Ohio Fisheries Information System

Version 1.1

A database user manual developed by

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Ohio Department of Natural Resources
Division of Wildlife

Federal Aid in Sport Fish Restoration Project FIDR07

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Preface

The Ohio Fisheries Information Systems (OFIS) was developed to consolidate fisheries monitoring, management, and research data from an array of sources into one location. Standardized reporting of data is critical for timely and effective management and research. OFIS was developed to house data collected by the Ohio Department of Natural Resources, Division of Wildlife (ODNR, DOW) and its partners in fisheries management. The first version of this database was released on March 1, 2001 and the current version (OFIS 1.1) was released on June 28, 2004. Evolution of the database and OFIS, the central repository for DOW fisheries data, will continue indefinitely as needs evolve and expand.

The database described in this manual was developed, tested, and implemented through a self-directed work team composed of one representative from each ODNR, DOW District, the Inland Fisheries Research Unit (IFRE), and The Ohio State University, Aquatic Ecology Laboratory (AEL). The project has received full support of the DOW Fisheries Administration and is the sanctioned repository for inland fisheries data collected by the agency. Database support is provided by a Local OFIS Manager (LOM) in each DOW district and the AEL, and coordinated through a program manager (PM) at the IFRE.

This manual describes the detailed use of the database and provides related information such as reference tables for data codes and descriptions of variables, examples of reporting fish marking data in the field and database, and sample field forms for recording data. Please review the manual and view it as a desk reference for the database. Suggestions for improvement of the manual and the database are welcome.

Acknowledgements

We thank Gary Isbell, Randy Miller, Ray Petering, Jack Henry, Steve Graham, Larry Goedde, Phil Hillman, Dave Bright, Doug Maloney, Joe Mion, Jim Stafford, Mike Costello, and Roy Stein for their support of the project. Special thanks to Jeff Rowley for vastly improving OFIS by upgrading the original Access database to a Sequel Server version. We also gratefully acknowledge the many DOW fisheries staff and AEL students who contributed to development and testing.

Citation of this manual should be as follows:

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User Authorization

Access to OFIS is authorized at four different levels to facilitate technical support, database stability, and security. Personnel included in each level and their access to the database are specified below:

- **Level 1: Database Administrator** (Jeff Rowley) authorization provides complete access to the database for use and modification. This level is limited to the Database Administrator because the database structure has become highly technical with the current SQL version of OFIS.

- **Level 2: Program Manager** (Scott Hale / Rich Zweifel) authorization provides access to enter data, edit records at all levels, and use the maintenance tables for upgrading codes lists.

- **Level 3: Local OFIS Manager** authorization provides access to enter data and edit records up to and including the sample table level.

District 1:	Marty Lundquist
District 2:	Ed Lewis
District 3:	Andy Burt
District 4:	Tim Parrett
District 5:	Glenn Trueb
OSU:	vacant

- **Level 4: OFIS Associate** (all other users) authorization provides access to enter and edit data records at the fish, angler, water, and plankton levels.

User authorization levels 1-4 for OFIS.

OFIS Users (Authorization Level)	Access			
	Edit records Data entry Data browsing Data export Query module	Edit sample table data	Maintenance menus Full edition Edit at all levels	Complete access
(1) Database Administrator	**yes**	**yes**	**yes**	**yes**
(2) OFIS Program Managers	**yes**	**yes**	**yes**	**no**
(3) Local OFIS Manager	**yes**	**yes**	**no**	**no**
(4) OFIS Associate	**yes**	**no**	**no**	**no**

User Agreement

Database and data security depends upon good communication and a complete understanding of protocols for database use and data sharing. All OFIS users will be asked to read and accept an agreement pertaining to database modification and data sharing. This agreement provides a reminder to OFIS users to be considerate of fellow OFIS users for everyone's mutual benefit. The agreement is specifically intended to:

- Ensure that new database users are familiar with OFIS procedures and protocols.
- Clarify the means of database modification and data sharing.
- Establish an agreement among OFIS users to follow protocols and procedures for database modification and data sharing.
- Remind OFIS users to be considerate of the data contributions from all project leaders. Each of us should make good faith efforts to communicate with the originators of data when information will be used for summary, analysis, or presentation.

OFIS USER AGREEMENT
Ohio Fisheries Information System
Current: July1, 2004

The following overview is provided as a reminder to OFIS users that use of protocols and procedures are important to security of our database and data. Please review these protocols and procedures before using the database.

Database Modification

- New data codes, variables, and suites of variables will be added to the database only through protocols established in the OFIS manual.
- Modification of the database is limited to Level 1 authorization (Database Administrator).

Data Sharing

- Complete downloads of any portion of OFIS to non-authorized parties are strictly prohibited. A complete download is defined as transfer of ANY data provided in the format of the OFIS database structure (i.e. a complete table or groups of tables).
- Data sharing procedures in the OFIS user manual should be reviewed and followed upon receiving a request for data from parties not authorized to use OFIS.
- Distribution of OFIS data to parties not authorized to use OFIS is limited to Level 2 authorization.

OFIS Data Use

- OFIS users who intend to formally use data for presentation or publication that were not collected under their direction are **strongly encouraged** to review any intended use of those data with the project leader who directed the data collection prior to such use.

Introduction

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Introduction

Purpose of this database

The **O**hio **F**isheries **I**nformation **S**ystem inland fisheries database (OFIS) was created to standardize data entry, store data, and provide a conduit for the dissemination of information among users in real-time. This database was designed to accept data pertaining to a wide array of sample types pertinent to understanding the structure, function, and use of Ohio's inland waters. Data pertaining to fish, water, zooplankton and icthyoplankton collections as well as angler surveys can all be entered and stored within and retrieved from this database.

What to expect from this manual

The following pages provide step-by-step instructions for using the **O**hio **F**isheries **I**nformation **S**ystem inland fisheries database.

In this manual you will find descriptions of all fields, data entry standards, and help sections. There are also sections on protocols, data administration, and database security. Eventually, data reporting and summary components will be developed in Microsoft Access as a companion to the current database.

This manual is arranged with one main concept per page with a figure or illustration on the facing page. Under the text on each page there is room to write down helpful notes. The notes you write may clarify problems or questions that may occur in the future.

Introduction

System Requirements

The OFIS database was created using Sequel (SQL) server. Database users must have Microsoft Access XP© and network access (M-drive).

In our computer dependant society, new or upgraded software is released every couple of years. The OFIS database will need to be upgraded to keep pace with changing technology. Local OFIS managers will assist with these upgrades.

Minimum System Requirements

- Pentium Processor
- Access to the M-drive
- RAM
  Windows XP 256 (512 is preferred)
  Access XP installed
- 20 GB hard drive

Introduction

General Database Structure and Terms

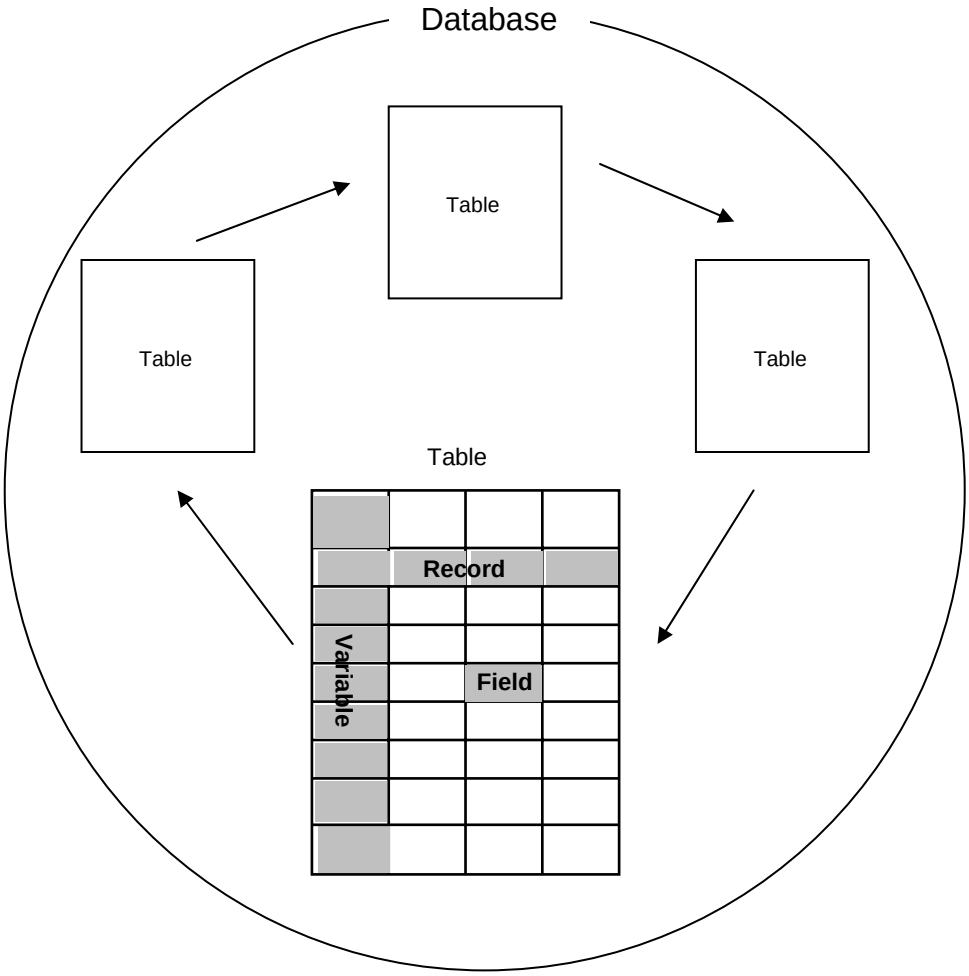
Database terminology can be confusing and overwhelming. However, it is essential to understand some of the basic terminology and how it relates to the collection, reporting, and storage of field data. By definition, a **database** is a collection of data structured and organized in a disciplined fashion so that quick access to the information of interest is possible. Databases can be small and simple to understand, like a personal address book, or very large and complex. Data within a database are housed within many **tables**. Each table is a collection of data in which each item is arranged in relation to the other (i.e. a spreadsheet of data). Each column of data in the database is called a **field**. A field is the specific location of data within a record and is the database term for a **variable** measured within the project such as date, location, species, etc. Lastly, a **record** is a group of related data items treated as one unit of information. A record can be pictured as a row of data in a spreadsheet.

In its simplest form, a **database is a series of tables that have common fields linking one table to another**. It is the common associations between tables, known as relations, that allow databases to perform advanced queries (search and retrieval of data).

Each of the tables within a database is linked to a related table(s). Linking of tables and their data eliminates data redundancy and provides a finer data resolution. For instance, one table may house sample details such as equipment used, time of sample, etc. A related table will contain fish data such as species, age, and tagging information. A third table may refine the sample data even further by containing fish diets.

OFIS users will not enter the data directly into the tables. Instead, a **form** is used for data entry. Forms simplify data entry by organizing and grouping data. Forms can be designed to look exactly like the field data sheets or customized to eliminate unused data fields.

- **Database –** a collection of data structured and organized in a disciplined fashion so that quick access to information of interest is possible.
- **Table –** a collection of data in which each item is arranged in relation to the other (ex. a spreadsheet of data).
- **Record –** a group of related data items treated as one unit of information.
- **Field –** the specific location of data within a record. It is the database term for a variable measured within a project.
- **Variable –** a) a property with respect to which individuals within a sample differ in some discernible way. b) The name given to a symbol that represents or substitutes for a number, letter, or combination of letters.
- **Form –** a way of viewing or entering data in a table one record at a time.



Introduction

Goal of the Ohio Fisheries Information System (OFIS)

The goal of the Ohio Fisheries Information System (OFIS) is to:

1. Facilitate data storage, security, and access
2. Encourage inter- and intra-agency data analysis and sharing
3. Increase the speed of information transfer

OFIS not only allows for centralized storage of all fisheries data, but it also allows convenient reporting and interpretation of data.

Access to OFIS

Personnel at the five Division of Wildlife District offices, as well as the Inland Fisheries Research Unit (IFRE), DOW Fisheries Administration, The Ohio State University Aquatic Ecology Lab (AEL), and Miami University currently use OFIS. Each District has a copy of the database installed on their computers. An OFIS representative at each District office can answer questions concerning the database, or refer questions to the Database Administrator at IFRE. Each District will always have access to their District's data through one or more computers in their office. In addition, each District will receive periodic updates of OFIS from the program manager at IFRE.

Introduction

What can the database do for me?

OFIS will benefit all those associated with management and research of Ohio's inland fisheries.

Individuals that collect field data will find the field data sheets organized and simple to use. Data entry personnel will appreciate the point and click navigation of the database and the similarity between field data sheets and data entry forms. Personnel who analyze data will appreciate the analysis programs that are provided to accompany OFIS data. Fisheries managers will find that quick access to both historical and current fisheries data is invaluable in the management of Ohio's fisheries, in addressing the public, and in developing operation plans.

OFIS does not limit or alter fieldwork, rather, field data collections shape the database. The OFIS database was designed to incorporate present sampling techniques, such as Inland Management System (IMS) data, but it is flexible enough to adapt as needs change.

Introduction

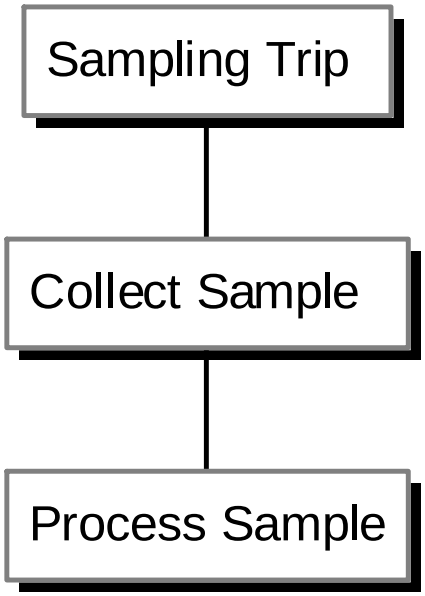
Structure of OFIS

There is a logical hierarchy to the flow of data through the database that follows the process of data collection. The forms in OFIS are arranged to parallel data collection in a project. The most critical data to be entered in OFIS are the trip meta data contained within the *Trip Entry Form*. Meta data consist of the most general data concerning a trip. Information entered in the *Trip Entry Form* includes project number, the water body being sampled, and date, along with other items such as the purpose of the trip and the field crew.

Once a crew arrives at a study site, the next logical step is for them to collect a sample. The corresponding sampling form in the database is the *Sample Entry Form*. This form contains information such as what gear was used, effort expended, and location of the sample. After a sample is collected, processing information needs to be recorded. For example, the initial fish processing information, such as species and individual lengths and weights are entered into the *Individual Fish Sample Entry Form.* Data pertaining to groups of fish, such as count data or batch-marking, can be entered into the *Group Fish Sample Entry Form*. If further processing of samples, such as back-calculation of growth or diet analysis is required, other forms in the database are available. The form for entering annuli measurements is called *Fish Annuli Measurements Form*. There are several data entry forms in the OFIS database, but they can all be considered variations of either sample collection or sample processing forms.

Because the database structure follows a hierarchy, it is necessary to start at the beginning with the trip meta data form, then work through the sample entry and sample processing forms. **Data entry into the Sample forms cannot precede entry of Trip Meta Data into the *Trip Entry Form***. The program will either not allow the person to proceed to enter sample data in the field, or it will not allow the person to save the data.

Flow diagram of data collection and OFIS data entry



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Getting Started

Opening OFIS

The file name for the OFIS database is ***OFIS***. The OFIS file will be located in a folder titled "OFIS" on the computer's hard drive. **See your District Representative for assistance if it cannot be found.**

There are three ways to open OFIS.

1. Using the desktop shortcut
2. Using the Start Menu
3. Using "My Computer"

1. Using the desktop shortcut:
   - Double click on the OFIS icon

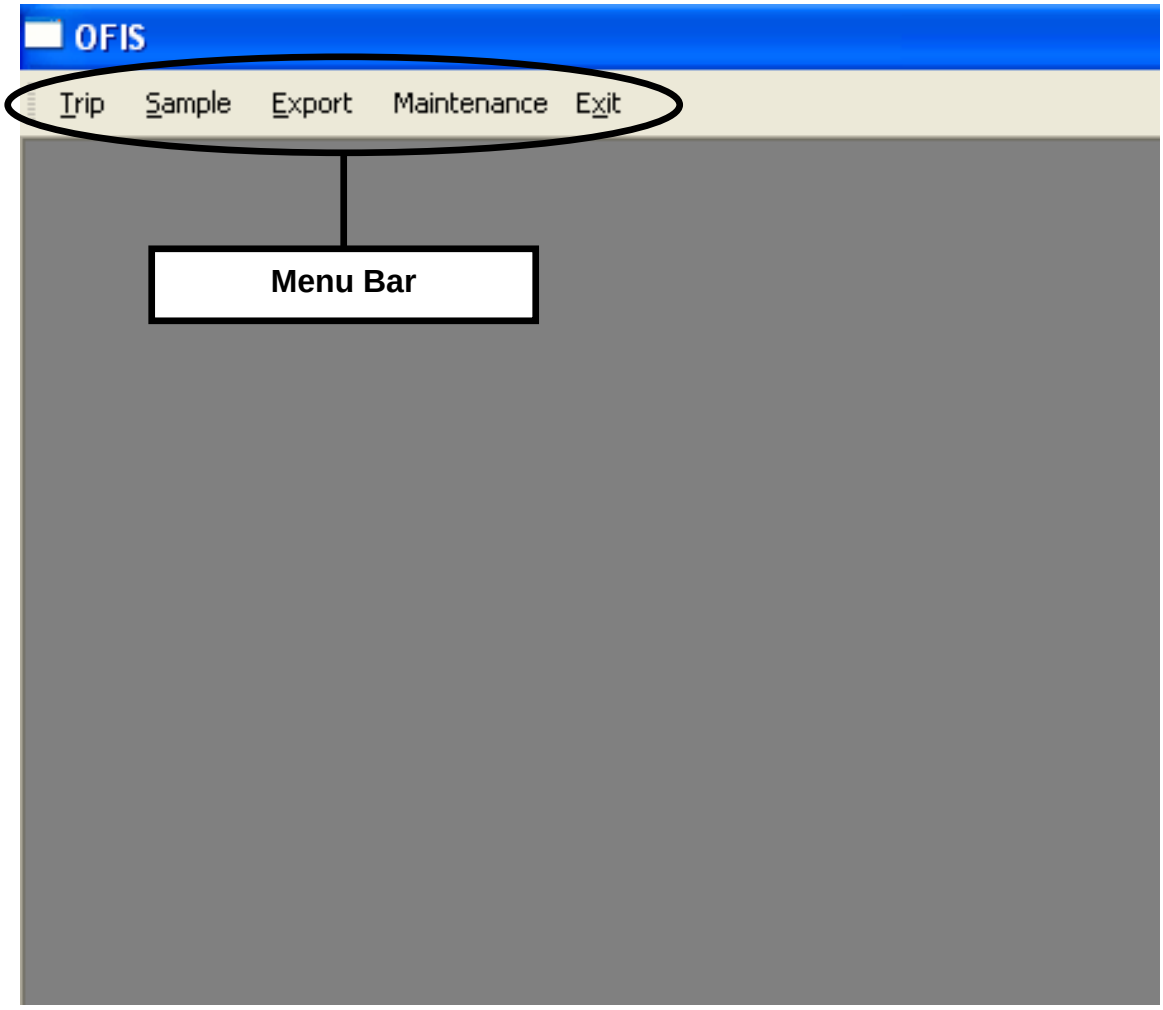
2. Using the Start Menu:
   - Click start in the lower left corner of the display
   - Select "All Programs"
   - Highlight the OFIS option
   - Click on the OFIS icon (green crankbait)

3. Using "My Computer"
   - Click on "My Computer" from the start menu
   - Double click "Local Disk (C:)"
   - Double click the "Program Files" folder
   - Double click the OFIS folder
   - Double click the OFIS Access icon

Main Menu

Database Organization

Previous versions of OFIS were organized via a switchboard containing buttons for navigation through the various forms. Navigation through the current version of OFIS is accomplished through selections on the menu bar like many other word processing and spread sheet applications. However, instead of the standard File, Edit, etc… options, the menu bar in OFIS has been customized for navigation through the database. Options on the menu bar in OFIS are *Trip, Sample, Export, Maintenance,* and *Exit*. Each of these options will be discussed in detail in the following sections.



Main Menu

Trip Option

The first option on the menu bar is *Trip*. All data entry will begin with selection of this option.

Within the *Trip* option you have two choices:

1. *Add – New Trip Data*
2. *Browse – Trip Information*.

The *Add – New Trip Data* option is where data entry begins for a new sampling trip. Selection of this option will bring up the *Trip Entry Form*. The *Trip Entry Form* creates a new trip and records essential meta data from a sampling event such as Project Number, Date, Location, and Target Species.

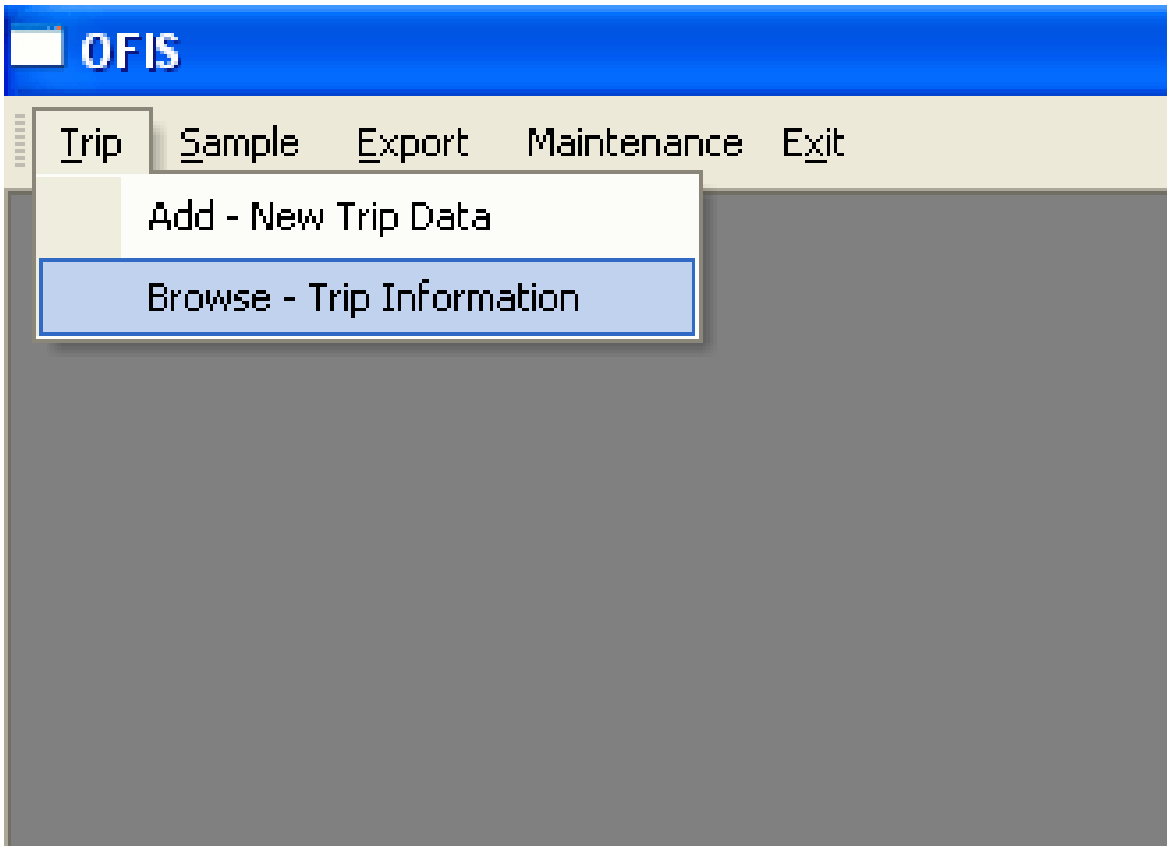
The Browse – Trip Information selection is one of two options a user can select to navigate to data entry forms for trips that have already been created. This option contains the forms for entry of sample and catch data. Additional trip meta data such as crew, designating a trip as an IMS survey, and additional comments can be entered into the trip entry form using this option. This option is the only means by which a user can access the form for entering fish annuli measurements for back-calculating growth. For more information, please refer to the Data Entry section in this manual.

