace	<i>Rhinichthys falcatus</i>
speckled dace	<i>Rhinichthys osculus</i>

Appendix E. Continued.

reidside shiner	<i>Richardsonius balteatus</i>
tench	<i>Tinca tinca</i>
Utah sucker	<i>Catostomus ardens</i>
longnose sucker	<i>Catostomus catostomus</i>
bridgelip sucker	<i>Catostomus columbianus</i>
bluehead sucker	<i>Catostomus discobolus</i>
largescale sucker	<i>Catostomus macrocheilus</i>
mountain sucker	<i>Catostomus platyrhynchus</i>
black bullhead	<i>Ameiurus melas</i>
brown bullhead	<i>Ameiurus nebulosus</i>
yellow bullhead	<i>Ameiurus natalis</i>
blue catfish	<i>Ictalurus furcatus</i>
channel catfish	<i>Ictalurus punctatus</i>
tadpole madtom	<i>Noturus gyrinus</i>
flathead catfish	<i>Pylodictis olivaris</i>
sand roller	<i>Percopsis transmontana</i>
burbot (ling)	<i>Lota lota</i>
mosquitofish	<i>Gambusia affinis</i>
guppy	<i>Poecilia reticulata</i>
green swordtail	<i>Xiphophorus helleri</i>
platy	<i>Xiphophorus ssp.</i>
green sunfish	<i>Lepomis cyanellus</i>
pumpkinseed	<i>Lepomis gibbosus</i>
warmouth	<i>Lepomis gulosus</i>
bluegill	<i>Lepomis macrochirus</i>
smallmouth bass	<i>Micropterus dolomieu</i>
largemouth bass	<i>Micropterus salmoides</i>
black crappie	<i>Pomoxis nigromaculatus</i>
white crappie	<i>Pomoxis annularis</i>
yellow perch	<i>Perca flavescens</i>
walleye	<i>Stizostedion vitreum</i>
sauger	<i>Stizostedion canadense</i>
mottled sculpin	<i>Cottus bairdi</i>
Paiute sculpin	<i>Cottus beldingi</i>
slimy sculpin	<i>Cottus cognatus</i>
shorthead sculpin	<i>Cottus confusus</i>
Bear Lake sculpin	<i>Cottus extensus</i>
Shoshone sculpin	<i>Cottus greenei</i>
Wood River sculpin	<i>Cottus leiopomus</i>
torrent sculpin	<i>Cottus rhotheus</i>
Mozambique (Java) talapia	<i>Talapia mossambica</i>
redbelly (Zill's) talapia	<i>Talapia zilli</i>
convict cichlid	<i>Cichlasoma nigrofasciatum</i>
Oriental weatherfish	<i>Misgurnus anguillicaudatus</i>
American shad	<i>Alosa sapidissima</i>

FISHERIES SYMBOLS
(Internationally Standard)

Symbol

A	*Mortality rate (fraction) (often 1-S)
B	Biomass (general)
C	Catch of fish (number)
D	*Natural death rate (fraction)
E	* Exploitation rate (fraction)
F	*Fishing mortality rate (instantaneous)
G	*Growth rate (general)
K	*Growth rate (von Bertalanffy equation)
M	*Natural mortality rate (instantaneous)
N	Sample size
P	Biomass of fish in a stock
R	*Number of recruits (annual recruitment)
S	*Survival rate (fraction)
V	Virtual population estimate
Y	Yield (catch of fish in weight)
Z	*Total mortality rate (instantaneous)
e	Natural base
f	Fishing effort
l	Length of individual fish
l _c	Length of first capture
m	Number of fish marked
q	Catchability coefficient (F/f)
r	Number of fish recaptured
t	Time
t _c	Time at first capture
w	Weight of individual fish
W _c	Weight at first capture
	*Rate estimators