To open a sample file using the Trip option:

1. From the main menu click on Trip and select Browse Trip Information

2. Enter or select the appropriate Trip Sample Type (Fish, Water, Plankton), Project Number, Date and Location.

Notes:


OFIS
Trip
Sample
Export
Maintenance
Exit
Add - New Trip Data
Browse - Trip Information

Main Menu

Sample Option

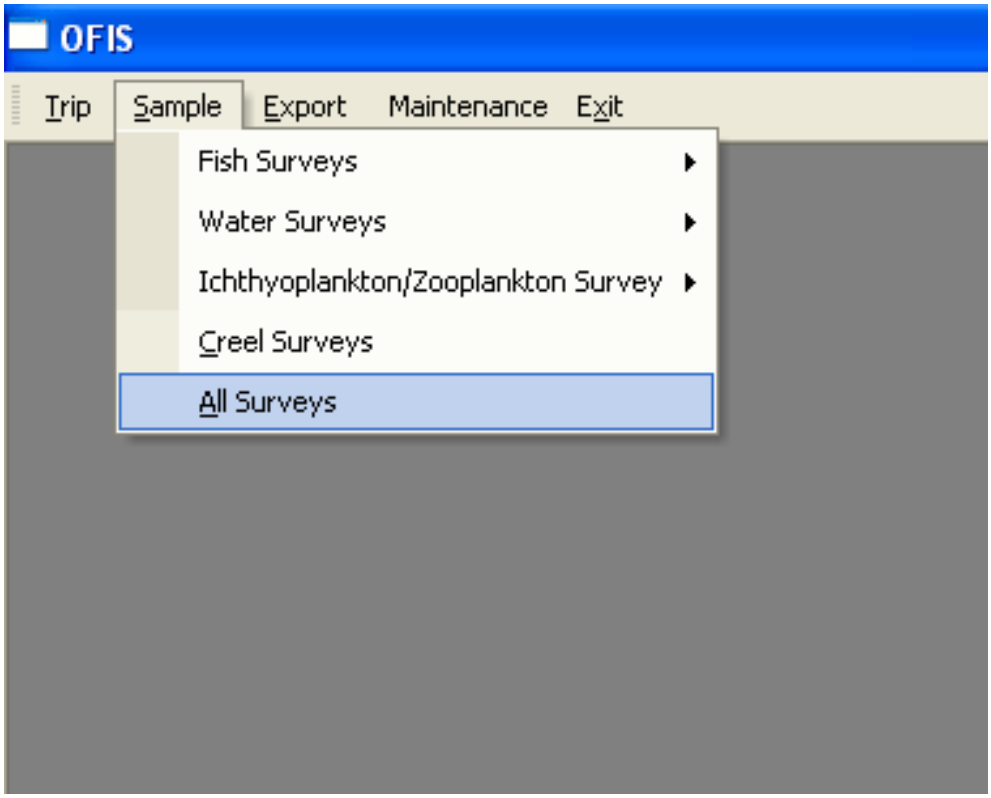
The Sample option is another method of navigating to an appropriate sample for data entry and editing**.** This option allows the user to navigate to a desired sample if the trip meta data has already been completed. This option will take a user directly to the sample, bypassing the Trip Entry Form. If additional meta data or fish annuli measurements need to be entered use the Trip option from the menu bar and select Browse – Trip Information.

To open a sample file using the Sample option:

1. From the main menu select the Sample option

2. Using the mouse move the to the desired survey type (Fish survey – Individual Fish)

3. Enter or click on the appropriate Project Number, Date, and Location



Main Menu

Export Option

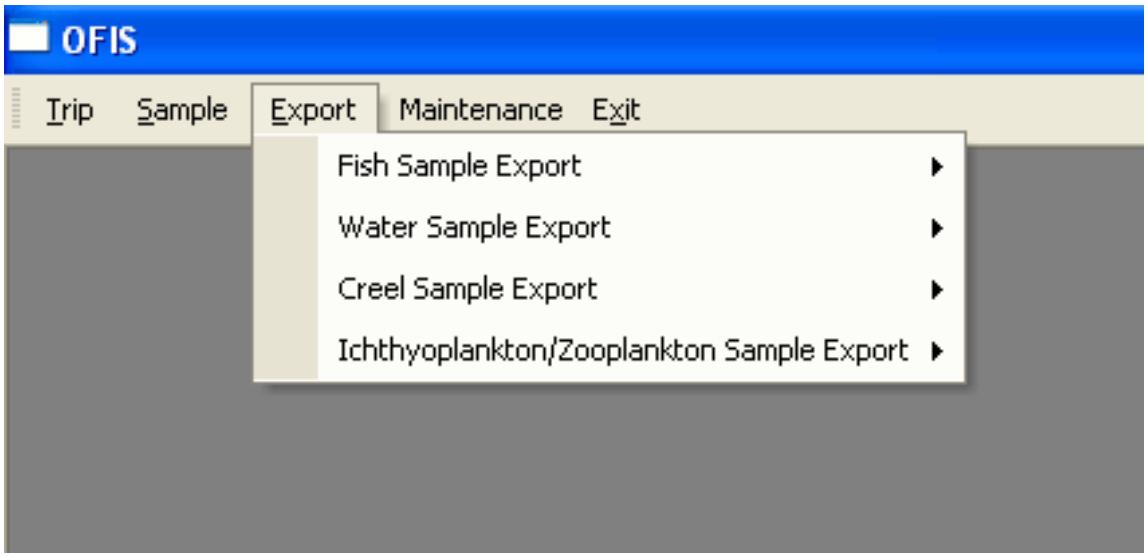
The export option allows a user to export data from OFIS as either a fixed-width (space-delimited) text file or as a spreadsheet. Since data analysis programs are not available within OFIS itself, exporting data for analysis in another software application (SAS) is necessary. The export option is set up much like the Sample option discussed in the previous section.

To export a file:

1. Select Export from the main menu and click on the desired survey type (i.e. Fish Survey; Individual Fish)

2. Type or select the appropriate Project Number, Date and Location

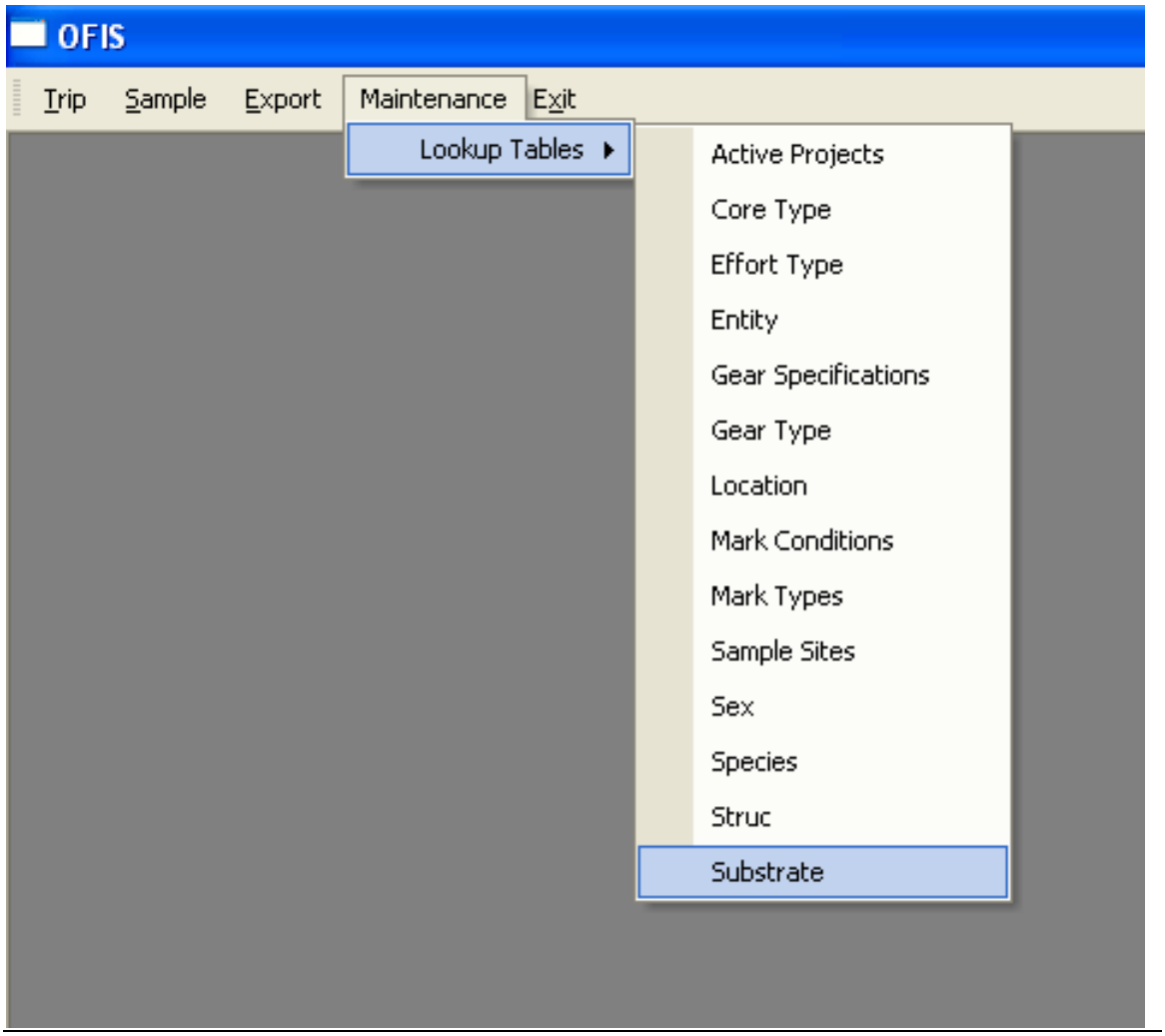
3. Select the desired export format from the Export Preference Box in the upper right hand corner: fixed width text or Excel spreadsheet.



Main Menu

Maintenance Option

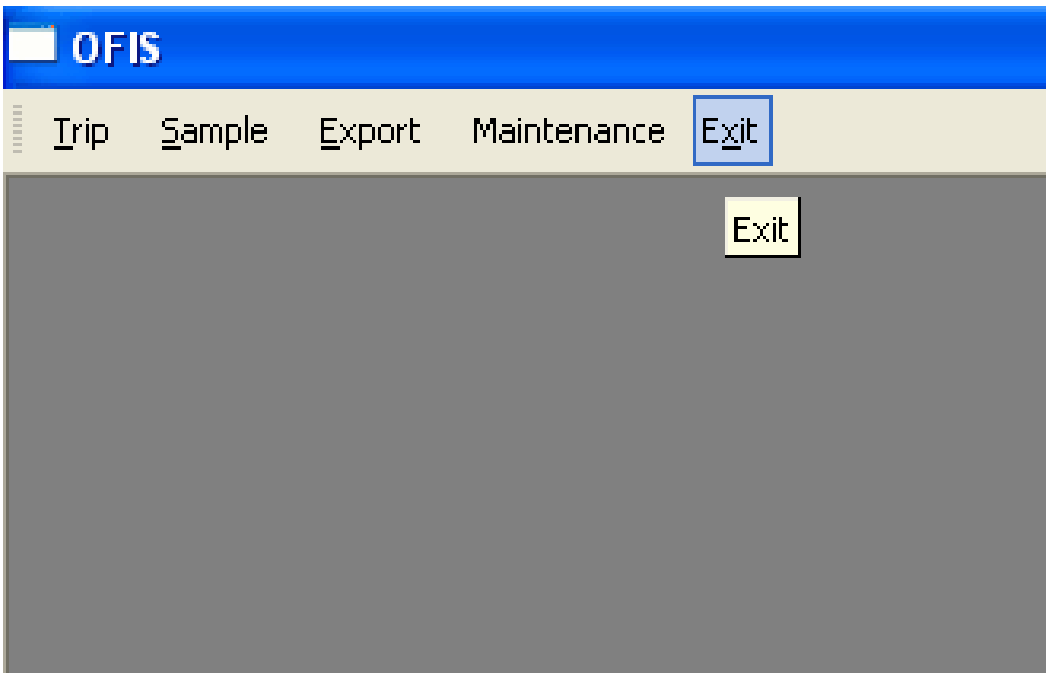
The maintenance option contains the codes tables that correspond to the form variables used in OFIS. These code tables can only be accessed and edited by the Program Manager. Other database users will not see this menu item. **Appendices 1 and 2** contain a complete list of all code tables.



Main Menu

Exit Option

The Exit option closes the OFIS database. The database can either be closed using the Exit option on the menu bar or by clicking the **x** in the upper right hand corner of the screen.

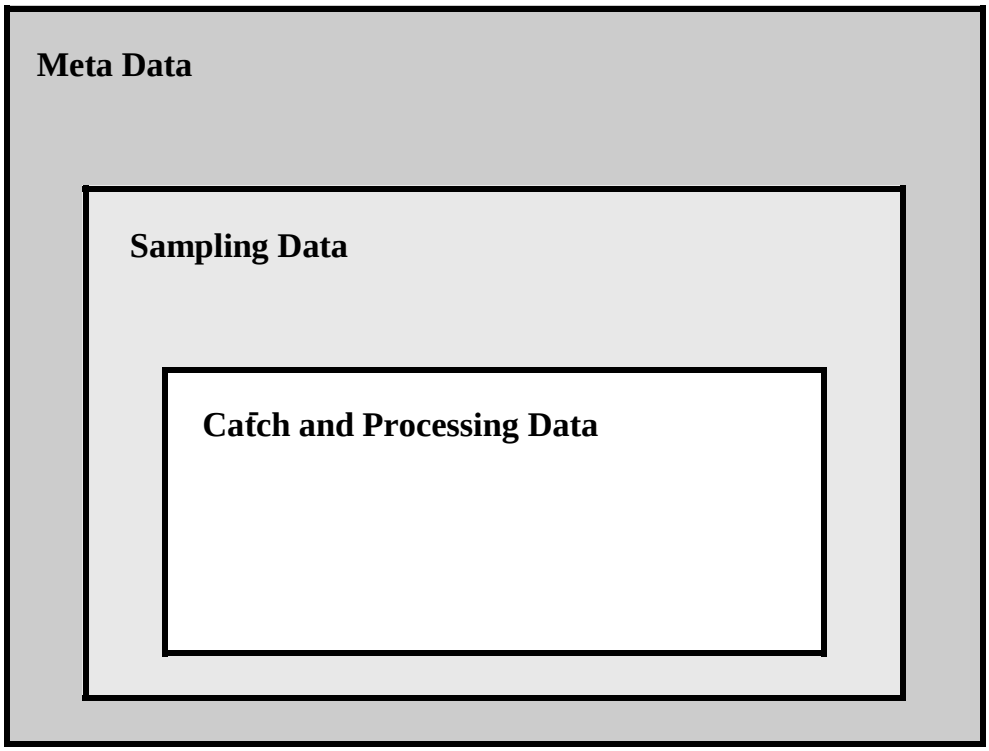


Data Entry Basics

The OFIS database is designed to meet a wide array of data entry needs. Some variables are common to all investigators, such as project number, location, and date, and are entered by all OFIS users, whereas other data are not always collected and are not universally needed. **The presence of a field on a data entry form does not necessarily mean that the field must be populated.** Therefore, some fields are “required fields” and others are “optional fields.”

OFIS forms are arranged with a nested hierarchy. The main form contains trip meta data such as project number, date, and location, which are required for entry of all data. Contained within the Trip form is a sample form for entering sampling details, such as sample number, gear and effort. Nested within the sample form are the processing forms for entering catch or measurements, such as lengths and weights, temperature and DO profiles, and angler interview responses. Processing forms are specific to the type of sampling conducted. Nesting one form with another reduces the amount of redundant data entry, but requires users to pay attention to database hierarchies.

Illustration of the hierarchy used for data entry in OFIS.



Data Entry Basics

Layout

Database forms help users navigate through the database, simplify data entry, and reduce errors. However, it takes an introduction to the layout of the forms to understand the different aspects of them.

At the bottom of the display on the left side of most forms, vertical bars containing an arrow identify each record. These bars are called *Record Selectors*. *Each* form and its nested forms will also have its own navigation buttons.

IT IS CRITICAL TO KNOW WHAT INFORMATION IS CONTAINED WITHIN EACH FORM TO ENSURE THAT SAMPLE DATA ARE ENTERED CORRECTLY.

Notes:

Data Entry Basics

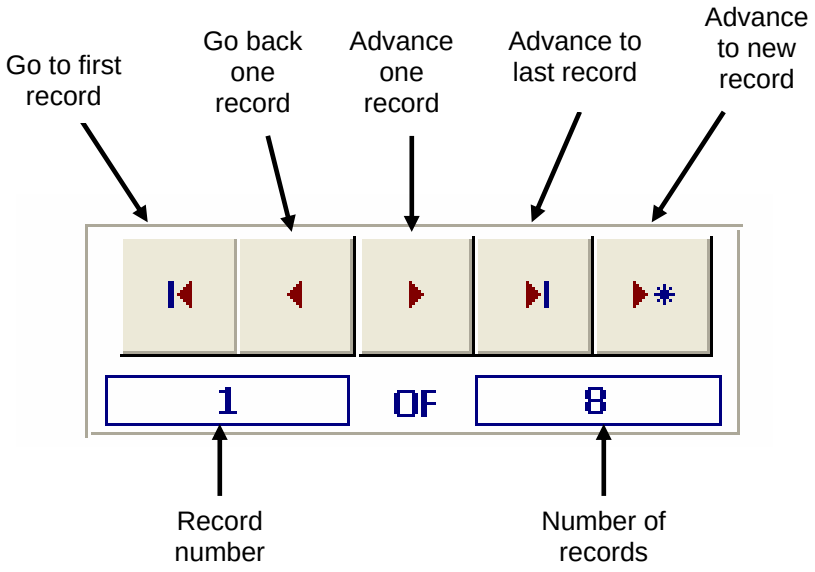
Navigation Buttons and Scroll Bars

Navigation buttons allow for advancing to the next, previous, or new set of records in a form or subform. Depending on the form, one or more sets of navigation buttons may be present. It is important to know which navigation buttons are associated with the different subforms of data within each form to locate specific records and to ensure data are entered properly. The Record Selector (the bar on the left side of each form, subform, and sub-subform) will indicate the various subforms and which navigation buttons are required for their navigation.

Representation of Navigation Buttons used in this manual:

- ▸* advance to a new record
- ▸ advance to the next record
- ▸| advance to the last record
- ◂ return to previous record
- |◂ return to the first record

Navigation buttons on each form and subform.



Data Entry Basics

Data Entry Errors

Anyone that enters data in OFIS will at one time or another enter data incorrectly or encounter a incorrect entry. Some errors will be obvious and the database will notify you of your error by beeping and giving you an error message. If you receive an error message, you cannot continue with data entry or even exit the form until the error is corrected.

In most cases, errors occur because a required field on the form was left blank. Users should clear the error message and correct the data.

In some instances, users will not know where the error occurred and cannot fix the problem. This can be a very frustrating and annoying problem. You do not know what is causing the error so it cannot be fixed, yet you cannot exit the form or a field because the database keeps beeping and giving more error messages.

IF YOU ENCOUNTER AN ERROR AND CANNOT CORRECT IT, USE THE **ESC** KEY ON THE KEYBOARD UNTIL YOU CAN PROCEED.

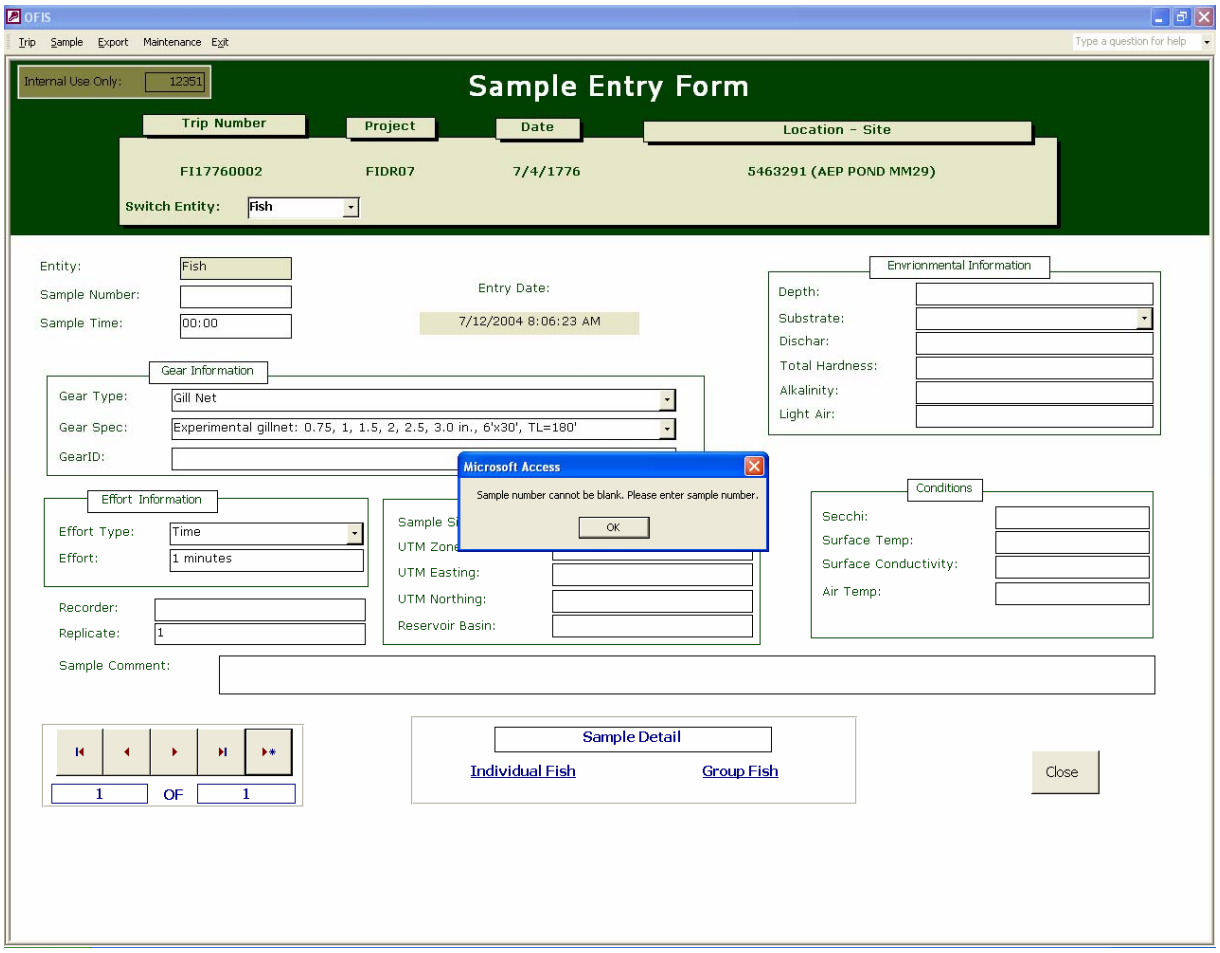
The escape key “undoes” data entry in a record, which then allows you to go back and enter the data correctly.

Likewise, if you catch yourself entering data in the wrong field or record, you can use the ESC key to undo the typing. However, once the record is advanced, it is saved, and the ESC key cannot reset it.

In the lower right corner of several data entry forms there is a button that will delete the current record. This function can be useful if, for example, fish lengths and weights are entered under the wrong sample number.

Notes:

A typical error message. This error occurred because the required Sample Number field was left blank.



Data Entry

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Helpful Hints

Like all computer applications, OFIS has tricks and keyboard shortcuts to make data entry easier and less frustrating.

- <Tab> through records.
  Use the **Tab** key on the keyboard to advance to the next field instead of using the mouse. Some less-commonly used fields require use of the mouse to enter data.
- <Ctrl ’> to copy data forward.
  To copy data from the previous record’s field to the current record’s field, hold down **Ctrl** (Control) and press the **‘** (apostrophe) key.
- Ask for help.
  If you have problems with OFIS, ask for help. Contact your Local OFIS Manager first. Then, if necessary, contact the Program Manager (Rich Zweifel / Scott Hale).

Notes:

Data Entry

Adding New Projects, Locations, or Target Species

New projects, locations, and target species must be added to the database before the corresponding data can be entered. The addition of new codes can only be done by the Program Manager. Coordinating new code additions through the Program Manager is an effort to maintain statewide continuity within the database and avoid confusion when interpreting data obtained from a number of different sources. Sampling trips that do not have a target fish species should be entered as “Non-fish Sampling” (99990).

NOTE: If a code is not presently in the database refer to the protocol section (page 6-1) of the manual.

Notes:

Data Entry

Add Trip Information

A new trip must be added to the database before specific data for the trip can be entered. When combined, four fields are unique to each trip and identify data associated with that sampling trip. These fields link all sampling and processing data for each trip.

- **Project –** Project code from DOW Inservice Document 13
- **Date** – Date of sampling event
- **Location –** Water body name
- **Target -** Species being sought, or "Non fish Sampling" if no fish species is being targeted.

To add a new trip click on *Trip* from the menu bar and select *Add – New Trip Data*. The *Submit Trip Information* form will appear. The project, date location, and target fields are required and must have values entered before you can proceed. Target species should be submitted whenever fish data are being entered. Not all sample data entered into OFIS target a specific species (i.e. water chemistry samples).

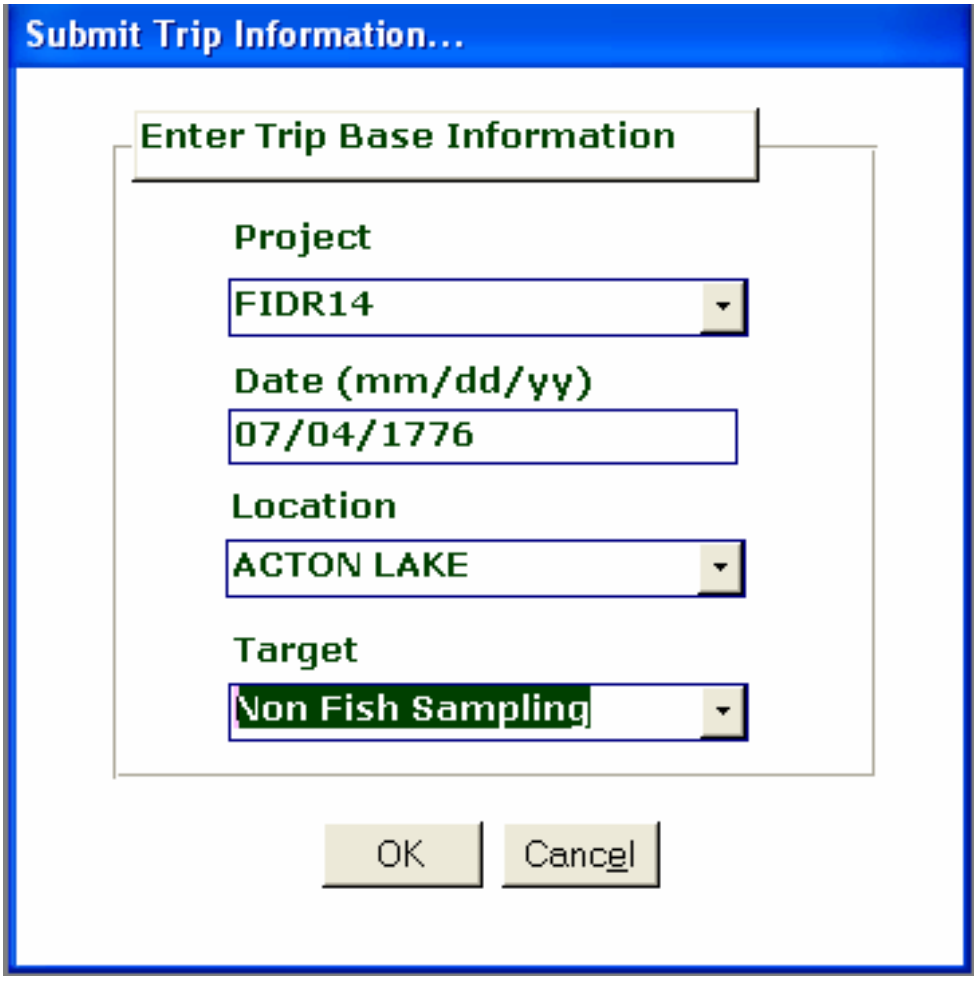
1. Type or select the project number
2. Enter the trip date as numeric month/day/year (mm/dd/yyyy)
3. Type or select the location of the sampling trip
4. Type or select the target of the trip

A list box with all previously added projects, locations and target species is present on the form so users can choose the appropriate selection from the dropdown list.

Hint – It is often easier to begin typing in a dropdown box and allow the box to auto-complete the rest of the name.

NOTE: Think of the Project, Date, Location, and Target fields as ONE unit. **Every unit will be unique**. Therefore, you will **NEVER** enter in the same combination of these data more than once in these fields.

The Submit Trip Information Form is used to create a new trip



Trip Meta Data

Once a new trip has been created, the next step is to provide specific data pertaining to the sampling trip. The Trip Entry Form is where all data entry will begin. Entry of all sample data requires the meta data (Project, Date, Location, and Target) be provided before sample or catch data can be recorded. This form contains fields to enter general information from a specific sampling trip. The Project, Date, Location, and Target specified when the trip was created are displayed and any additional information regarding the sampling trip such as the crew that collected the sample and detail pertaining to the overall purpose of the trip can be entered into this form.

To access the Trip Entry Form:

1. Click *Trip* on the menu bar from the main menu and select *Browse – Trip Information*.

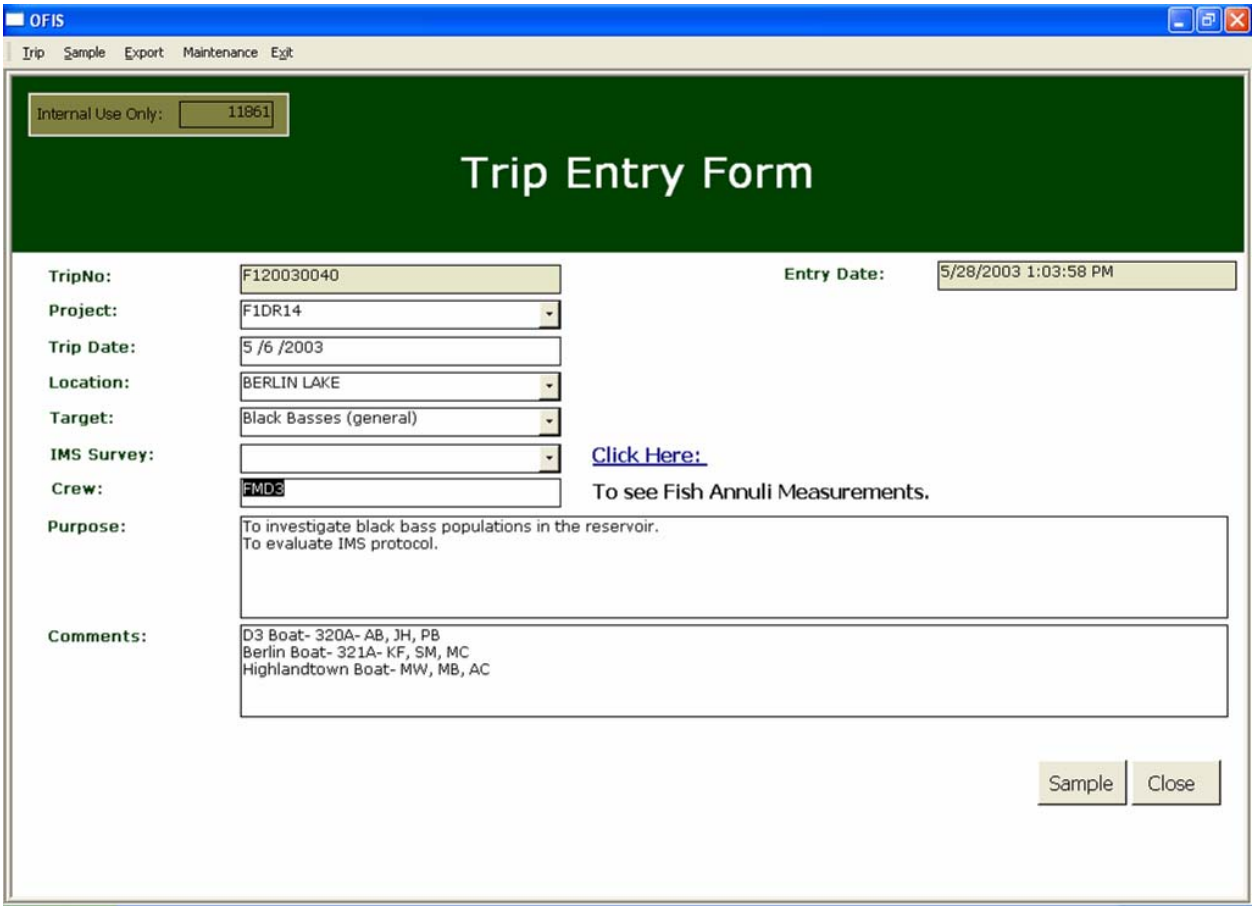
2. Enter or select the desired Trip Sample Type, Project Number, Date, and Location.

3. Double click the desired trip from the list to bring up the Trip Entry Form.

THE *META DATA CONTAINED WITHIN THE TRIP ENTRY* FORM IS THE MOST IMPORTANT FORM IN THE DATABASE. It provides fields to record general information about a sampling trip and specific data about the Project, Date, Location and Target. If data are not entered into this form correctly, all data pertaining to that sampling event will be incorrect.

Notes:

Trip entry form



Variables within the Trip Entry Form

Variable Name	**Description**
TripNo.	Trip number automatically assigned to each new trip.
Project[1]	Project code from DOW Inservice Document 13 (ex. FADR00).
Date[1]	Date of sampling (mm/dd/yyyy).
Location[1,2]	Water body name.
Target[1]	Species or combination of species targeted.
IMS Survey	Was this survey conducted as part of the **I**nland **M**anagement **S**ystem?
Crew	Crew conducting the sampling (ex. WDST2). If desired, names of individuals can be placed in the Comments field.
Purpose	Description of the reason for sampling, if applicable.
Comments	Other comments from sampling trip including names of people sampling, an explanation of gear, weather problems, observations, etc.

[1] required field for data entry
[2] if a desired water body name does not appear in the location list, it must be added by the Program Manager

Sample Entry Form

The Sample Entry Form contains fields to record details about a sampling event (i.e. gear and effort). The form contains two parts 1) the general sampling information, and 2) subforms for the entry of measurement and processing data. The appropriate Trip Meta Data (Project, Date, and Location) is displayed at the top of the screen. Confirm that this information is correct before entering any data. Trip Meta Data cannot be altered in the Sample Entry Form, if this information is not correct close this form and return to the Trip Entry Form. Entry of sampling and catch data are described below.

To open the *Sample Entry Form*:

1. Click the sample button in the lower right hand corner of the Trip Entry Form. Always make sure the meta data are correct before proceeding.

   - or -

2. From the main menu select Sample and click on the appropriate survey type. Type or select the project, date, and/or location. Search for the sample of interest and double click on the sample to activate the sample entry form.

The sampling form includes specific sampling gear, procedure, and effort data. Five fields in the sampling form are required fields for entry of fish, plankton, and water data. The Sample Entry form pertaining to angler surveys differs from that of fish, plankton, and water samples and is discussed in the Angler Survey section below.

The required fields in the Sample Entry form are:

- Sample Number
- Sample Time
- Gear Type
- Gear Spec
- Effort Type

Users cannot proceed with sample data entry until these fields have been populated.

Notes:

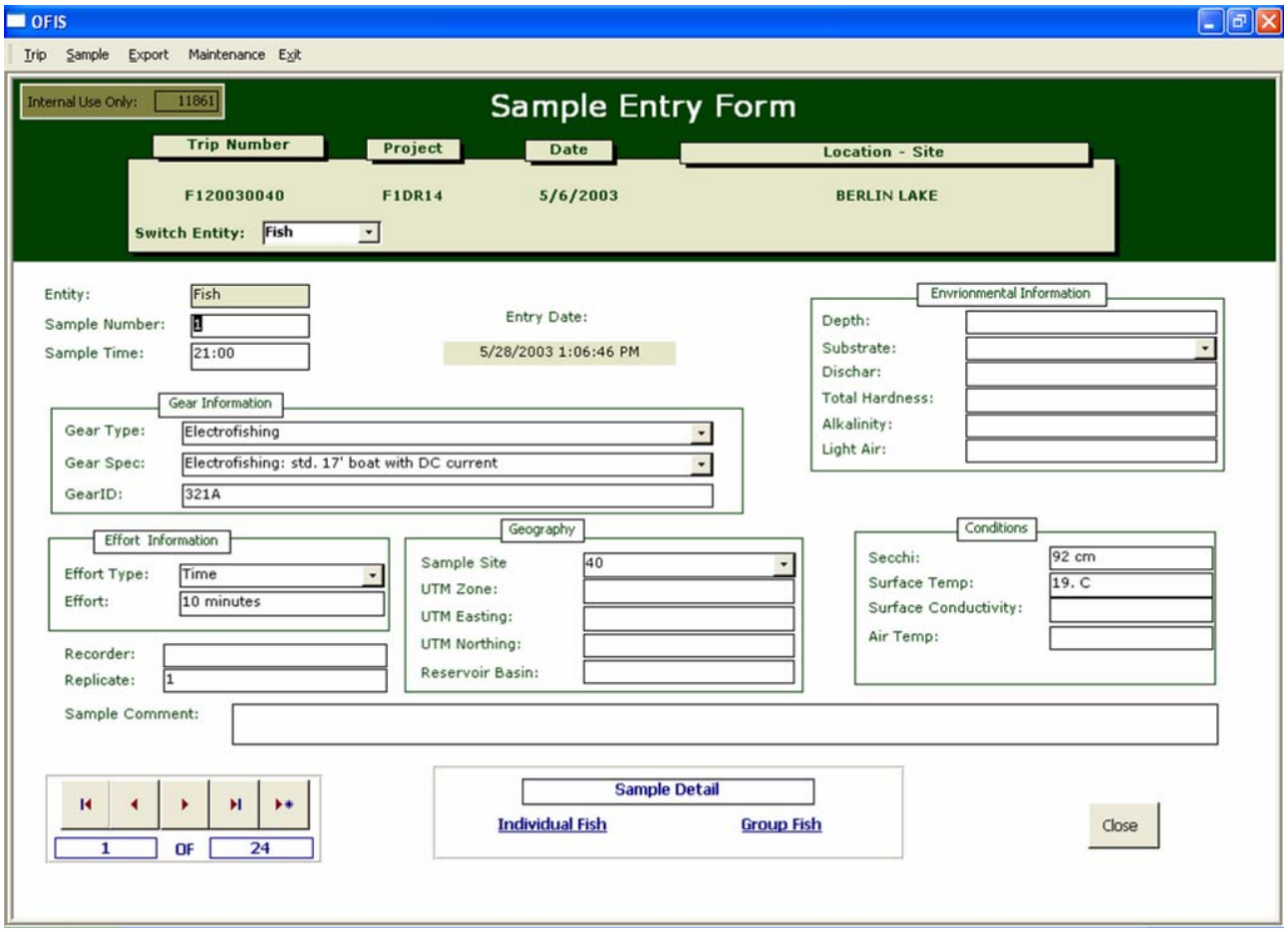
Sample Entry Form

Sample Data Entry Steps

WARNING – DO NOT TYPE OVERTOP OF DATA IN A FIELD UNLESS THAT VARIABLE IS BEING EDITED! IT WILL BE PERMANENTLY DELETED!

1. Select the entity that corresponds with the data being entered from the entity drop-down list. Multiple sample types can be entered for a given trip. For example, temperature and dissolved oxygen profiles associated with fish sampling events.
2. Use the navigation bar to bring up the desired record or select the ▸* button on the navigation bar to add a new record.
3. Enter sampling event details (Sample Number, Gear Type, Effort, etc…) in the appropriate fields. Data must be entered into all required fields for each record before you can proceed.
4. Enter additional sampling records by selecting the ▸* button on the navigation bar. Each sample should be recorded in a separate record. For example, if 10 nets were set on a trip there should be 10 records, one for each net.
5. Close the form by clicking on the close button in the lower right hand corner.

NOTE: It is important to understand when to use the "Effort not measured" option in the Effort Type field. **Effort Type should be entered as "Effort not measured" anytime the effort is not reliable or the data is not intended to be used in CPUE calculations**. Unreliable data includes: bad weather, tampered gear, improperly set gear, etc. The data collected may still be valuable (length-weight, age and growth, etc…), but if used in CPUE calculations, the results would be inaccurate. In addition, "Effort not Measured" should be entered as the Effort Type field for **all water samples.**


OFIS
Trip Sample Export Maintenance Exit
Internal Use Only: 11861
Sample Entry Form
Trip Number
Project
Date
Location - Site
F120030040
F1DR14
5/6/2003
BERLIN LAKE
Switch Entity: Fish
Entity: Fish
Sample Number: 1
Sample Time: 21:00
Entry Date:
5/28/2003 1:06:46 PM
Envrionmental Information
Depth:
Substrate:
Dischar:
Total Hardness:
Alkalinity:
Light Air:
Gear Information
Gear Type: Electrofishing
Gear Spec: Electrofishing: std. 17' boat with DC current
GearID: 321A
Effort Information
Effort Type: Time
Effort: 10 minutes
Geography
Sample Site 40
UTM Zone:
UTM Easting:
UTM Northing:
Reservoir Basin:
Conditions
Secchi: 92 cm
Surface Temp: 19. C
Surface Conductivity:
Air Temp:
Recorder:
Replicate: 1
Sample Comment:
1 OF 24
Sample Detail
Individual Fish
Group Fish
Close

Variables within the Sample Entry form.

Variable Name	Description
Entity[1]	Type of sample collected. Either Angler, Fish, Plankton, or Water.
SampNo[1]	The sample number for each individual gear effort that is consecutive and unique within each Project, Date, and Location.
Stime[1]	Sampling start time in military hours (hh:mm). ex. the time that nets were pulled or electrofishing began.
Etype[1]	Type of sample effort: Time, Distance, Area, Volume, or Effort not measured.
Effort	Total effort used in sampling. Either in minutes, meters, square meters, or cubic meters depending upon the Etype selection.
SampSite	Alpha-numeric code (up to 7 characters) that specifies the location of the Sample Number.
GearType[1]	Category of sample gear auto populated through the selection of GearSpec.
GearSpec[1]	Specific gear used to collect the sample.
GearID	The gear inventory number of the sampling equipment used.
UTM Zone	Number used to identify a specific GPS area on the Earth's surface. Ohio is either Zone 16 or Zone 17.
UTM Easting	East-West coordinates.
UTM Northing	North-South coordinates.
Reservoir Basin	Basin from which the sample was taken.
Depth	Water Depth (m).
Substrate	Type of substrate.
Discharge	Rate of water discharge (m^3).
Total Hardness	Total hardness of the water.
Alkilinity	Alkalinity of the water.
Light Air	Light reading above the surface of the water.
Secchi	Secchi depth (cm).
SurfTemp	Surface temperature of the water (C).
SurfCond	Conductivity on the surface of the water (micro-Siemens).
AirTemp	Air temperature (C).

[1] Required field for data entry.

Fish Catch Data

Entering Fish Processing Data

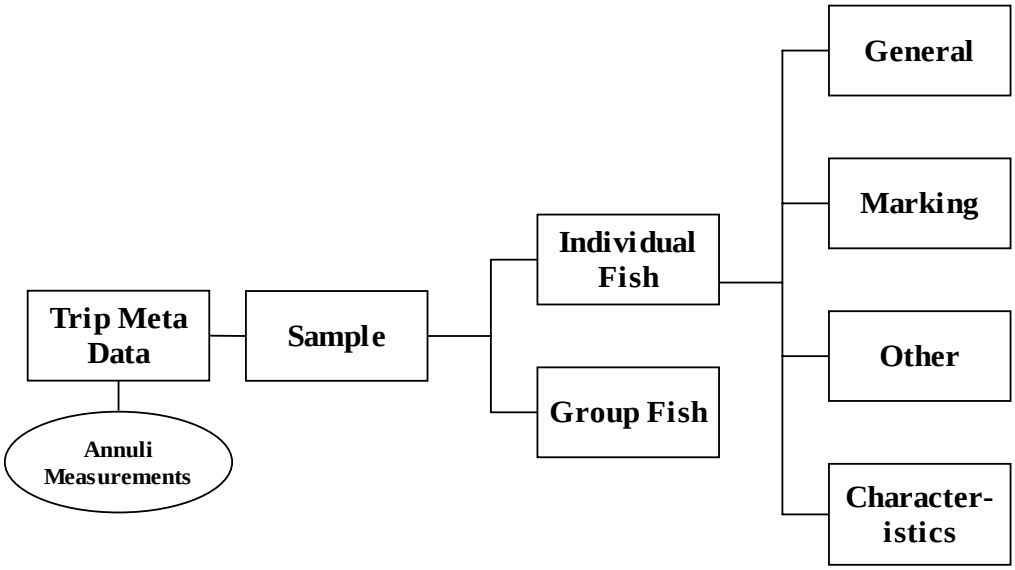
Once the appropriate Trip Meta Data (Project, Date, and Location) and sample number have been selected, catch data can be entered into one of the fish catch forms.

Before entering fish catch data it is important to recognize the most appropriate location for the type of data to be entered. OFIS has been designed to accommodate multiple types of fish data. OFIS has forms to accept species count data, commonly-collected fish data (length-weight), as well as more detailed data that are not collected during most sampling trips (diet, gonad weight, etc…). Data pertaining to individual fish and groups of fish are entered into separate forms.

Locate the *Sample Detail* box at the bottom center of the Sample Entry Form. If the data to be entered involves groups of fish handled in the aggregate (such as counts) click *Group Fish* otherwise click *Individual Fish*. A majority of fish data, including all IMS sample data, will be entered using the *Individual Fish* option.

Notes:

Organization of fish data entry forms.



Individual Fish

The Individual Fish Sample Form contains four sub-forms.

1. General – Catch data recorded in this form are from individual fish collected in each sample. These data include FishID, species, length and weight measurements, age, and sex / maturity. If annuli measurements are to be entered, FishID, species, and age fields in this form are required. Annuli measurements can be entered by clicking on “Click Here: To see Fish Annuli Measurements” in the Trip Entry Form. Annuli measurements are discussed further below.

2. Marking – This form should be used when fish were given some type of mark but measurements of individual fish were also recorded. Marks can either be unique (e.g. numbered tags) or batch markings (e.g. fin clips). For examples of recording tagging data, See Appendix 5.

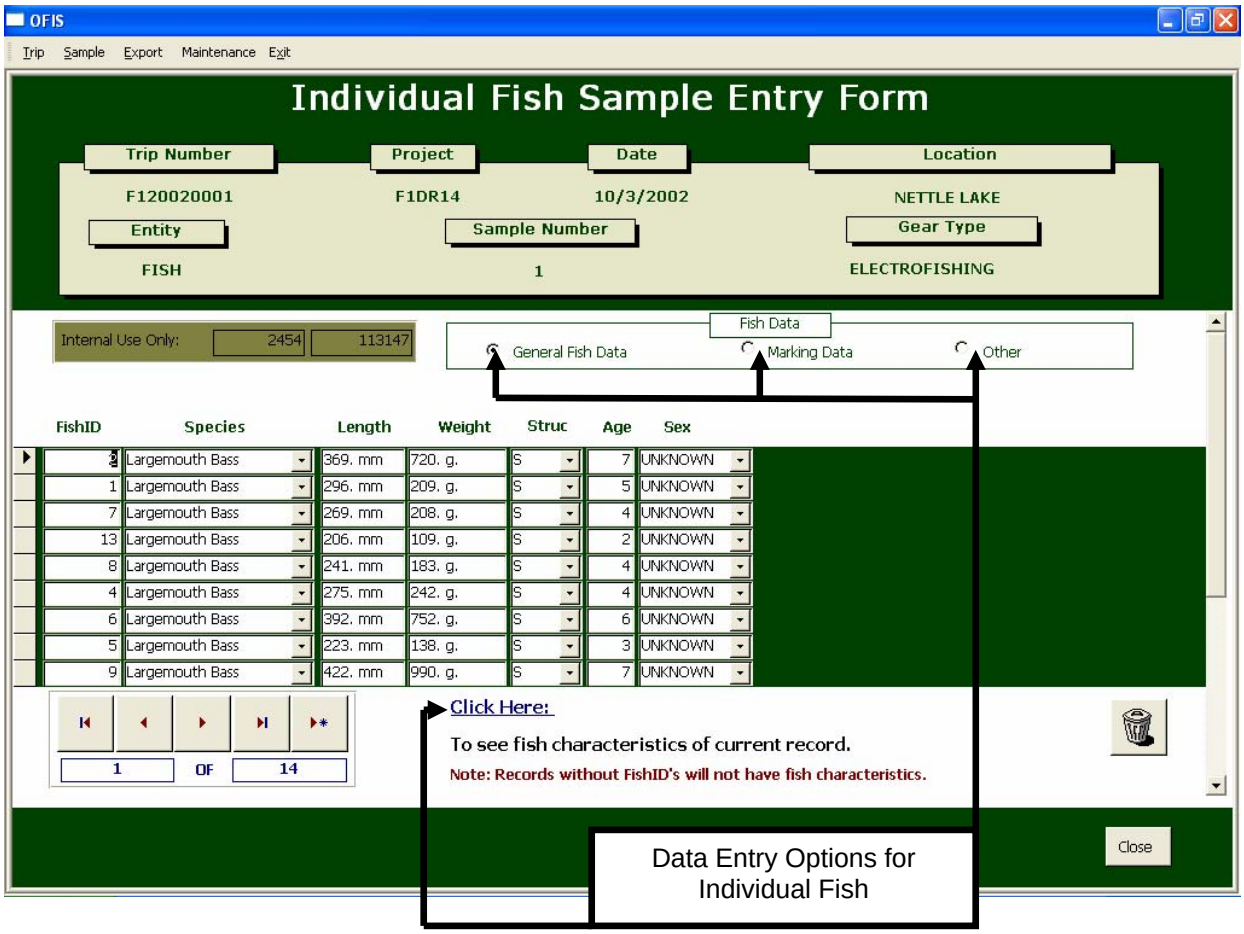
3. Other - This form allows for entry of additional information pertaining to individual fish. Data pertaining to gonad measurements, caloric density, weight of stomach contents, etc... can be entered into this form.

4. Fish Characteristics – This form contains data on individual fish measurements at an even finer resolution than #3. Data such as frequency and size of specific diet taxa can be entered into this form.

NOTE: If a sample caught no fish, enter the Individual Fish form and place a space (press space bar once) in the FishID field and select “No Target Species” in the species field. Do not enter data in any other field. The space will allow the CPUE calculations to account for no fish.

Notes:

Individual Fish Sample Entry Form, showing the general data option.



General catch data variables within the Individual Fish Sample Entry form.

Variable	**Description**
FishID[2]	A fish identification number unique within a Project, Date, and Location regardless of species or sample number. These numbers tend to be most useful when they are consecutive and continue from the previous sample number, although this is not required. This number is assigned at the time of the sample.
Species[1,2]	Species of fish collected.
Length	Total length of fish (mm).
Weight	Wet weight of fish (grams).
Struc[2]	Structure used to determine fish age.
Age[2]	Age in years.
Sex	The sex of the fish.

[1] Required field for data entry.
[2] Additional fields required for entering annuli measurements.

Marking variables within the Individual Fish Sample Entry form.

Variable	Description
FishID	A fish identification number unique within a Project, Date, and Location regardless of species or sample number. These numbers tend to be most useful when they are consecutive and continue from the previous sample number, although this is not required. This number is assigned at the time of the sample.
Species[1]	Species of fish collected.
Type	Type of mark given to a fish.
Recap	Mark observed on a recaptured fish.
Condition	Condition of the fish when released.
Prior	Four-digit year (yyyy) followed by two-digit mark type (e.g. 199902 = 1999 right pelvic clip).
Capture	Number of times the fish has been recaptured .
Tag	Unique alpha-numeric identifier on the first tag.
Tag2	Unique alpha-numeric identifier on the second tag .
TransNo	Transmitter number.
Translife	Expected transmitter battery life.

[1] Required field for data entry.

“Other” variables withing the individual fish sample entry form.

Variable	Description
FishID	A fish identification number unique within a Project, Date, and Location regardless of species or sample number. These numbers tend to be most useful when they are consecutive and continue from the previous sample number, although this is not required. This number is assigned at the time of the sample.
Species	Species of fish collected.
GonadWeight	Weight of both gonads in grams.
OvDryWeight	Dry weight of ovaries in grams.
DietDryWeight	Dry weight of stomach contents.
Calories1	Whole-fish caloric density – replicate 1.
Calories2	Whole-fish caloric density – replicate 2.
OFileName	
DFileName	
Age in Days	Age of a larval fish in days.

[1] Required field for data entry.

Annuli Measurements

The Annuli Measurements form is used for recording annuli measurements for back calculation of growth rates. Annuli measurement data can be entered once the catch data in the Individual Fish Sample Entry Form has been completed.

As with all other data entry forms, select the appropriate trip Meta Data (Project, Date, Location) from the Zipbox before entering any data.

Fish Age and Growth Data Entry Steps

WARNING – DO NOT TYPE OVERTOP OF DATA IN A FIELD UNLESS THAT VARIABLE IS BEING EDITED!

To enter annuli measurement data:

1. Select Trip from the menu bar and click on Browse – Trip Information.
2. Select the appropriate Meta Data from the *Zipbox* to bring up the Trip Entry Form.
3. In the center of the Trip Entry Form click where it says:

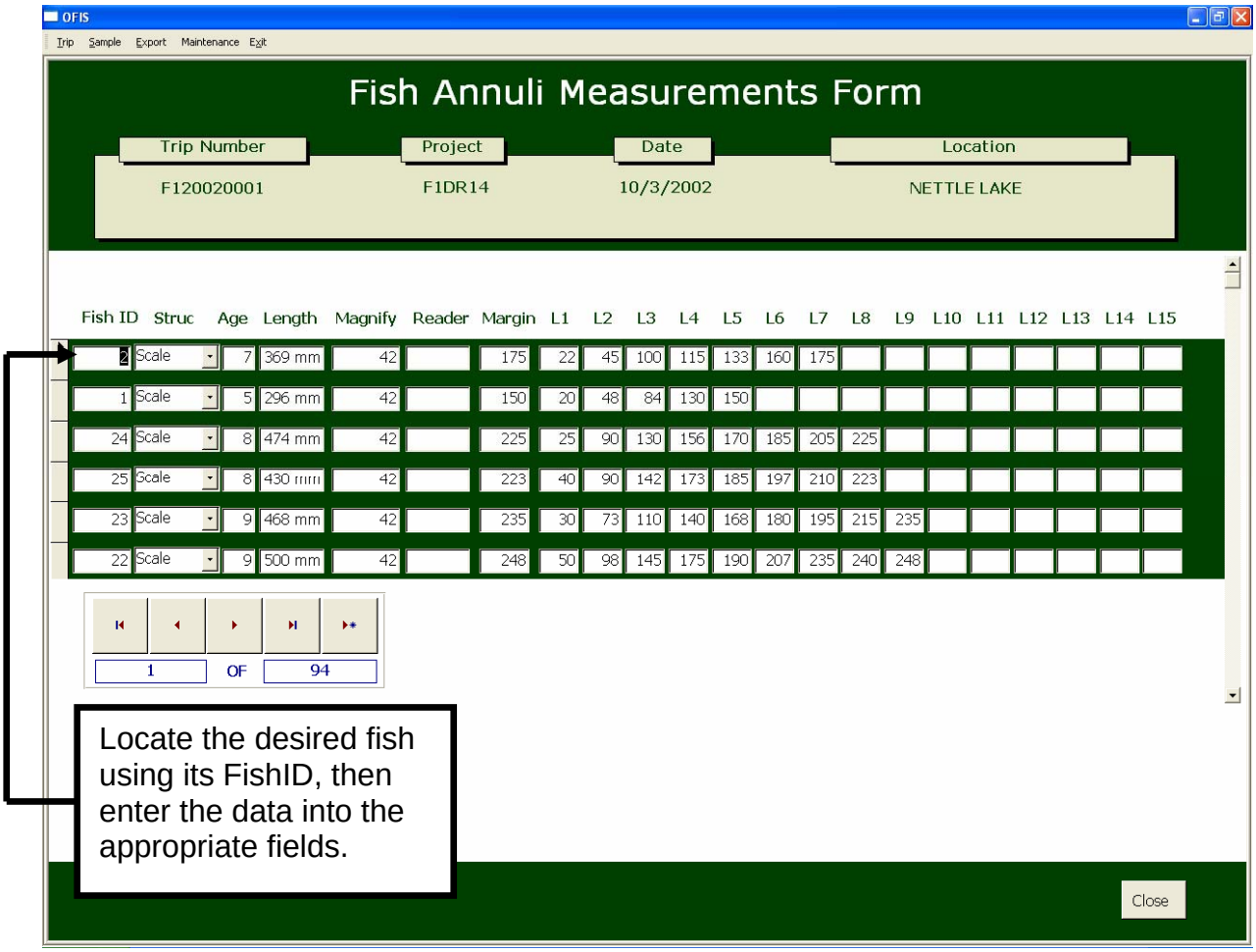
   "Click here:

   To see Fish Annuli Measurements"
4. All *FishID, Length*, and *Struc* data previously entered in the Individual Fish Sample Entry Form will automatically appear in this form. Use the navigation buttons and scroll bar to locate the appropriate fish record FishID.
   a. Edit or add annuli measurements for the corresponding FishID.
5. Close the form.

HINT: To order records for easy location place the cursor in the FISHID field, right click, and select "sort ascending".

Notes:

Fish annuli measurements form



Variables associated with the Annuli Measurements form.

Variable Name	**Description**
FishID[1]	Fish identification number unique within a Project, Date, and Location regardless of species or sample number. This is the same ID as in the catch data on the Individual Fish Sample Entry form.
Species[1]	Species of fish as recorded in the Fish Sampling and Catch Form.
Length[1]	Total length in mm.
Struc[1]	Structure used to age the fish.
Magnify	Magnification used to read the annuli measurements.
Reader	Initials of the person who read the aging structures.
Age[1]	Age of the fish in years. Age equals the total number of annuli present and assumes the fish hatched on January 1.
Margin	Measurement from the focus to the margin.
L1 – Lx	Measurement of each consecutive annulus from the focus.

[1] Auto populated from previous data entry in the Individual Fish Sample Entry form.

Group Fish

The Group Fish Sampling Form is similar to the Individual Fish Sample Entry form except that it is used for entry of data for fish that have been grouped or subsampled. The most common use of the Group Fish Sampling Form is for quadrat rotenone sampling, but it can also be used if subsampling is necessary.

Individual fish within a group will have no weights or measures associated with them. Instead, only the overall group characteristics are recorded.

Like the Individual Fish Entry Form trip metadata and sample information must be recorded before data can be entered into the Group Fish form. The Individual Fish Sample Entry form and the Group Fish Sample Entry form are accessed from the same Sample Entry form for given trip Meta Data. This makes it possible to have both group fish data and individual fish data for the same sample as long as the Sample Number is the same in both forms. If Group Fish data are from a different sample, be sure to enter a different Sample Number in the Sample Entry form.

NOTE: If each fish has a corresponding weight and length then the data should be entered into the Individual Fish Sample Entry form.

Notes:

Group Fish

Group Fish Sampling Data Entry Steps

To enter data into the Group Fish Sample Entry Form:

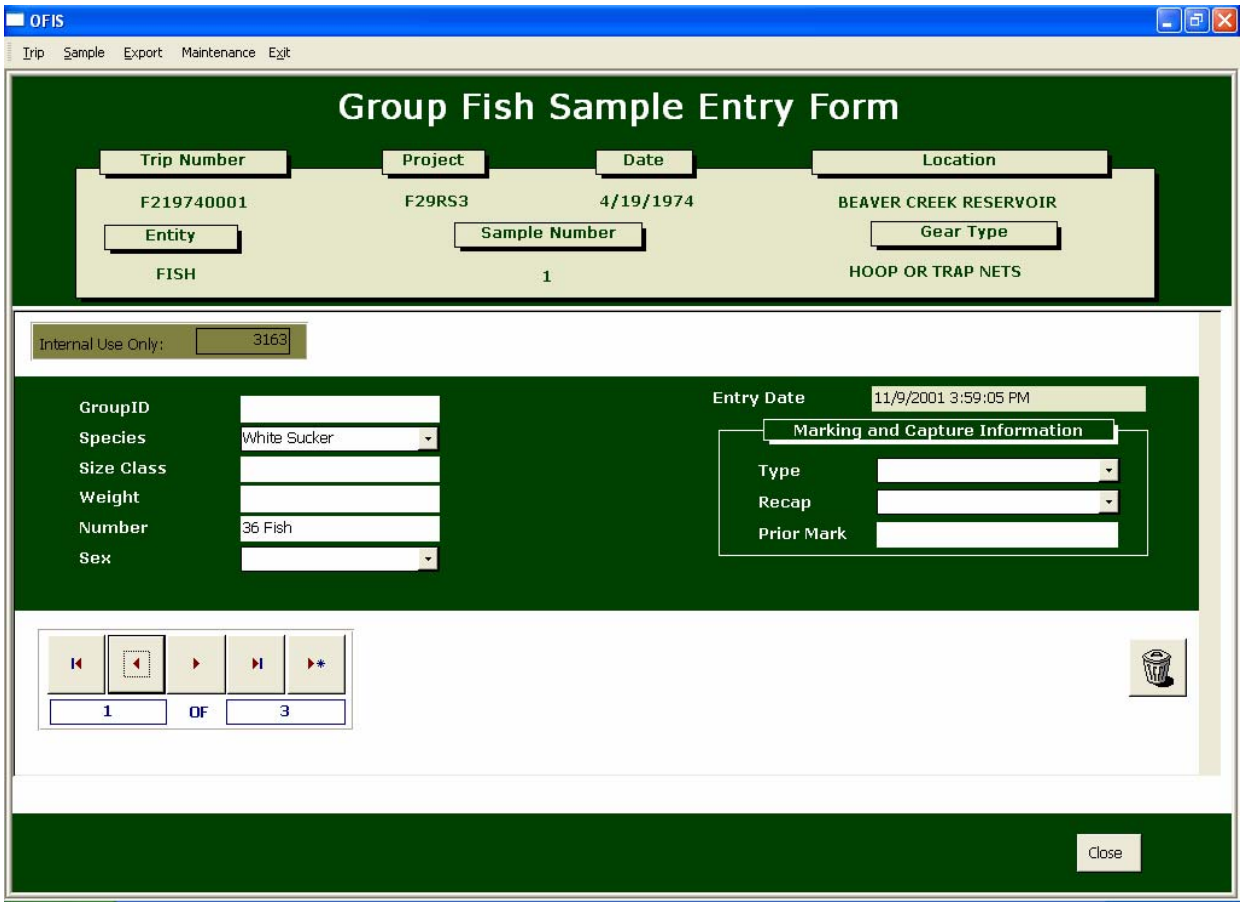
WARNING – DO NOT TYPE OVERTOP OF DATA IN A FIELD UNLESS THAT VARIABLE IS BEING EDITED!

To enter data:

1. From the Sample Entry Form click on the Group Fish option in the sample details box at the bottom center of the form.
2. Use the navigation buttons to enter a new record or to locate the appropriate sampling record.
3. Enter group data in the corresponding fields.
4. Click on the close button in the lower right corner to close the form.

Notes:

Group Fish Sample Entry form



Sampling variables within the Group Fish sampling form.

Variable Name	**Description**
GroupID	Unique group fish identification number within a sampling trip regardless of species or sample number.
Species[1]	Species of fish.
Size Class	The size class of the grouped fish (mm).
Weight	Total weight of the group (g).
Number[1]	Number of fish in the group.
Sex	Sex of the fish in the group.
Type	Type of mark given to a fish.
Recap	Mark observed on a recaptured fish.
Prior Mark	Four-digit year (yyyy) followed by two-digit mark type (e.g. 199902 = 1999 right pelvic clip).

[1] Required field for data entry.

Water Sampling

The water sampling forms are for entry of water quality variables such as temperature and dissolved Oxygen. Other water quality variables such as conductivity, chlorophyll$_a$, nitrogen, and phosphorous can be entered in these forms as well.

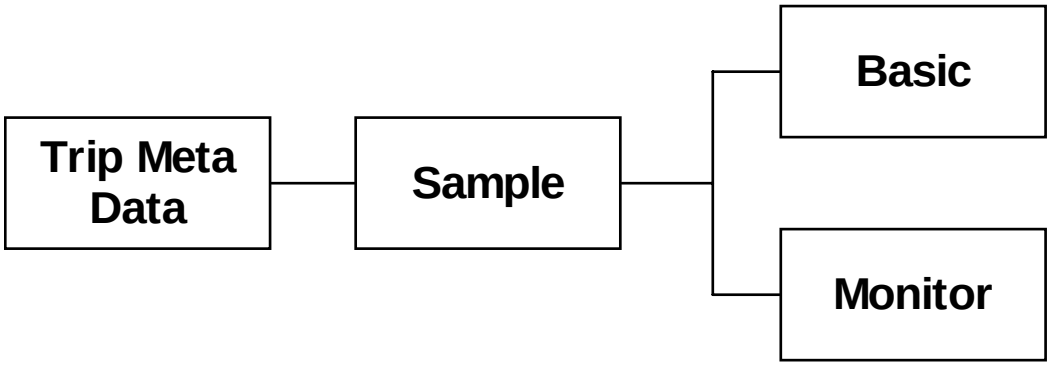
The benefit of the water sampling component in OFIS is its capability to accept depth-specific water quality measures. Water sampling data are entered in the same manner as for the fish data in that sample measurement/processing data can only be entered after the Trip Meta Data and Sample data have been completed.

OFIS will accept both stand alone water sampling data and water sampling conducted in association with another sampling event, such as temperature and DO profiles taken during fish sampling. Secchi depth, surface temperature, surface conductivity, and air temperature measurements taken during fish sampling events should be entered into the Sample Entry form corresponding to the fish sampling information.

There are two forms associated with water samples: 1. Basic Water Sampling, and 2. Water Monitoring. The Basic Water Sample form is for the entry of depth specific water quality measurements such as temperature and dissolved oxygen profiles. The Water Monitor Sample form is for the entry of multiple water quality measurements from the same site over time, such as on-site monitoring stations (hobotemp data).

NOTE: "Effort not measured" should be entered in the Effort Type field in the Sample Entry form for all water samples.

Organization of water sampling data entry forms



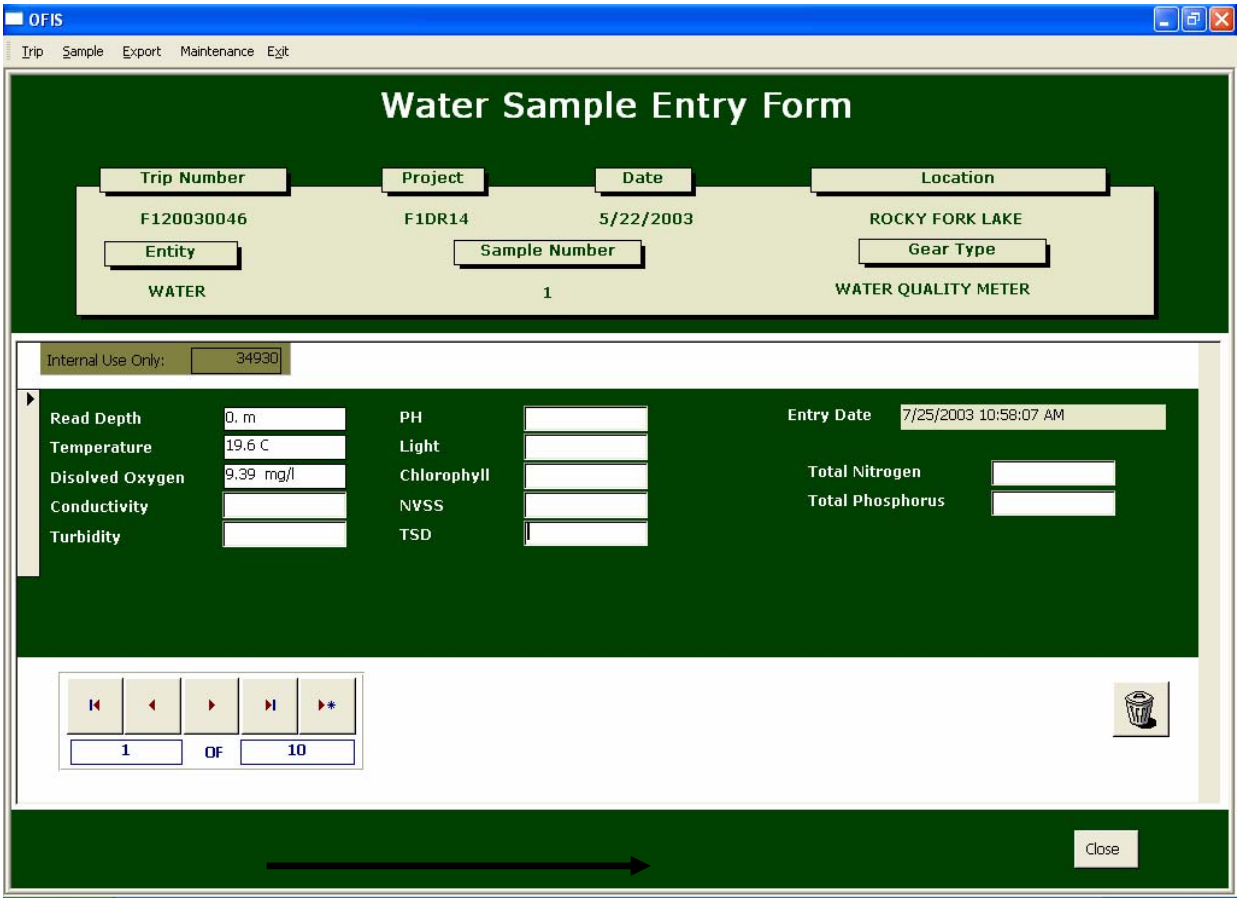
Water Sample Entry Form

To enter depth-specific water measurements in the Water Sample Entry form:

1. Select the appropriate trip meta data (Project, date, and location) to access the desired sampling trip.
2. Use the navigation bar to select the appropriate sample number or click on the ▸* button to add a new sample. If the water sampling data are associated with another sampling trip (fish sampling) switch the entity to *Water*, and enter the sampling information in the required fields.
3. Enter all required sample data.
4. Click on Basic Water in the Sample Details box at the bottom center of the Sample Entry Form.
5. Enter the depth (meters) the water sample was taken in the Read Depth field and water measurement data into the corresponding fields. Read Depth should be entered as 0 for water samples taken at the surface.
6. Click the ▸* button on the navigation bar to add a new record for each depth-specific measurement. For example, if measurements were taken at 1m intervals from the surface to 5m then six records are required for entry of the entire profile (0, 1, 2, 3, 4, and 5 m).
7. When all data have been entered click on the close button to close the form.

Notes:

Basic Water Sample Entry Form for entry of depth-specific measurements.



Variables within the Water Sample Entry form.

Variable Name	**Description**
Read Depth[1]	Depth (m) water sampling was conducted.
Temperature	Temperature in degrees C, to the tenth decimal place.
Dissolved Oxygen	Dissolved oxygen, in mg/L, to the hundredth decimal place.
Conductivity	Conductivity as micro-Siemens (µS).
Turbidity	NTU's in whole numbers.
PH	pH to the tenth.
Light	Light intensity as micro-moles per second per square meter (µmoles/s/m^2).
Chlorophyll	$Chlorophyll_a$ in micrograms per Liter (µg/L).
NVSS	Non-Volatile Suspended Solids in milligrams per liter (mg/L).
TDS	Total dissolved solids in milligrams per liter (mg/L).
Total Nitrogen	Total nitrogen concentration of the water in micrograms per liter (µg/L).
Total Phosphorous	Total phosphorous concentration of the water in micrograms per liter (µg/L)

[1] Required field for data entry.

Water Monitoring Entry Form

The water monitor form is for string data from repeated samples at the same site over time. This form is intended to house streams of data logger (hobotemp) data and would be used to browse rather than enter data. Protocols for uploading streams of water monitor data will be provided in the future.

Notes:

Plankton

The plankton sampling forms pertain to zooplankton or icthyoplankton sample processing data (hereafter referred to as plankton). Plankton data are handled much the same as fish data. OFIS can accommodate either course-grain processing data such as frequency or fine-scale data such as individual lengths and egg counts.

Like fish data, plankton data are entered as either groups or individuals. However, in contrast to fish data, most plankton data will be entered into the group entry form. Plankton samples often capture too many individuals to count and measure each organism, thus enumerating only a random subsample is common practice. Therefore the calculation of CPE for plankton and fish should be handled differently as well. Plankton CPE should be calculated only from the counts provided in the group entry form not from a combination of the individual and group forms. The individual entry form is for the generation of plankton size structure only.

Notes:

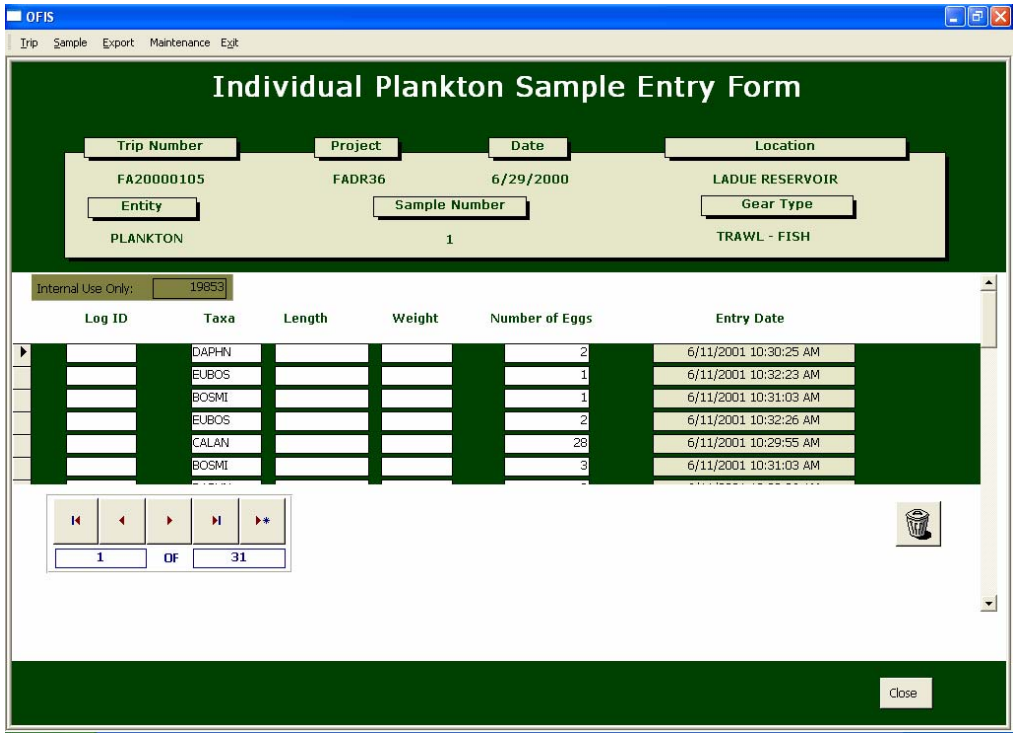
Individual Plankton

The Individual Plankton Sample Entry Form is for entering taxa-specific measurements of length, weight and fecundity from individual plankters. Data entered into this form pertain exclusively to measurements of individuals, for size structure or fecundity/production calculations. This form should not be used to enter data for calculation of CPE. CPE data should be entered into the Group Plankton Sample Entry Form.

Since taxonomic resolution of plankton samples is dependent on the objectives of the study, taxa names for plankters are left to the discretion of the investigator. Often, plankters are only identified to genus (*Daphnia* spp., *Bosmina* spp.), but some researchers may find it necessary to differentiate between species. When entering plankton data please use logical taxonomic delineations that can be easily interpreted. Examples of taxonomic names currently being used are provided in appendix 2.16. Try to keep as much consistency between studies as possible.

Notes:

Individual Plankton entry form



Variables associated with the Individual Plankton Sample Entry Form.

Variable	**Description**
Log ID	Unique identification number.
Taxa	Taxonomic delineation.
Length	Plankter length in mm.
Weight	Plankter weight in mg.
Number of Eggs	Number of eggs borne by a plankter.

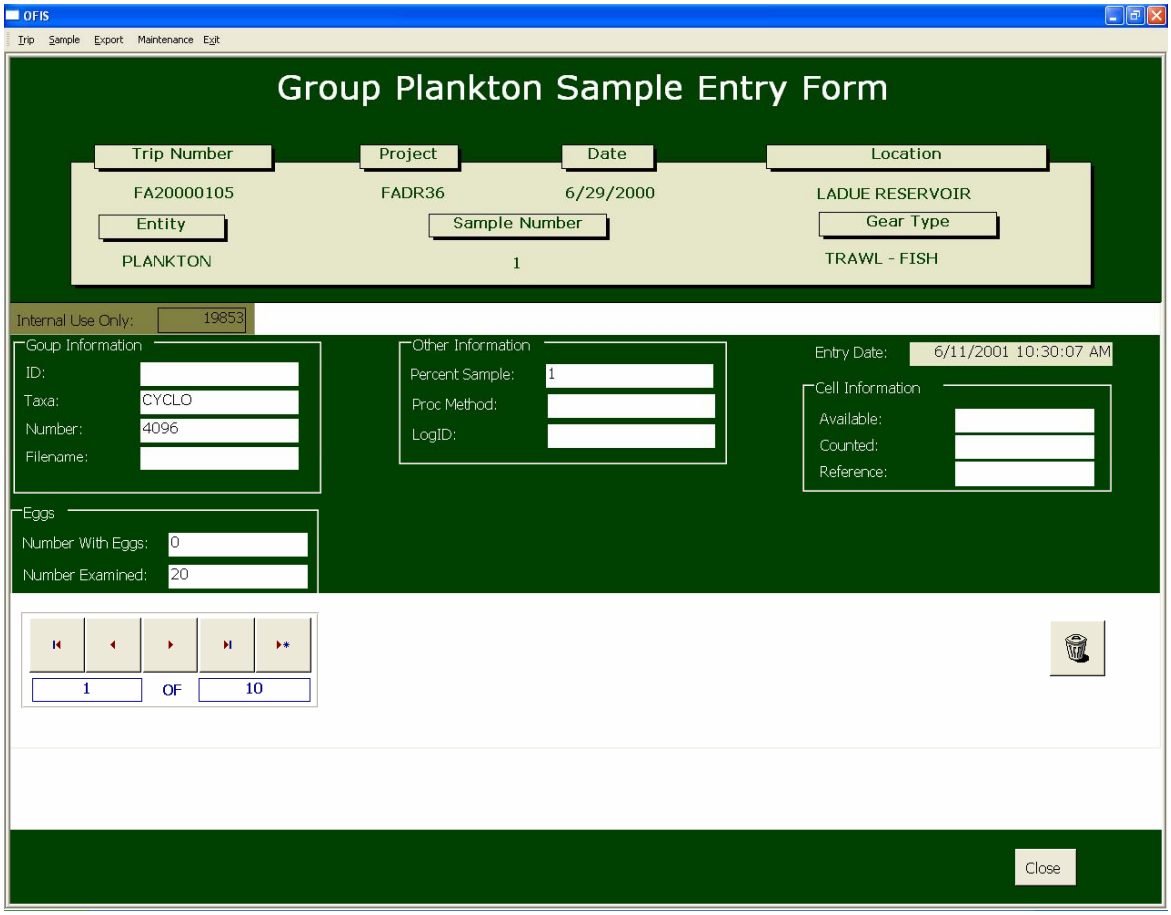
Group Plankton

The Group Plankton Sample Entry Form is for data pertaining to taxa-specific maturity, subsampling methods, and count data for the calculation of CPE.

As for the Individual Plankton Form taxonomic delineations are left to the discretion of the investigator. However, when entering plankton data please use logical taxonomic delineations that can be easily interpreted. Examples of taxonomic names currently being used are provided in appendix 2.16. Try to keep as much consistency between studies as possible.

Notes:

Group Plankton entry form



Variables associated with the Group Plankton Sample Entry Form.

Variable	**Description**
ID	Unique identification number.
Taxa	Taxonomic delineation.
Number	Frequency of taxa occurrence.
Filename	
Number with eggs	Number of individuals observed bearing eggs.
Number examined	Number of individuals examined for eggs.
Percent Sample	Percent of the total sample enumerated.
Proc Method	Method used to extract subsample.
Log ID	
Available	
Counted	
Reference	

Angler Sampling Form

The angler sampling form in OFIS was designed to accept data from annual angler surveys conducted by the Division of Wildlife. The angler Sample Entry form can accept instantaneous counts, angler catch statistics, and responses to interview questions.

Like the Sample Entry forms for fish, plankton and water samples, angler data cannot be entered until a trip has been created for each sampling day. Angler survey trips will always be created using project number FIDR01 and No Target Species (99998) as the target.

There are three required fields for entry of records into the Angler Sample Entry form as well.

Required fields for entry of angler data:

Sample Number
Sample Time
Survey Type

After the survey type has been selected (Interview or Count) the fields associated only with that type of data are available for data entry. Additional angler survey data are entered by clicking on the various options within the Sample Entry form rather than entering data into sample subforms as with fish, plankton and water samples.

Notes:

Angler Sampling Form

Angler data entry

To enter angler data:

1. Create a new trip by clicking Trip from the menu bar and select Add – New Trip Data. A new trip must be created for each survey day.
   a. Type or select the appropriate Project, Date, Location and Target. Project number will always be FIDR01 and Target will always be No Target Species.

2. From the menu bar select Trip and click on Browse – Trip Information.
   a. Type or select the desired trip metadata (project FIDR01, date, and location) and double click the appropriate trip.

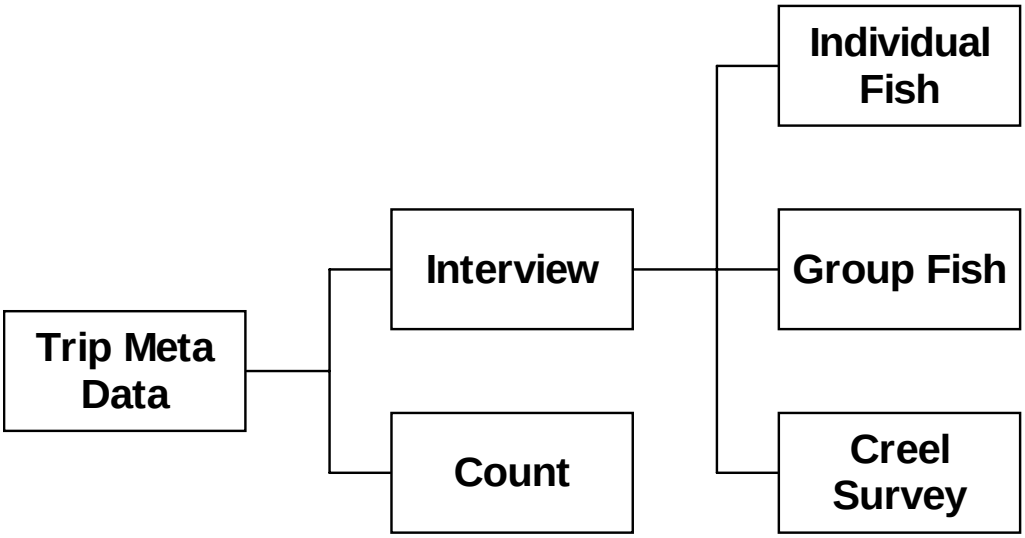
3. Use the navigation bar to select the appropriate sample number or click on the ▸* button to add a new sample.

4. To enter interview data select Interview in the Survey Type field. To enter count data select count in the Survey Type field. Interview and count data should not be entered using the same sample number. Count data should only be given sample numbers 1 to 9 and interviews should be assigned a sample number greater than or equal to 10.

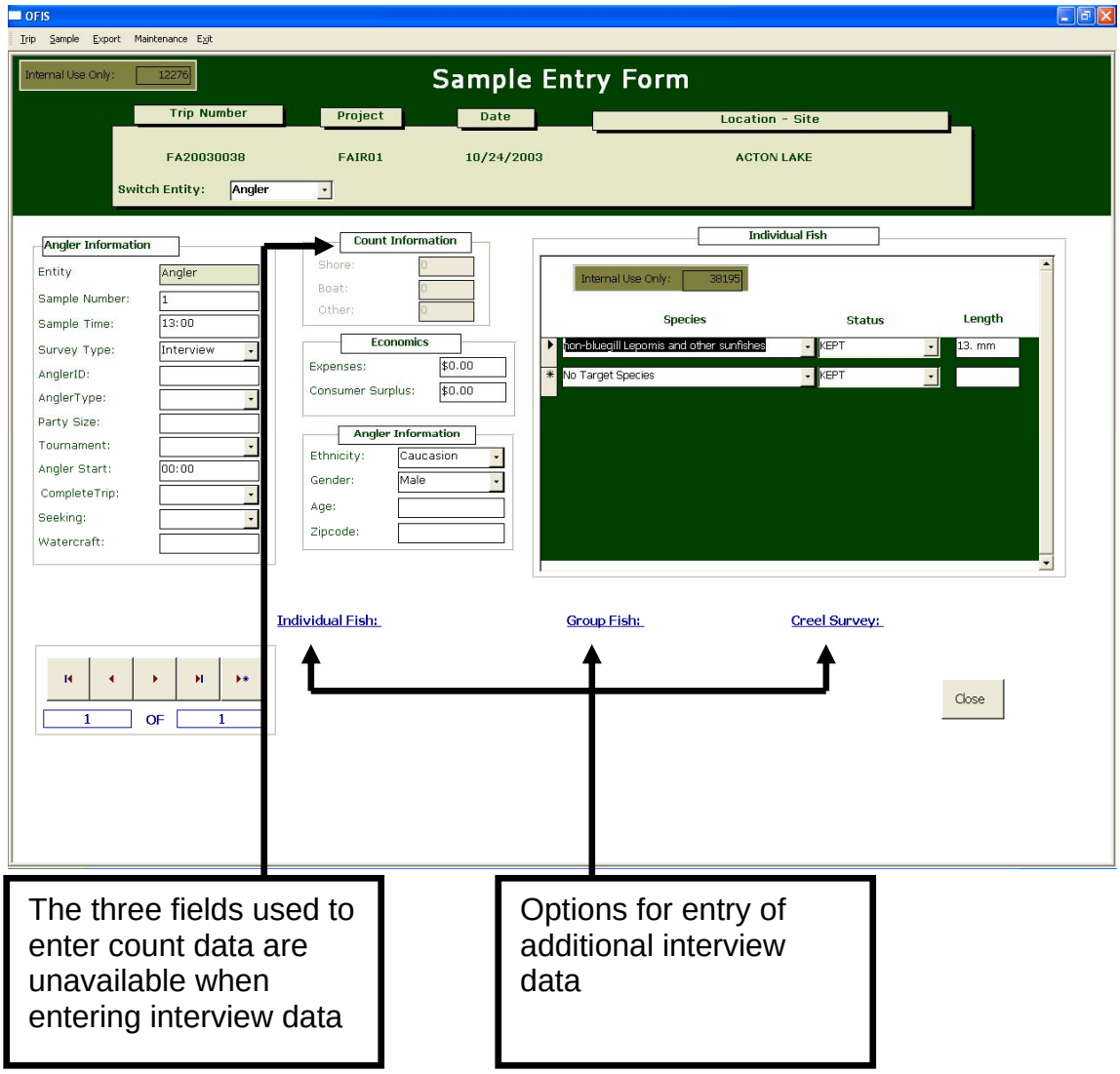
5. Enter data into the appropriate fields.
   a. Fish catch and additional question response data are entered into the Survey Box by clicking on the appropriate options (discussed in the next section).

Notes:

Diagram of angler sampling data form hierarchy.



Angler sample entry form showing entry of interview data. Note: Count fields are unavailable when Interview is displayed in the Survey Type field.



The three fields used to enter count data are unavailable when entering interview data

Options for entry of additional interview data

Interview Data

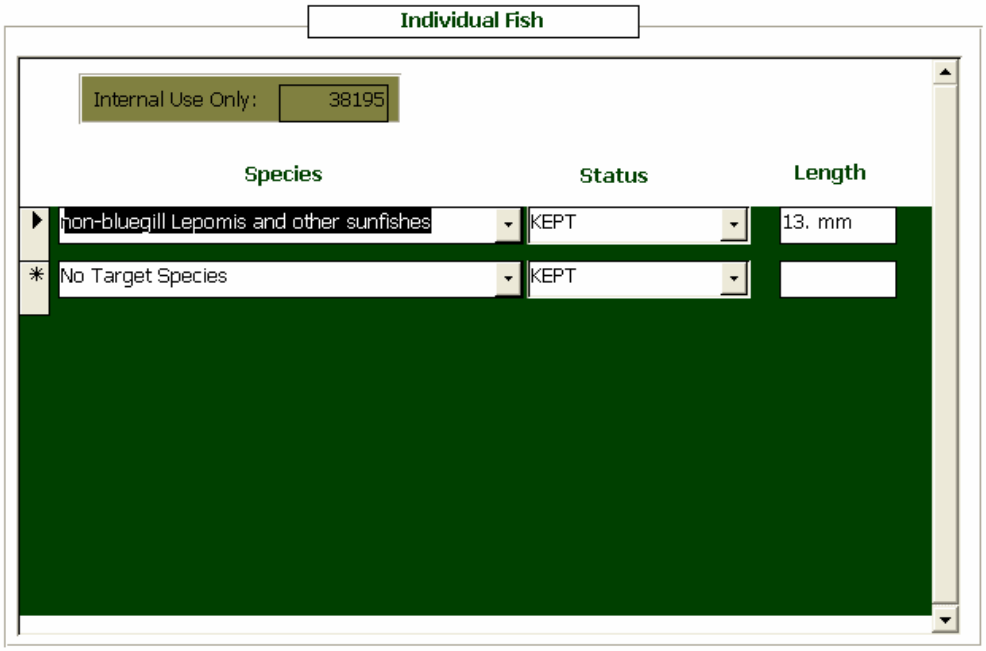
Additional information associated with angler interviews are entered into the Angler Sample Form using the Individual Fish:, Group Fish:, and Creel Survey: options (blue text) provided within the form. The Individual Fish and Group fish options are for entering species-specific catch, harvest, and length information. The Creel Survey option is for recording data pertaining to additional interview questions.

There are two options for entering fish catch data associated with an angler interview. Angler catch data where individual fish lengths were recorded are entered by clicking on the Individual Fish: option to bring up the data entry form in the Sample Box in the upper right corner of the form. The individual fish option is for entering species-specific harvest information when fish lengths were recorded. All other angler catch data are entered using the Group Fish: option. The group fish form should be used to enter species-specific catch and harvest where individual fish lengths were not recorded, such as released fish. Catch data from a single angler will often be entered into both forms. For example, if an angler caught 9 saugeye but harvested only one; the length for the one measured fish should be entered into the Individual Fish form; and 9 entered into the caught and 1 entered into the kept fields in Group Fish.

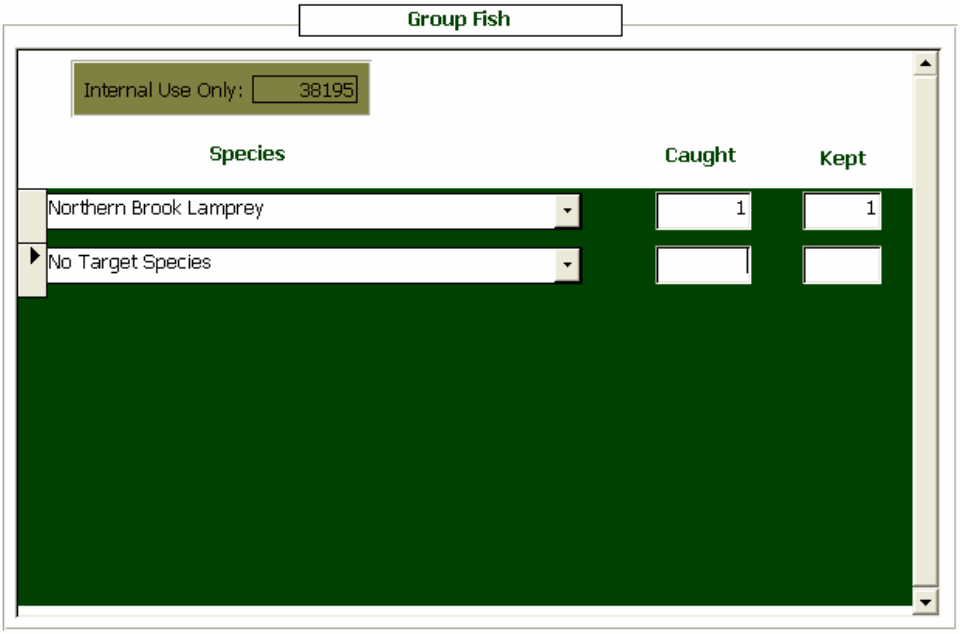
The Creel Survey: option provides for the entry of angler responses to six questions. These questions were intentionally not programmed into the form to allow for annual flexibility in angler interviews. This allows for annual evaluation and adaptation of the interview module by the addition / deletion of questions. When this option is selected the questions are displayed at the top of the Survey Box with space provided below to enter the corresponding angler response. Responses to general questions can be typed into the space provided. Responses to categorical questions are programmed into the form and are entered by simply clicking on the appropriate response.

Notes:

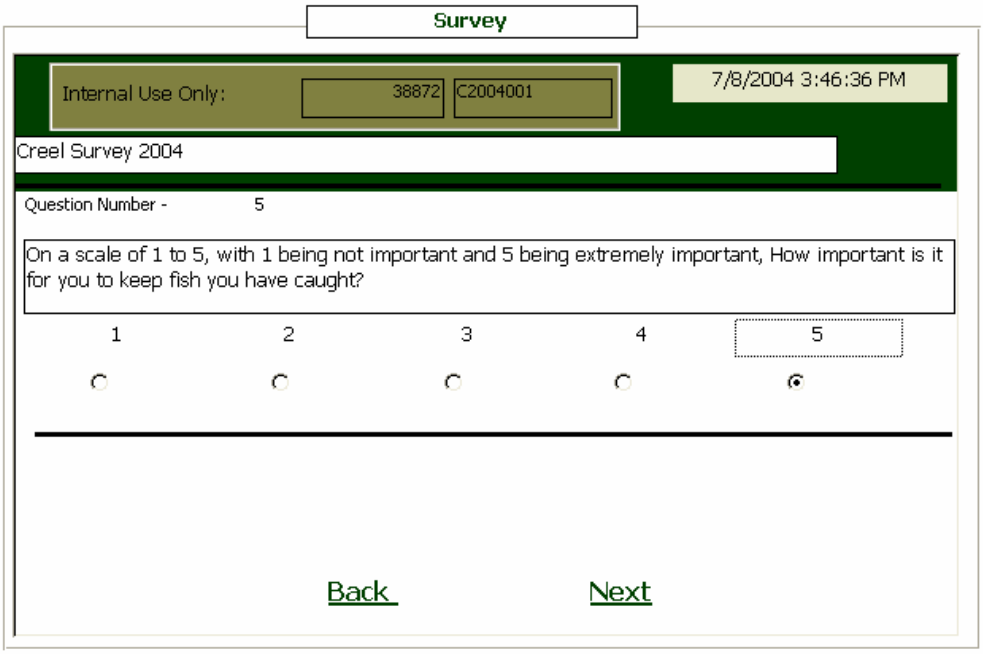
The individual fish form for entering species-specific catch and harvest information when fish lengths were measured.



The group fish form for entering species-specific catch and harvest information when fish lengths were not recorded.



The creel survey form for entering angler responses to additional interview questions.



Variables associated with the angler sampling form.

Variable Name	Description
Sample Number[1]	A unique number assigned to each count and interview (1-9 for counts, interviews start at 10). Sample numbers are sequential for a given sample day.
Sample Time[1]	Time the interview was conducted (in military time). If this is a completed trip enter the value for “End Time” instead of “Time of Interview”.
Survey Type[1]	Type of data being entered, count or interview.
AnglerID	We replaced this variable on the interview data sheet with one called "Mail Survey" (responses are "Y" for yes, the spokesman agreed to take a mail survey or "N" for no, the spokesman did not take a mail survey.)
Angler Type	Is the angler or angling party fishing from a boat or from shore ("B" for boat angler or "S" for shore angler).
Party Size	Number of anglers in the party.
Tournament	Is the angler or angling party fishing as part of a tournament ("Y" for yes or "No" for no)?
Angler Start	The time the angler or angling party began fishing (in military time).
Complete Trip	Is this a completed trip interview ("Y" for yes or "N" for no)?
Seeking	The species the angler or angling party was seeking.
Watercraft	The watercraft ID number of boat anglers.
Expenses	The dollar amount the angler or angling party spent on gas, bait, food, lodging, and related items for this trip only.
Consumer Surplus	The dollar amount the angler or angling party would be willing to spend over and above what had already been spent.
Ethnicity	The ethnicity of the party spokesperson ("Caus" for caucasian, "Afri" for African-American, "Hisp" for Hispanic, "Asia" for Asian-American, and "Oth" for other).
Gender	The gender of the party spokesperson ("M" for male or "F" for female).
Age	The approximate age of the party spokesperson (years).
Zipcode	The zip-code of the spoksperson's place of residence.
Status	Either “KEPT” or “RELEASED”.
Length	Length of the fish in mm.
Caught	Number of fish caught by an angler.
Kept	Number of fish kept by an angler.

[1] required fields

Data Analysis

DATA ANALYSIS ..... 5 - 1
Data Export ..... 5 - 3
Data Analysis Programs ..... 5 - 5
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Data Analysis

OFIS is designed to facilitate data collection, storage, and analysis. Provided with OFIS are standardized SAS programs for routine fisheries analysis. If SAS is not installed on the computer, these programs cannot be used for analysis. However, data could exported as an Excel spreadsheet and analyzed with that program.

A researcher is required to have some rudimentary knowledge of SAS in order to analyze the data. Some user input is required to run the programs. The input data file name needs to be changed every time a new analysis is conducted in order to import the correct data for analysis.

Notes:

Data Export

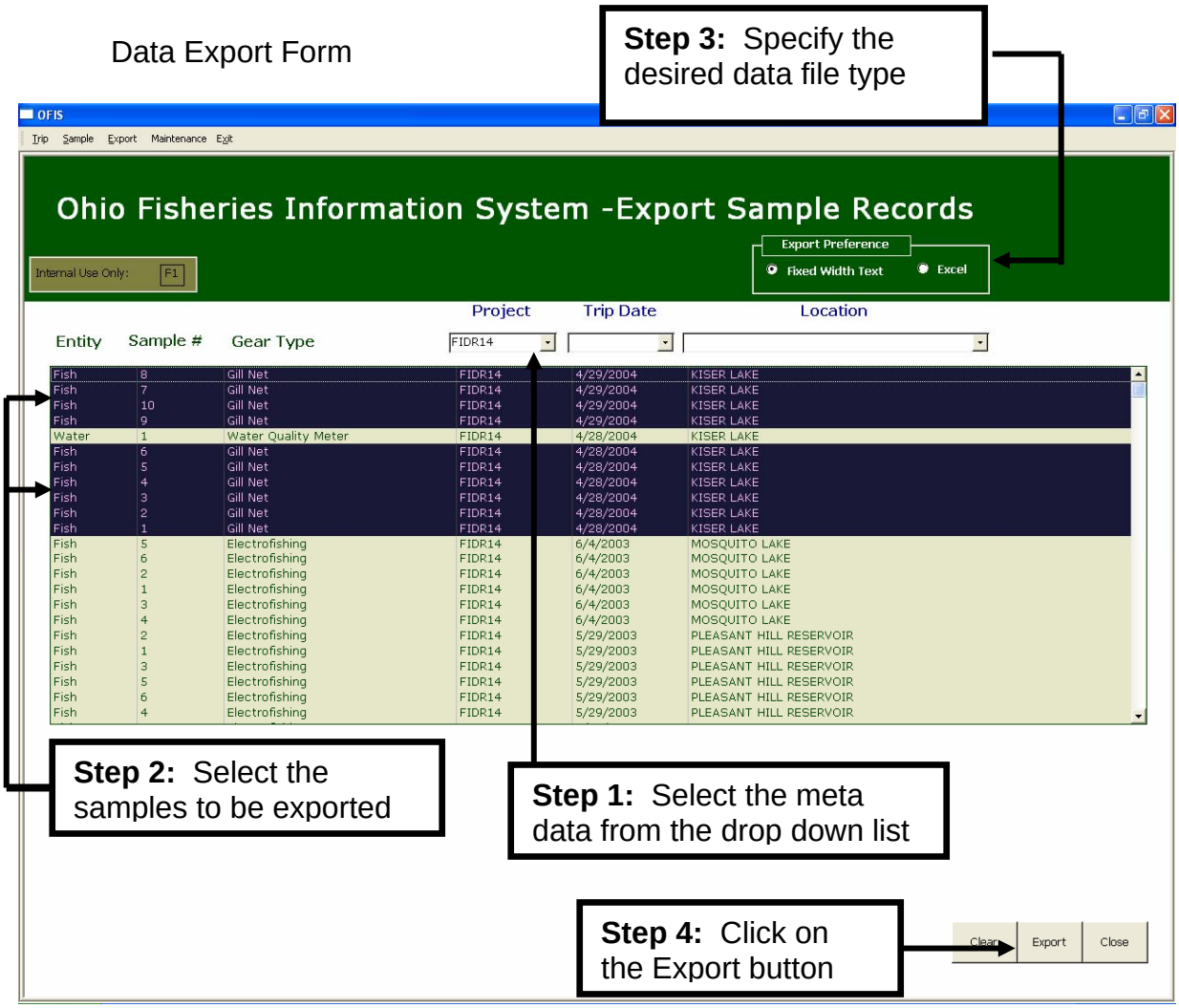
The Export option from the menu bar is used to export data so that routine analyses can be performed in SAS. The export option generates an output data set containing the most commonly used variables. If additional variables are desired for export, they can be obtained using the OFIS Querying Module (discussed below). Use the Export option to export data for calculations of catch per unit effort, length-weight regressions, length-at-age back-calculation, length-frequency distributions, and other basic analyses.

To export an OFIS dataset:

1) From the menu bar select Export and choose the desired export type. For example, to export annulus measurement data for back-calculation, select “Fish Sample Export” then “Backcalculated Growth Export”.
2) Type or select the appropriate Project, Date(s), Location(s), and sample number(s).
   a) To select multiple samples, hold the <Ctrl> key down on the keyboard while selecting discontinuous data, or hold the <Shift> key down to select contiguous items in a list.
3) Select the type of file to be exported. Data can be exported as either a fixed-width text or as an Excel spreadsheet. The analysis programs will accept only fixed-width text files, thus in order to analyze the exported data using the SAS programs provided choose “Fixed Width Text” as the export file format.
4) Click the export button in the lower right corner.
   a) Specify the directory to which the data are being exported. Data should be exported to the “C:\OFIS Analysis” folder in order for the SAS program to find the dataset.

NOTE: If a desired trip contains both individual fish and group fish data then two separate exports must be conducted. In order for the IMS2.sas program to calculate catch statistics properly, both individual fish and group fish data sets must be exported. Individual fish data are exported using the “Individual Fish Export” option and the group fish are exported using the “Group Fish Export” option.

Data Export Form



Data Analysis Programs

Three SAS programs are provided to facilitate analysis of fisheries data exported from OFIS. These programs are not meant to be all encompassing. They are, however, the most commonly used fishery analysis tools.

The IMS1.sas and IMS2.sas programs are provided to summarize catch data and calculate common catch statistics. IMS1.sas is for the calculation of population statistics when only individual fish data are to be analyzed (no group data). IMS2.sas can accommodate trips that include both individual and grouped fish data.

Statistics calculated by IMS1.sas and IMS2.sas:

- Catch per unit effort (CPUE)
- Length frequency distributions
- Length-weight regressions
- Length-at-age
- Stock density indices (PSD and RSD-P)
- Relative weight (Wr)

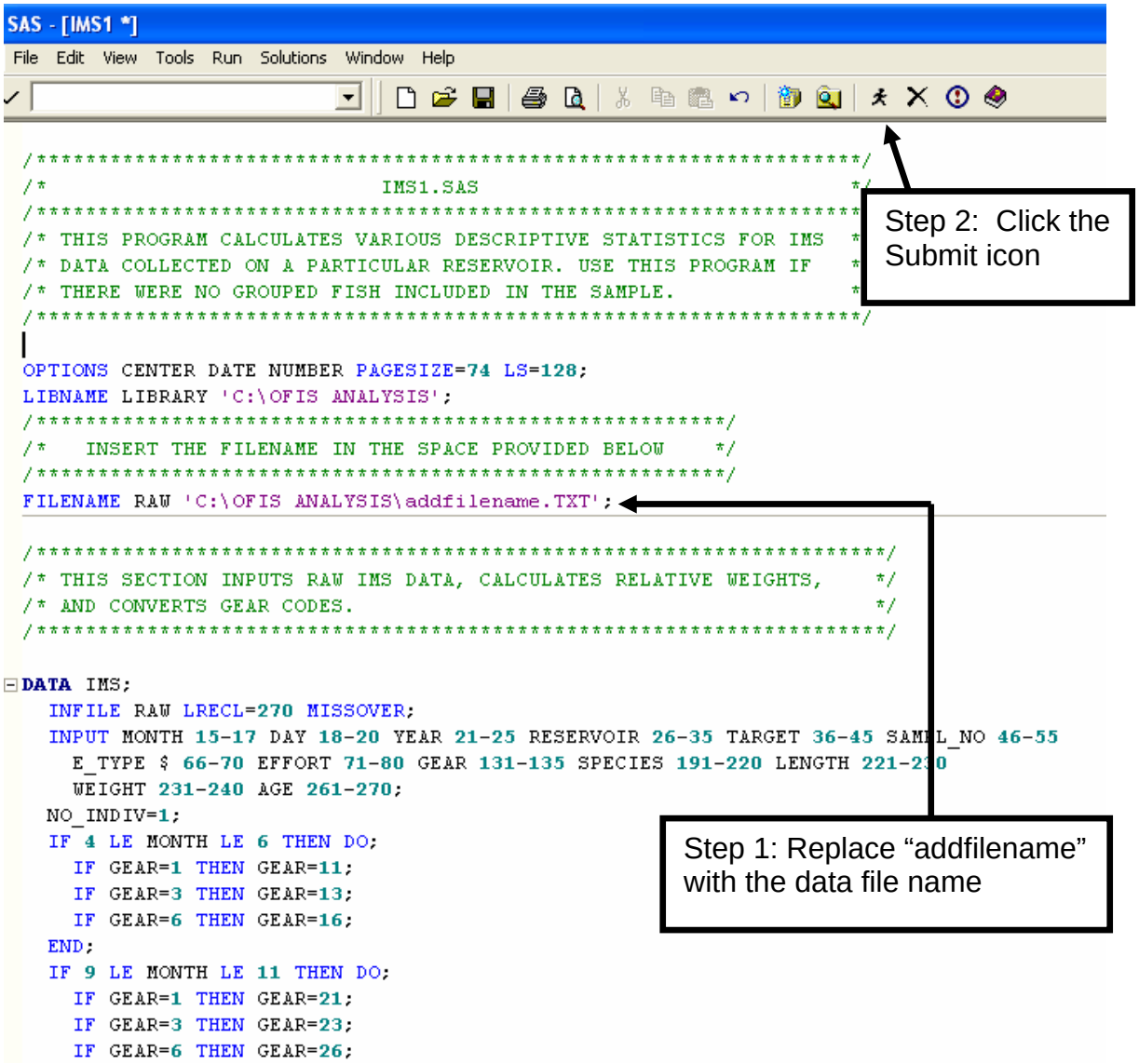
Also included is an additional SAS program for back-calculating length-at-age (annulus formation). The BACKCALC.sas program is used to estimate length-at-age from scale annulus measurement data contained in Backcalculated Growth Export datasets.

Data Analysis Steps

To analyze OFIS export data in SAS:

1) Open the desired data analysis program in SAS from the folder *OFIS SAS programs* located in the OFIS folder.
   a) IMS1.sas calculates catch statistics for “Individual Fish” export datasets only
   b) IMS2.sas calculates catch statistics for a combination of “Individual Fish” and “Group Fish” export data sets.
      i) Individual fish data and group fish data are exported separately. Both data sets are required for analysis with IMS2.sas.
   c) BACKCALC.sas back-calculates length-at-age (annulus formation) from “Backcalculated Growth” export data sets.
2) Change the input file name(s) to the desired data file name(s).
   a) IMS2.sas requires two input datasets. The first dataset is for individual fish data and the second is for group data.
3) Click the Submit icon to start the analysis.

Procedures for running analyses on an exported Individual Fish data set.




```
/*********************************************************************/
/*                          IMS1.SAS                                 */
/*********************************************************************
/* THIS PROGRAM CALCULATES VARIOUS DESCRIPTIVE STATISTICS FOR IMS   *
/* DATA COLLECTED ON A PARTICULAR RESERVOIR. USE THIS PROGRAM IF    *
/* THERE WERE NO GROUPED FISH INCLUDED IN THE SAMPLE.               *
/*********************************************************************/

OPTIONS CENTER DATE NUMBER PAGESIZE=74 LS=128;
LIBNAME LIBRARY 'C:\OFIS ANALYSIS';
/*********************************************************/
/*   INSERT THE FILENAME IN THE SPACE PROVIDED BELOW     */
/*********************************************************/
FILENAME RAW 'C:\OFIS ANALYSIS\addfilename.TXT';

/*********************************************************************/
/* THIS SECTION INPUTS RAW IMS DATA, CALCULATES RELATIVE WEIGHTS,    */
/* AND CONVERTS GEAR CODES.                                          */
/*********************************************************************/

DATA IMS;
  INFILE RAW LRECL=270 MISSOVER;
  INPUT MONTH 15-17 DAY 18-20 YEAR 21-25 RESERVOIR 26-35 TARGET 36-45 SAMPL_NO 46-55
    E_TYPE $ 66-70 EFFORT 71-80 GEAR 131-135 SPECIES 191-220 LENGTH 221-230
    WEIGHT 231-240 AGE 261-270;
  NO_INDIV=1;
  IF 4 LE MONTH LE 6 THEN DO;
    IF GEAR=1 THEN GEAR=11;
    IF GEAR=3 THEN GEAR=13;
    IF GEAR=6 THEN GEAR=16;
  END;
  IF 9 LE MONTH LE 11 THEN DO;
    IF GEAR=1 THEN GEAR=21;
    IF GEAR=3 THEN GEAR=23;
    IF GEAR=6 THEN GEAR=26;
```

Procedures for running analysis on samples containing both individual and group fish data.

SAS - [IMS2 *]

File Edit View Tools Run Solutions Window Help

```
/*****************************************************************/
/*                          IMS2.SAS                             */
/*****************************************************************/
/* THIS PROGRAM CALCULATES VARIOUS DESCRIPTIVE STATISTICS FOR IMS  */
/* DATA COLLECTED ON A PARTICULAR RESERVOIR. USE THIS PROGRAM IF   */
/* THERE ARE GROUPED FISH INCLUDED IN THE SAMPLE.                  */
/*****************************************************************/

OPTIONS CENTER DATE NUMBER PAGESIZE=74 LS=128;
LIBNAME LIBRARY 'C:\OFIS ANALYSIS';
/*********************************************************/
/*  INSERT THE FILENAMES IN THE SPACES PROVIDED BELOW    */
/*********************************************************/
FILENAME RAW1 'C:\OFIS ANALYSIS\addfilename.TXT'; /* INDIVIDUAL FISH DATA */
FILENAME RAW2 'C:\OFIS ANALYSIS\addfilename.TXT'; /* GROUP FISH DATA      */

/*****************************************************************/
/* THIS SECTION INPUTS RAW IMS DATA, CALCULATES RELATIVE WEIGHTS,  */
/* AND CONVERTS GEAR CODES.                                        */
/*****************************************************************/

DATA IMS1;
  INFILE RAW1 LRECL=270 MISSOVER;
  INPUT MONTH 15-17 DAY 18-20 YEAR 21-25 RESERVOIR 26-35 TARGET 36-45 SAMPL_NO 46-55
    E_TYPE $ 66-70 EFFORT 71-80 GEAR 131-135 SPECIES 191-220 LENGTH 221-230
    WEIGHT 231-240 AGE 261-270;
  NO_INDIV=1;
  IF 4 LE MONTH LE 6 THEN DO;
    IF GEAR=1 THEN GEAR=11;
    IF GEAR=3 THEN GEAR=13;
    IF GEAR=6 THEN GEAR=16;
  END;
  IF 9 LE MONTH LE 11 THEN DO;
    IF GEAR=1 THEN GEAR=21;
    IF GEAR=3 THEN GEAR=23;
    IF GEAR=6 THEN GEAR=26;
  END;
/*********************************************************/
/*              CALCULATES RELATIVE WEIGHTS              */
/*********************************************************/
  IF SPECIES=74005 THEN DO;
    IF LENGTH LT 115 THEN REL_WGHT=.;
    IF LENGTH GE 115 THEN REL_WGHT=WEIGHT/(10**(-5.201+3.139*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77001 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
```

Step 3: Click the Submit icon

Step 1: Replace “addfilename” with the name of the file containing the Individual Fish data

Step 2: Replace “addfilename” with the name of the file containing the group fish data

Querying Module

Provided with the OFIS software is a querying module for extracting data from the database. This module provides access to the entire database and operates with all the capabilities of MS Access. The querying module allows a user to select specific criteria for customizing an output data set. A user can select the variables to be exported as well as specific records for those variables by specifying query criteria.

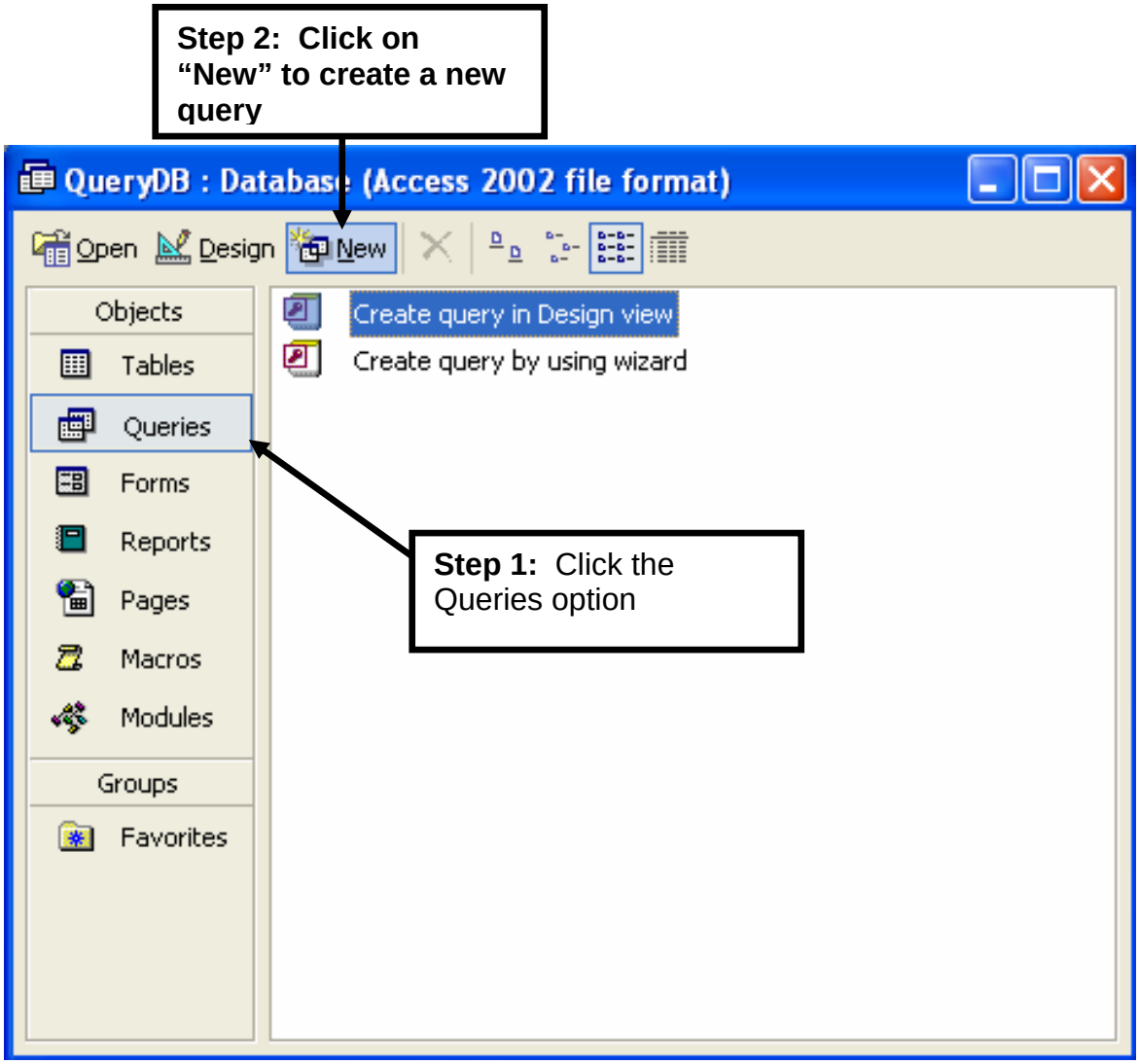
The OFIS querying module is located in “C:\Program Files\ OFIS \ Data Export”. To open the querying module double click the QueryDB icon:

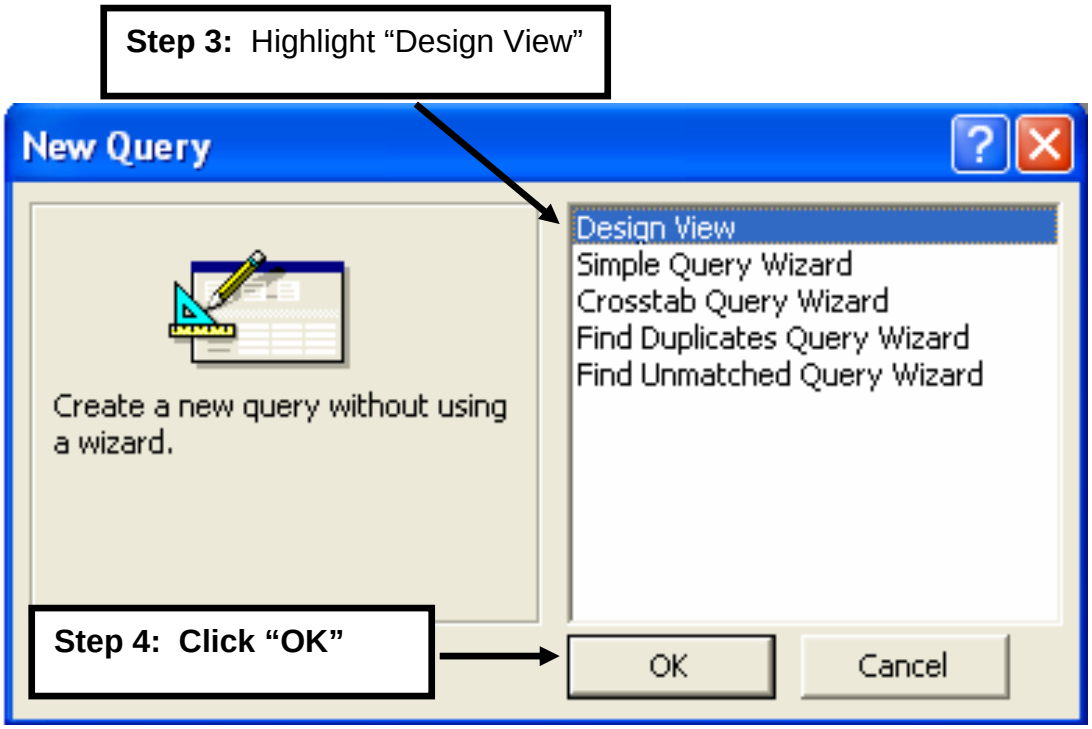
If the QueryDB file cannot be found contact your Local OFIS Manager for further assistance.

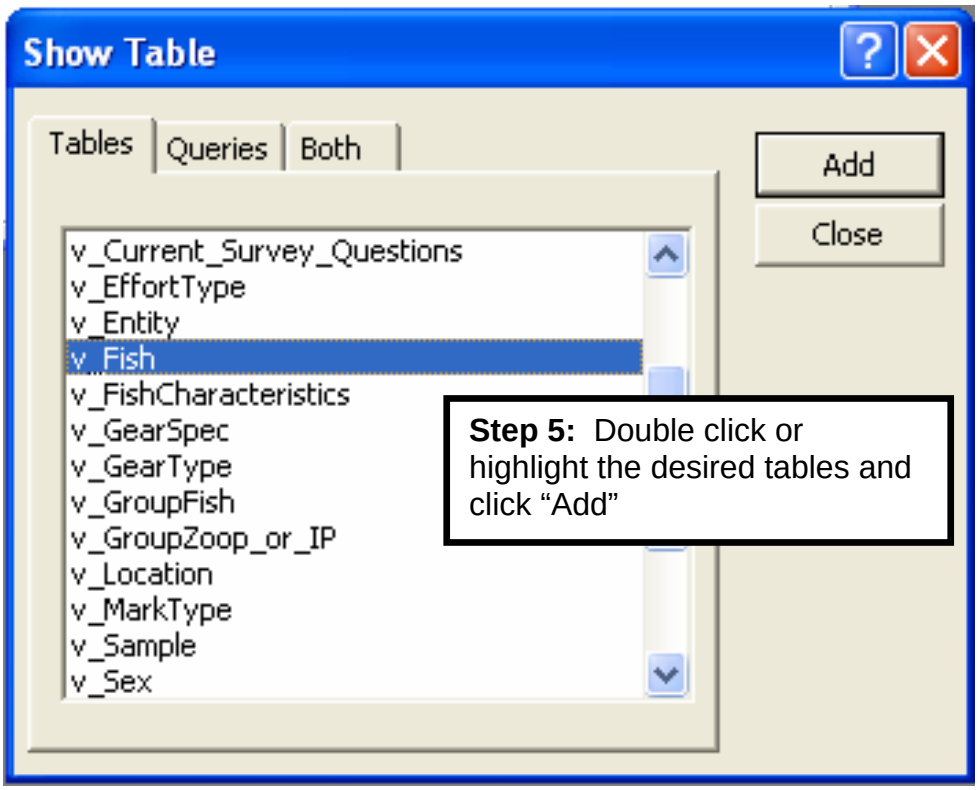
Creating a new query

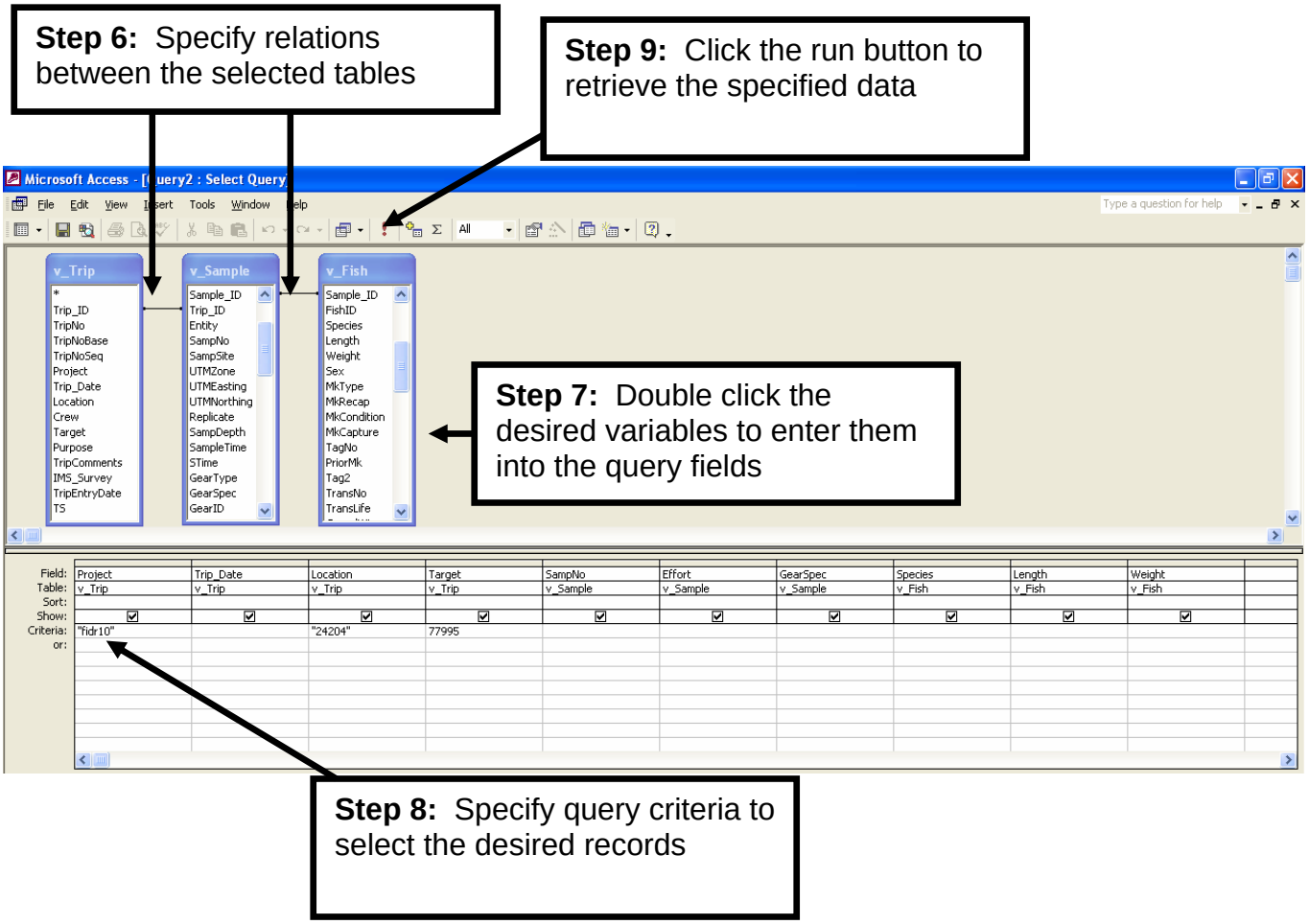
To create a new query:

1) Click on the Queries option under Objects on the left side of the QueryDB window. Click “New” from the menu bar on the QueryDB window to create a new query. This will bring up the New Query window.
2) Highlight “Design View” and click “OK” to bring up the “Show Table” window.
3) Select the tables containing all the desired variables by either double clicking or highlighting each and clicking on the “Add” button to bring them into the select query window.
4) Once all the necessary tables have been selected the user must set up the table relations by linking common variables within the selected tables. It is important that a user understands the nested structure of the tables within the database in order to set up the appropriate table relations.
   a) Table relations can be set up by dragging a linking variable from one table to the next. For example, Trip_ID is the variable that links the Trip and Sample tables (Trip_ID occurs in both). Dragging Trip_ID from the Trip table to Trip_ID in the Sample table creates a line between that variable in those two tables, linking those tables by Trip_ID.
   b) This can be done for as many tables as necessary but understand that relations should be shaped according to the nested hierarchy within the database. Fish data should be linked to sample data which is first linked to Trip Meta data.
5) Variables with each table can be selected for export by double clicking on them within the table itself or by entering (typing or selecting from the dropdown list) the desired table and field names into the appropriate query cells.
6) The data set can be further customized to extract only particular records for one or more variables by specifying the corresponding record-type in the “Criteria” field under the Field and Table names. For example, to extract only saugeye data from Buckeye Lake a user can enter 80026 under species and 80102 under location to select only those records. **NOTE: Codes must be used for all coded variables. Refer to the codes list in Appendix 2.**
   a) More than one selection criteria can be specified by entering multiple values, such as selecting samples from multiple dates.
7) Once all variables have been selected and search criteria entered click on the run button to retrieve the selected data.


Step 2: Click on "New" to create a new query
QueryDB : Database (Access 2002 file format)
Open
Design
New
Objects
Tables
Queries
Forms
Reports
Pages
Macros
Modules
Groups
Favorites
Create query in Design view
Create query by using wizard
Step 1: Click the Queries option


Step 3: Highlight "Design View"
New Query
Design View
Simple Query Wizard
Crosstab Query Wizard
Find Duplicates Query Wizard
Find Unmatched Query Wizard
Create a new query without using a wizard.
Step 4: Click "OK"
OK
Cancel


Show Table
Tables
Queries
Both
Add
Close
v_Current_Survey_Questions
v_EffortType
v_Entity
v_Fish
v_FishCharacteristics
v_GearSpec
v_GearType
v_GroupFish
v_GroupZoop_or_IP
v_Location
v_MarkType
v_Sample
v_Sex
Step 5: Double click or highlight the desired tables and click "Add"


Step 6: Specify relations between the selected tables
Step 9: Click the run button to retrieve the specified data
Microsoft Access - [Query2 : Select Query]
File Edit View Insert Tools Window Help
v_Trip
v_Sample
v_Fish
Step 7: Double click the desired variables to enter them into the query fields
Field: Project Trip_Date Location Target SampNo Effort GearSpec Species Length Weight
Table: v_Trip v_Trip v_Trip v_Trip v_Sample v_Sample v_Sample v_Fish v_Fish v_Fish
Criteria: "fidr10" "24204" 77995
Step 8: Specify query criteria to select the desired records

Exporting Data Queries

Once the data have been retrieved from OFIS they can be exported for summary and analysis. To export a data query:

1) From the menu bar Click on “File” and select “Export”.
2) Specify the directory to which the data are to be exported, the filename, and type of data file to be exported (text, excel, etc…).
3) Click the “Export All” button to save the data to the specified filename and directory.

NOTE: The SAS programs provided for analysis of fisheries data are written to accept standard OFIS export data sets. New programs must be written to analyze customized data sets exported using the querying module.

Protocols for Additions to the Database

PROTOCOLS FOR ADDITIONS TO THE DATABASE..... 6 - 1
Protocols: Data Codes..... 6 - 4
Protocols: Variables..... 6 - 6
Protocols: Suites of Variables..... 6 - 8

Protocols for Additions to the Database

All OFIS users and individuals that collect data in the field or laboratory will occasionally find that the database does not meet their needs for data storage. Updates of the database are expected as new needs arise. These updates must be implemented through procedures that ensure compatibility with the established database. Protocols to make additions to the database are outlined in this section. Always check Appendix 1 to see if the variable is already present in the database.

The protocols in this section are intended to prevent ambiguity of data codes, redundancy of database variables, and to provide guidelines for the introduction of new suites of variables. When data codes or variables are needed in the field, but are not available in the database, the first step will always be to assign temporary codes and variables. However, these temporary field codes and variables should never be entered into the database.

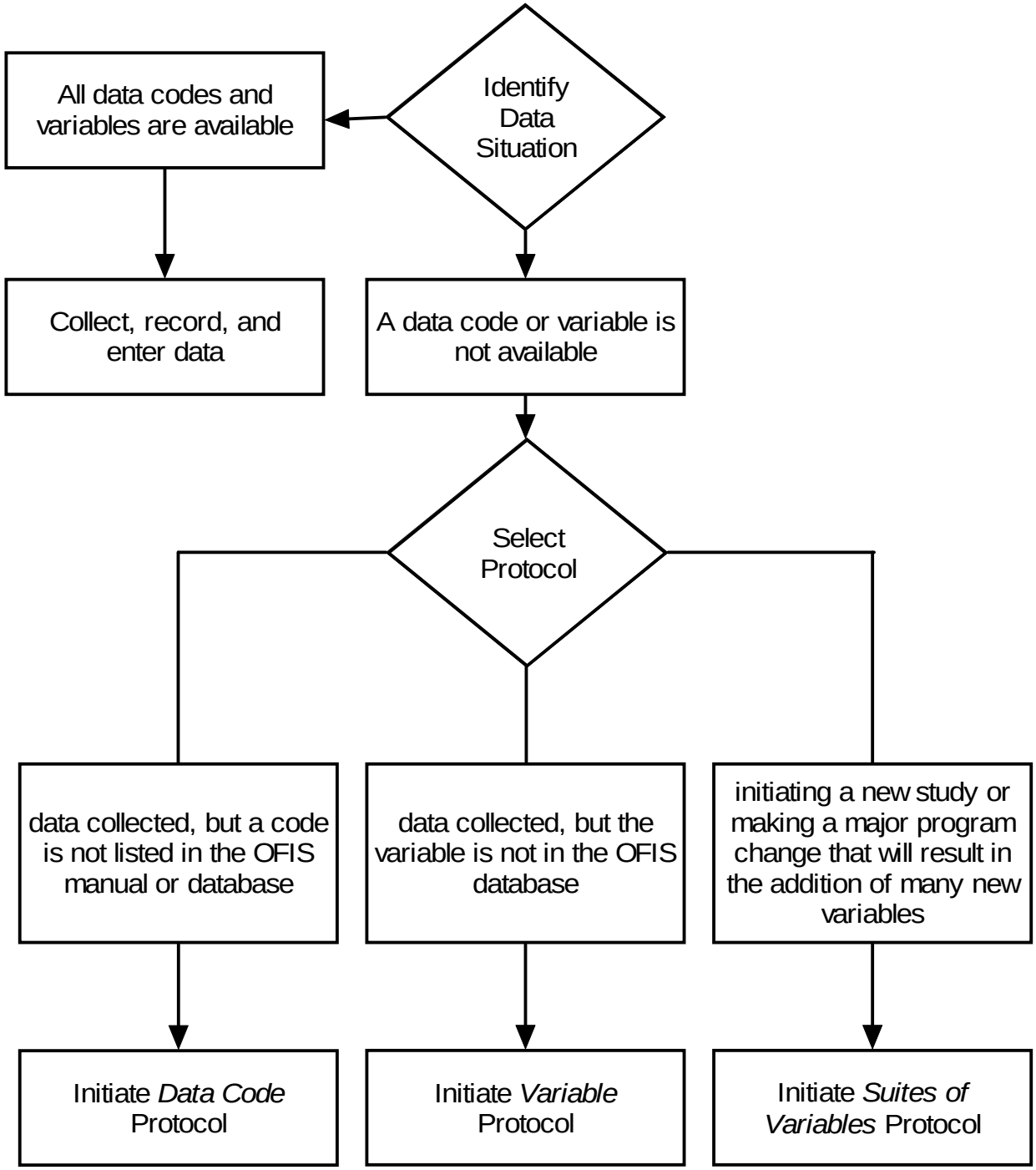
Protocols

- **Data codes** - protocols for new data codes are used to add codes to qualitative variables such as location, species, or gear type. Additions of new codes are expected as new locations are sampled, new species are introduced into Ohio waters, or new types of gear are used.

- **Variables** - protocols for new variables are used to add variables required by increased data needs for projects and programs. These variables may be qualitative, such as location, species, or geartype, or quantitative, such as fish length, ovary weight, or age.

- **Suites of variables (tables)** – protocols for new suites of variables will be used to add groups of variables to the database that may differ somewhat from the existing database structure. These types of changes can be expected with the addition of new projects or project objectives. Consultation with an OFIS representative will help clarify whether a request involves the addition of variables, or the addition of a suite of variables, to indicate which protocol to follow.

Choosing a protocol for database changes.



Protocols: Data Codes

Introduction of New Data Codes

Data codes are qualitative codes that identify individual data for specific variables such as a location, species, or gear code. The protocol for obtaining a new data code is as follows:

1. If a new code is needed immediately, field personnel assign a temporary code for use only on field data sheets. The new code should be described in the comments section of field notes. A temporary code should never be entered into the database.

2. An individual that needs a new code contacts their OFIS representative, indicates which variable the datum is identified with, and fully describes the datum.

3. The OFIS representative contacts the Program Manager, conveys the variable and descriptive information.

4. The Program Manager sends an e-mail to all OFIS representatives to indicate that a new code has been added.

5. The IFRE representative adds the new code through the OFIS Maintenance menu.

6. The Program Manaer updates the OFIS manual.

Protocol for adding a data code.

OFIS End User:
Initiate Data Code Protocol

- assign temporary code for field use, if necessary, but do not enter in the database
- contact Local OFIS Manager
- provide Local OFIS Maqnager with the following:
  1) which variable needs a new code
  2) description of datum

↓

Local OFIS Manager:
Convey Request to Program Manager

- double check to ensure the code is not available
- convey request to the IProgram Manager

↓

Program Manager:
Process Request

- e-mail all OFIS representatives to notify of new code
- add new code to the master code list
- add new code to the database
- update manual

Protocols: Variables

Introduction of New Variables

Variables are categories of specific types of data that can be either qualitative or quantitative. Qualitative variables include location, geartype, or crew, whereas quantitative variables include fish length, ovary weight, or age. OFIS contains many variables that are not present on the data entry forms. BEFORE INITIATING THE PROTOCOL TO ADD A NEW VARIABLE, CHECK APPENDIX 1 TO SEE IF THE PROPOSED VARIABLE ALREADY EXISTS IN OFIS.

The protocol for adding a new variable is as follows:

1. Field personnel develop a temporary variable for use only on field data sheets if a new variable is needed immediately. The new variable should be described in the comments section of field notes. A temporary variable cannot be entered into the database.

2. A request for a new variable is sent to the Local OFIS Manager. The request should include:
    a. brief discussion of why the variable is needed;
    b. description of the variable;
    c. suggestions for codes, if applicable.

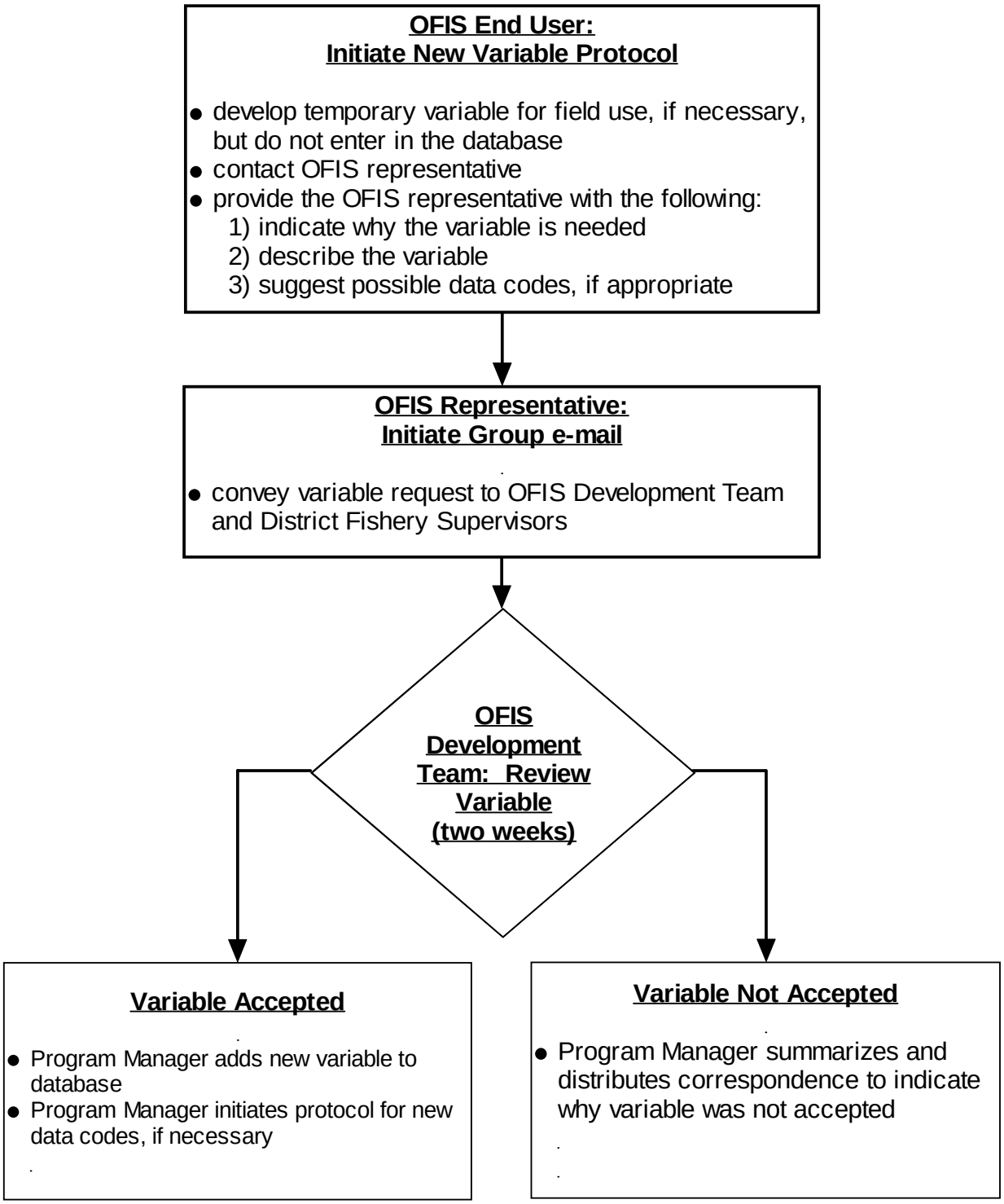
3. The OFIS representative initiates a group e-mail (OFIS Development Team) to indicate that a new variable is needed.

4. Addition of the variable is discussed (via e-mail) by the OFIS Development Team for a two-week period.

5. If accepted:
    a. the new variable is added to the database through the Program Manager;
    b. the database with the updated variable will be provided as soon as possible;
    c. the protocol is followed for the development of new codes (if applicable).

6. If not accepted:
    a. the reason why the variable was not accepted is summarized and distributed by the Program Manager (the most likely reason a variable may not be accepted is redundancy).

Protocol for adding a variable.



Protocols: Suites of Variables

Introduction of New Suites of Variables (Tables)

Suites of variables will periodically be added to the database as new projects are initiated, or program objectives change. Unlike adding a single variable, these suites of variables may differ enough from other variables currently in the database to warrant modification of database structure. These additions require significant thought about how the new data will be used, and how they will relate to other data. The protocol for adding a new suite of variables is as follows:

1. Individual requesting a new suite of variables submits a request to their Local OFIS Manager. The request should include:
    a. indication of why the new variables are needed;
    b. detailed description of the new variables;
    c. discussion of how the new variables might relate to existing variables;
    d. explanation of how the new information will be used;
    e. suggest data codes, if appropriate.

2. Local OFIS Manager contacts the Program Manager to review addition of the new suite of variables.

3. Program Manager reviews the request with the initiator of the protocol.

4. The Program Manager requests to modify the database as necessary.

5. Program Manager initiates the protocol for the addition of new data codes.

6. The updated database will be provided to the requesting party as soon as possible, and at the time of normal updates for the rest of OFIS end users.

Note: Requests for suites of variables should be made prior to initiating field collections of data.

Protocol for adding a new suite of variables.

OFIS User:
Initiate Protocol for a New Suite of Variables

- Provide Local OFIS Manager with the following:
  1) why the new variables are needed
  2) detailed descriptions of the variables
  3) how the new data will be used
  4) suggest data codes, if appropriate

↓

Local OFIS Manager:
e-mail Request to Program Manager

- Contact Program Manager with request information

↓

Program Manager:
Process Request

- Review request with initiator of protocol
- Modify database and incorporate new variables
- Initiate protocol for new data codes

Data Administration

DATA ADMINISTRATION ..... 7 - 1
Data Integrity ..... 7 - 3
Data Storage ..... 7 - 5
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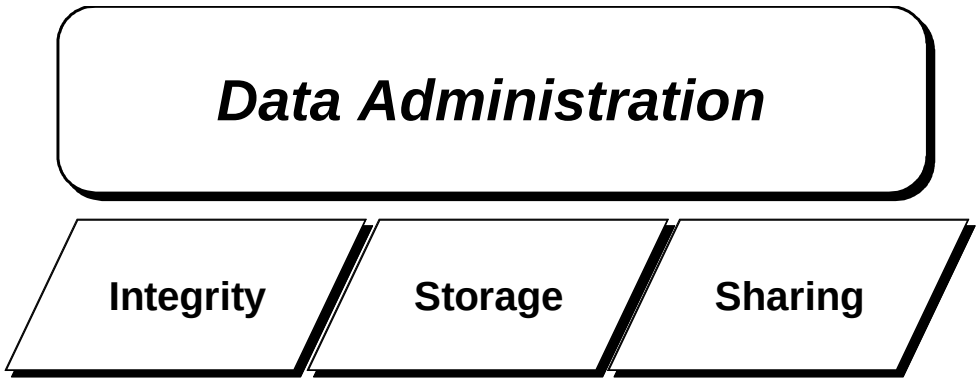
Data Administration

Data administration is a critical part of developing and maintaining a database. Five components of data administration in OFIS are: 1) ensuring data integrity, or quality control; 2) maintaining data accuracy; 3) transferring current data; 4) storing current and historical data; and, 5) sharing data. Data will be administered at individual, organizational unit, and central levels. Data administration is a shared responsibility.

Data Integrity, Maintenance, Transfer, Storage, and Sharing

- **Integrity** – Data integrity is the reliability of data that results from quality control in every step of data acquisition. The integrity of data is the joint responsibility of individuals that are collecting, reporting, entering, and using data. Good data integrity results from appropriate sampling strategies and field procedures, accurate data reporting, careful data entry, and thoughtful use of data. Data integrity is the most widely shared responsibility.
- **Storage** – OFIS data are backed up daily by the ODNR Office of Information Technology. Data are stored on servers located in a climate controlled, fireproof, secure storage area. Data backed up at OSU or Miami U are backed up locally and less frequently than at Fountain Square.
- **Sharing** – Sharing data stored in OFIS will provide opportunities to allow other investigators to use Ohio fisheries data for monitoring or analysis. Only authorized OFIS end users are provided access to the entire database. Data requests from non-OFIS users will be addressed through procedures for data sharing.

Data administration is a shared responsibility of all OFIS end users.



Data Integrity

Data integrity is the foundation of a useful database. Integrity of data is a function of how carefully data are collected, reported, and entered into a database. Virtually everyone involved with OFIS has a role in ensuring quality control of data, from biologists who design studies, to field crews that collect data, to personnel that enter data on the computer. These are the first and most critical steps in data administration.

Steps to Data Integrity

- Study Design – Carefully designed studies will help ensure that field procedures are valid and consider the best available information. Field studies and simulation models are often based upon literature review, investigator experience, and preliminary data when available. Once OFIS is populated with data, the database itself will assist biologists in the design of studies by providing background data for use in study design. In this sense, data integrity can be self-perpetuating.

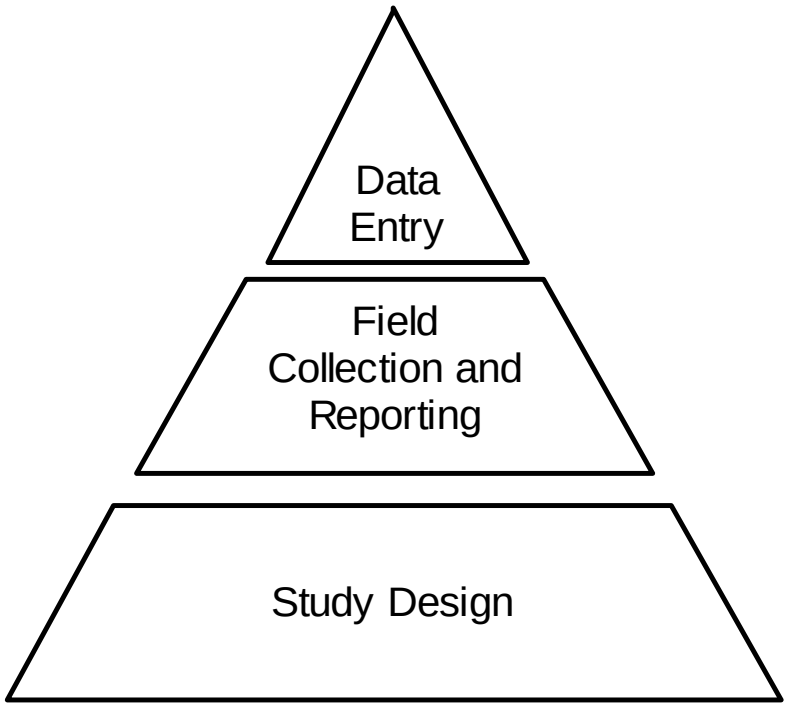
- Field Collection - Field data must be collected and reported with sound and uniform methods to facilitate data integrity. Field crews must make every effort to collect reliable data and report them in a clear and error-free manner.

- Data Entry - Data entry is the final step toward ensuring data integrity. Data entry must be proofed and edited as a minimum standard for OFIS:
    1) run data through an error-trapping program;
    2) detect errors;
    3) correct raw data as necessary.

  Data may also be edited with line-by-line field proofreading, although this level of detail is not required by OFIS guidelines.

Note: Deletion of some data will not be possible until a modification in the database is made.

Data Integrity is the Foundation of a Useful Database



Data Storage

Central storage of the OFIS database ensures that a current copy is always secure and available. Storage of the database is the responsibility of the Database Administrator and the ODNR Office of Information Technology.

Data Storage Procedures

The Database Administrator will ensure that back up of the most current database is performed daily at Fountain Square, Columbus, OH. The Program Manager will ensure that the most current codes files are backed up at the Inland Fisheries Research Unit, Hebron, OH.

Data Sharing Policy

Sharing data is one of the main reasons that OFIS was created. Data must be shared carefully to ensure database security and avoid intellectual property and conflict of interest issues. Authorized OFIS end users are strictly prohibited from transferring any portion of the database to non-authorized parties. All data transfers must proceed as follows:

Data Sharing Procedures

1) Direct all data requests from external sources (requests by non-authorized OFIS users) to the Program Manager.

2) The Program Manager will inform the party requesting data to submit a formal letter of request that includes:
   a. Full name, affiliation, position, address, phone number, e-mail address, date;
   b. Itemized list of requested data;
   c. Desired data format;
   d. Intent for use of the data;
   e. Agreement to recognize the source of the data in the acknowledgements or citations of any written publication;
   f. Agreement to recognize the source of the data in the acknowledgements or citations of any professional presentation.

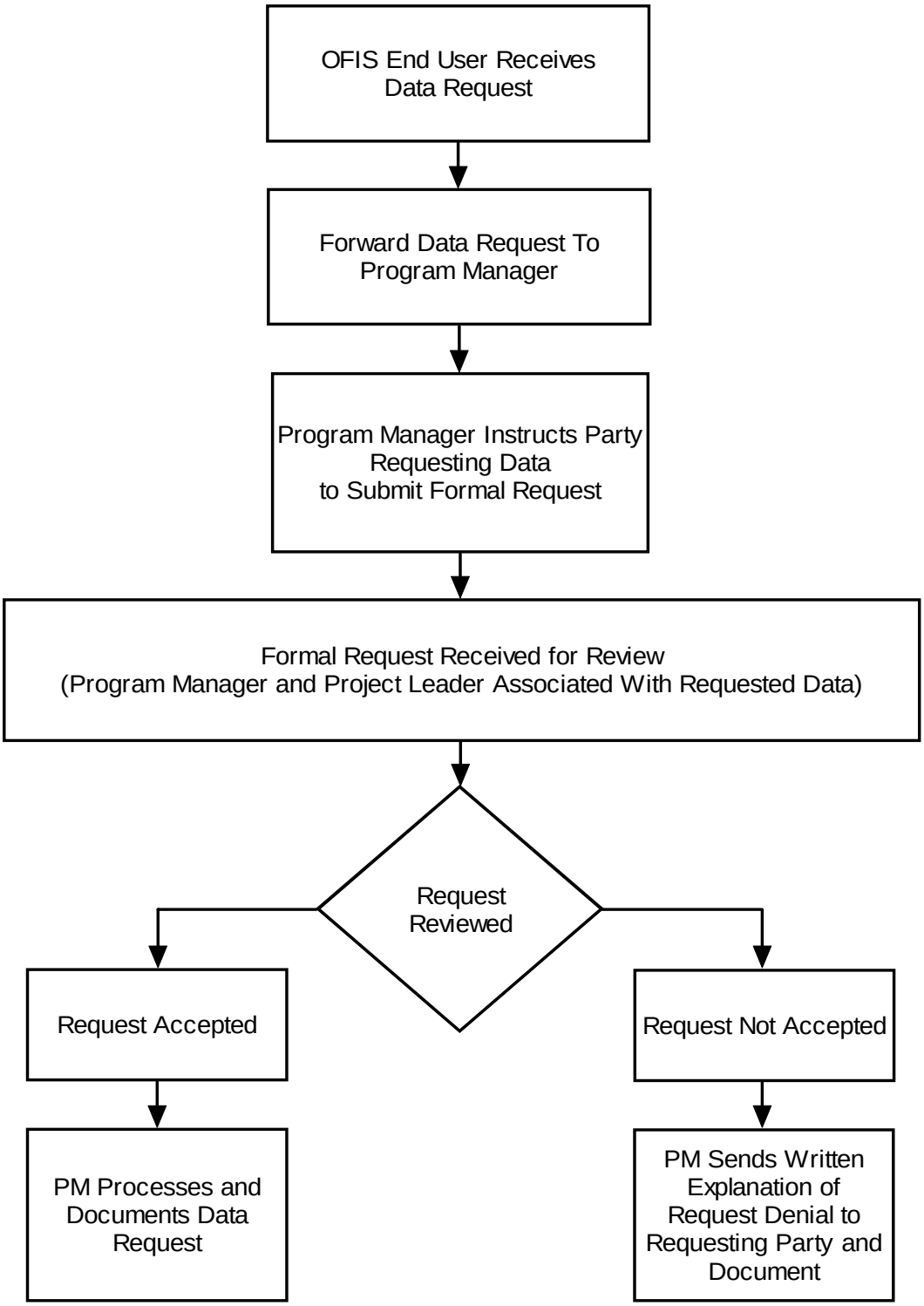
3) Upon receipt of the formal request, the Program Manager will forward a copy of the request to the project leader associated with the data for joint review of the request.

4) The request will be accepted or rejected based upon reviews by the Program Manager and the project leader.

   a) If the request is accepted, the Program Manager will query the database to fill the request and provide either raw or summary data. **Complete downloads of any portion of OFIS are strictly prohibited.**

   b) If the request is not accepted, the Program Manager will send a formal letter to the requesting party to specify why the request cannot be filled.

Procedure for responding to external OFIS data requests.



Security

Database security is necessary to ensure that the database continues to function properly, whereas **data security** is essential to protect data from corruption or misuse. This section of the manual provides details about security issues central to OFIS, including authorization levels of users, a user agreement, database modification, and data use and sharing.

Security Topics Important to OFIS Users

- **User Authorization** – Four levels of authorization are specified for OFIS end users. Each level provides a different degree of access to the database.

- **User Agreement** – All OFIS end users are requested to read and follow OFIS protocols and procedures.

- **Database Modification** – The database is intended to meet the needs of all OFIS users. Modifications of OFIS will be necessary through time as needs expand. Protocols for some modifications, such as the introduction of new data codes, new variables, and new suites of variables are available in the *Protocols* section. Procedures for the modification of forms are specified in this section on security.

- **Data Use and Sharing Policy** – Sharing OFIS data to meet requests of parties that are interested in OFIS data but are not authorized for use, such as other state agencies, universities, or consultants is discussed in the *Data Administration* section under Data Sharing. Specific procedures are outlined in that section for reviewing and meeting data requests. **Complete downloads of any portion of OFIS to non-authorized parties are strictly prohibited. A complete download is defined as transfer of ANY data provided in the format of the OFIS database structure.**

Security

User Authorization

User Agreement

Database Modification

Data Use and Sharing

User Authorization

Access to OFIS is authorized at four different levels to facilitate technical support, database stability, and security. Personnel included in each level and their access to the database are specified below:

- **Level 1: Database Administrator** (Jeff Rowley) authorization provides complete access to the database for use and modification. This level is limited to the Database Administrator because the database structure has become highly technical with the current SQL version of OFIS.

- **Level 2: Program Manager** (Scott Hale / Rich Zweifel) authorization provides access to enter data, editing records at all levels, and the maintenance tables for upgrading codes lists.

- **Level 3: Local OFIS Manager** authorization provides access to enter data and edit records up to and including the sample table level.

District 1:	Marty Lundquist
District 2:	Ed Lewis
District 3:	Andy Burt
District 4:	Tim Parrett
District 5:	Glen Trueb

- **Level 4: OFIS Associate** (all other users) authorization provides access to enter and edit data records at the fish, angler, water, and plankton levels.

Use authorization levels 1-4 for OFIS.

OFIS Users (Authorization Level)	Access			
	Edit records Data entry Data browsing Data export Query module	Edit sample table data	Maintenance menus Full edition	Complete access
(1) Database Administrator	**yes**	**yes**	**yes**	**yes**
(2) OFIS Program Managers	**yes**	**yes**	**yes**	**no**
(3) Local OFIS Manager	**yes**	**yes**	**no**	**no**
(4) OFIS Associate	**yes**	**no**	**no**	**no**

User Agreement

Database security and data security depends upon good communication and a complete understanding of procedures and protocols for database use and data sharing. All OFIS users will be asked to read and accept an agreement pertaining to database modification and data sharing. This agreement provides a reminder to OFIS users to be considerate of fellow OFIS users for everyone's mutual benefit. The agreement is specifically intended to:

- Ensure that new database users are familiar with OFIS procedures and protocols.
- Clarify the means of database modification and data sharing.
- Establish an agreement among OFIS users to follow protocols and procedures for database modification and data sharing.
- Remind OFIS users to be considerate of the data contributions from all project leaders. Each of us should make good faith efforts to communicate with the originators of data when information will be used for summary, analysis, or presentation.

OFIS USER AGREEMENT
Ohio Fisheries Information System
Current: July1, 2004

The following overview is provided as a reminder to OFIS users to know and use protocols and procedures that are important to security of our database and data for the mutual consideration of all database users. Please review these protocols and procedures before using the database.

Database Modification

- New data codes, variables, and suites of variables will be added to the database only through protocols established in the OFIS manual.
- Modification of the database is limited to Level 1 authorization (Database Administrator).

Data Sharing

- Complete downloads of any portion of OFIS to non-authorized parties are strictly prohibited. A complete download is defined as transfer of ANY data provided in the format of the OFIS database structure (i.e. a complete table or groups of tables).
- Data sharing procedures in the OFIS user manual should be reviewed and followed upon receiving a request for data from parties not authorized to use OFIS.
- Distribution of OFIS data to parties not authorized to use OFIS is limited to Level 2 authorization.

OFIS Data Use

- OFIS users who intend to formally use data for presentation or publication that were not collected under their direction are **strongly encouraged** to review any intended use of those data with the project leader who directed the data collection prior to such use.

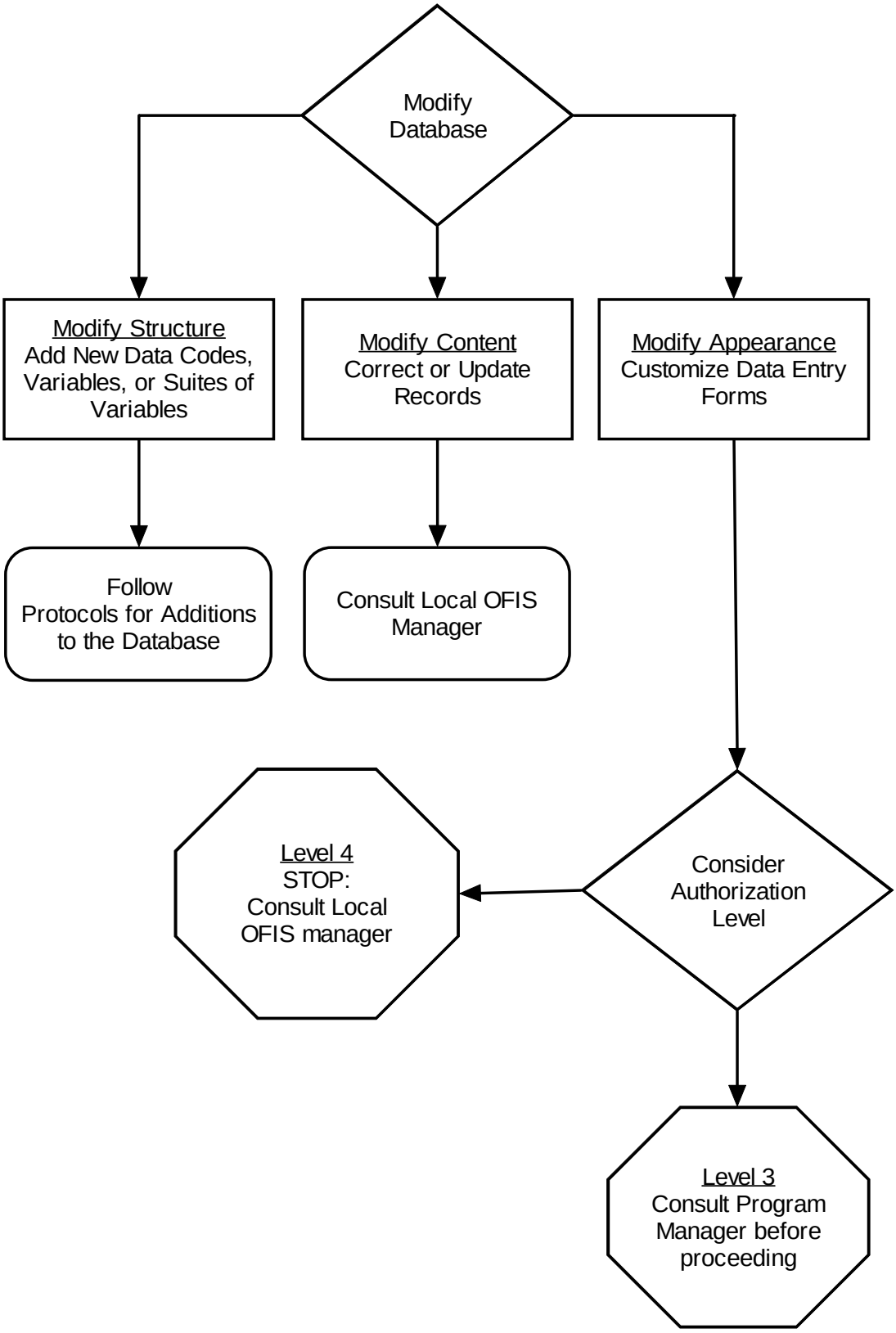
Database Modification

The database can be modified in structure, content, or appearance. Database structure is the collection of working parts of the database, such as the variables, and how they relate to one another. Database content refers to the records of data that have been entered into the database. Database appearance is the “look” of the forms used for data entry. Access to modify the database varies among the authorized level of use. OFIS protocols and procedures guide end users through the steps necessary to modify the database.

Modification of database **structure** is necessary to make additions to the database and is conducted by the Database Administrator (DBA). Allowing only one person to make these changes facilitates production of uniform updates. Protocols for the introduction of new data codes, variables, and suites of variables in the *Protocols for Additions to the Database* section outlines the steps for all OFIS users to take when these types of additions to the database are required.

Modification of database **content** is necessary to periodically correct data records and regularly update data records. Procedures for data maintenance, when records need corrected or supplemented, or transfer, when data need to be regularly routed for updating the database, are specified in the *Data Administration* section.

Modification of database **appearance** may be desired in some cases to make data entry easier. OFIS users should submit requests for database modification to the Program Manager and cc all Database Development Team members in the correspondence.


Modify Database
Modify Structure
Add New Data Codes, Variables, or Suites of Variables
Modify Content
Correct or Update Records
Modify Appearance
Customize Data Entry Forms
Follow Protocols for Additions to the Database
Consult Local OFIS Manager
Consider Authorization Level
Level 4
STOP:
Consult Local OFIS manager
Level 3
Consult Program Manager before proceeding

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Appendix 1: Table Fields and Descriptions

Appendix 1.1: Active Projects

Variable	Description
ProjectID	Project number
ProjectOrgUnit	Organizational unit responsible for project implementation
ProjectActive	Is this project active? (True / False)

Appendix 1.2: Core Type

Variable	Description
CoreType	Abbreviated code for tissue core sample location
CoreDescription	Location of tissue core sample

Appendix 1.3: Effort Type

Variable	Description
EType	Abbreviated code for sample effort type.
EDescription	Description of the sample effort used.

Appendix 1.4 Entity

Variable	Description
Entity	Abbreviated code describing the type of sampling conducted
EntityDesc	Type of sampling conducted

Appendix 1.5: Gear Specifications

Variable	Description
GearSpec	Numeric code assigned to a sampling gear
GearSpecName	Specific description of a sampling gear
GearType	Numeric code assigned to each family of gears (gillnets, electrofishing, etc…)
GearDescript	

Appendix 1.6: GearType Codes

Variable	Description
GearType	Numeric code assigned to a family of gears
GearTypeName	Name given to a family of gears
GearEntity	Entity sampled by a family of gears

Appendix 1.7 Location Codes

Variable	Description
Location	Numeric code assigned to a water body
Lake	Water body name
Acreage	Surface acreage (acres)
County	County(s) water body is located
Township	Township(s) water body is located
Watershed	
Watershed2	
Shoreline	
Type	
Latitude	
Longitude	
MaxDepth	Maximum depth (m)
PondAcess	
PondRefSiteNo	
PondInflow	Does the water body have an inflow? (true/false)
PondOutflow	Does the water body have an outflow? (true/false)
PondHistory	
Comments	

Appendix 1.8: Mark Condition

Variable	Description
MkCondition	Numeric code assigned to a fish condition
MkConditionDesc	Description of a fish condition

Appendix 1.9: Mark type

Variable	Description
MkType	
MkTypeDesc	

Appendix 1.**10:** Sample Sites

Variable	Description
SiteNo	Sample site number
Location	Waterbody name
UTM Zone	UTM Zone of the sample site
UTM Northing	UTM Northing coordinates of the sample site
UTM Easting	UTM Easting coordinates of the sample site

Appendix 1.11: Sex

Variable	Description
Sex	Abbreviated code used to indicate fish sex and maturity
SexDescription	Description of sex / maturity codes

Appendix 1.12: Species

Variable	Description
Species	Numeric code assigned to a fish species or group of species
SpeciesName	Common name
Latin Name	Latin binomial – genus and species
EPA Code	
Yintercept	Intercept used for Fraser-Lee growth backcalculations
CmLength-RangeLow	Minimum length observed for a species
CmLength-RangeHigh	Maximum length observed for a species

Appendix 1.13: Structure

Variable	Description
Struc	Abbreviated code used to signify the structure used to age a fish
StrucDescription	Structure used to age a fish

Appendix 1.14: Substrate

Variable	Description
Substrate	Abbreviated code used to indicate substrate type
SubstrateDesc	Description of a substrate category

Appendix 2: Field Codes

Appendix 2.1: Active project codes

ProjectID:	ProjectOrgUnit:	ProjectActive:
ADFM05	AD	False
ADFM06	AD	False
ADFM09	AD	False
ADFM27	AD	False
F1DM03	F1	True
F1DR14	F1	False
F1DX06	F1	False
F1NB01	F1	False
F1NB02	F1	False
F1NX01	F1	False
F1SM01	F1	True
F29R02	F2	False
F29R03	F2	False
F29R27	F2	False
F29RS3	F2	False
F2BN01	F2	False
F2DM58	F2	True
F2DM59	F2	False
F2DM60	F2	True
F2DR19	F2	False
F2DR23	F2	False
F2DR25	F2	False
F2DX06	F2	False
F2NB01	F2	False
F2NM03	F2	False
F2NX01	F2	False
F2SM01	F2	True
F2SM02	F2	False
F3DM02	F3	True
F3DR19	F3	False
F3DX06	F3	False
F3NB01	F3	False
F3NB02	F3	False
F3NX01	F3	False
F3SM01	F3	True
F3SM02	F3	True
F4DM01	F4	False
F4DM02	F4	False

Appendix 2.1 (cont…)

ProjectID:	ProjectOrgUnit:	ProjectActive:
F4DM03	F4	False
F4DM05	F4	False
F4DM06	F4	False
F4DM07	F4	True
F4DR09	F4	False
F4DR10	F4	True
F4DR11	F4	True
F4DX06	F4	False
F4NB01	F4	False
F4NX01	F4	False
F4NX02	F4	False
F4SM01	F4	False
F4SR02	F4	True
F53RS0	F5	False
F5DM02	F5	True
F5DR07	F5	True
F5DR19	F5	True
F5DX06	F5	False
F5NB01	F5	False
F5NX01	F5	False
F5SM01	F5	True
FADB01	FA	True
FADB02	FA	True
FADB03	FA	True
FADM03	FA	True
FADM04	FA	True
FADM05	FA	True
FADR29	FA	True
FADR36	FA	True
FADR37	FA	True
FADR38	FA	True
FADR39	FA	True
FADR40	FA	True
FADR41	FA	True
FADR42	FA	True
FADX03	FA	True
FADX07	FA	True
FADX09	FA	True
FADX10	FA	True
FADX11	FA	True
FAIR01	FA	True

Appendix 2.1 (cont…)

ProjectID:	ProjectOrgUnit:	ProjectActive:
FANB01	FA	True
FASR01	FA	True
FCCM01	FC	True
FCDR01	FC	True
FCFX01	FC	True
FCNB01	FC	True
FCNB02	FC	True
FCNM01	FC	True
FCNM02	FC	True
FCNM03	FC	True
FCNM04	FC	True
FCNX04	FC	True
FCSM01	FC	True
FCSR01	FC	True
FFDB01	FF	True
FFDB02	FF	True
FFDR01	FF	True
FFDR04	FF	True
FFDR05	FF	True
FFDR06	FF	True
FFDX01	FF	True
FFNB01	FF	True
FFSM01	FF	True
FIDB01	FI	True
FIDR01	FI	True
FIDR03	FI	True
FIDR06	FI	True
FIDR07	FI	True
FIDR08	FI	True
FIDR10	FI	True
FIDR11	FI	True
FIDR12	FI	True
FIDR13	FI	True
FIDR14	FI	True
FINB01	FI	True
FINX01	FI	True
FISR01	FI	True
FMD202	FM	False
FMD203	FM	False
FMD207	FM	False
FMD224	FM	False
FMD225	FM	False

Appendix 2.1 (cont…)

ProjectID:	ProjectOrgUnit:	ProjectActive:
FMD236	FM	False
FMD2S0	FM	False
FMD2SO	FM	False
FPDX01	FP	True
FPDX02	FP	True
FPDX03	FP	True
FPDX04	FP	True
FPDX05	FP	True
FPDX06	FP	True
FPDX09	FP	True
FPDX10	FP	True
FPNB01	FP	True
FPNX01	FP	True
FSDB01	FS	True
FSDB02	FS	True
FSDB03	FS	True
FSDR03	FS	True
FSDR06	FS	True
FSDR11	FS	True
FSDR13	FS	True
FSDR17	FS	True
FSDR18	FS	True
FSDX01	FS	True
FSNB01	FS	True
FSSR01	FS	True
NSF859	NS	False
WWSR04	WW	False

Appendix 2.2: Core type codes

CoreType	CoreDescription
LD	Left Dorsal
LM	Left Middle
LV	Left Ventral
RD	Right Dorsal
RM	Right Middle
RV	Right Ventral
UK	Unknown

Appendix 2.3: Effort type codes

EType:	EDesc:
A	Area
D	Distance
N	Effort not measured
T	Time
V	Volume

Appendix 2.4: Entity codes

Entity Code	Entity Type
A	Angler
F	Fish
P	Plankton
W	Water

Appendix 2.5: Gear specification codes

GearSpec:	GearSpecName:	GearType:
99	No Gear: Observed	99
96	Water Collection: Unknown Water Collection Sampler	17
59	Integrated tube sampler for water collection	17
48	Integrated Tube Sampler for water collection	17
40	Water Collection: VanDorn, 2.2 liter horizontal alpha bottle	17
98	Plankton: Unknown Plankton Sampler	16
47	Plankton: Schindler-Patalis sampler (12 liter); 53 um mesh	16
46	Plankton: Schindler-Patalis sampler (10 liter); 60 um mesh	16
39	Plankton: Schindler-Patalis sampler (30 liter), 53 um mesh	16
38	Plankton: Wisconsin-style plankton net, 53 um mesh	16
100	Water Quality: YSI model 85 temp., conductivity, and DO meter	15
97	Water Quality: Unknown Water Quality Sampler	15
45	Water Quality: Licor underwater quantum meter and Horiba U-10 Meter	15
44	Water Quality: Secchi disk	15
43	Water Quality: Licor underwater quantum meter, spherical sensor	15
42	Water Quality: Hanna Total Dissolved Solids & Conductivity meter	15
41	Water Quality: Horiba U-10 Water Quality meter	15
15	Water Quality: YSI model 55 temp. and DO meter	15
86	Angling: Unknown	14
53	Angling: Creel surveys	14
87	Explosives and Concussion: Unknown	13
95	Poisons: Unknown Poison	12
37	Poisons: Quadrat rotenone sampling	12
88	Traps: Unknown Traps	11
89	Trammel Net: Unknown Trammel Net	10
93	Trawl: Unknown Trawl	7
35	Trawl: Miller High Speed Sampler with 0.5 mm mesh	7

Appendix 2.5 (cont…)

GearSpec:	GearSpecName:	GearType:
34	Trawl: Bottom Trawl: 12' net, 12"x24" doors, 3/8" body mesh, 1/4" cod mesh	7
14	Trawl: Neuston net: 1x2m frame, 1.8 mm mesh	7
13	Trawl: Neuston net: 1x2m frame, 0.5 mm mesh	7
92	Gill Net: Unknown Gill Net	6
64	Seine, 8-m, 3-mm mesh	6
62	Experimental gillnet: 0.75, 1, 1.5, 2, 2.5, 3.0 in., 6'x30', TL=180'	6
61	Experimental gillnet: 0.75, 1, 1.5, 2, 2.5 in., 6'x20' panel, TL=100'	6
58	Gill Net: 5" mesh, 100' long, 18' deep	6
57	Gill Net: 5" mesh, 100' long, 12' deep	6
56	Gill Net: 5" mesh, 100' long, 6' deep	6
55	Gill Net: 6" mesh, 200' long, 15' deep	6
54	Gill Net: 5" mesh, 100' long, 18' deep	6
31	Gill Net: Exp 8 panel; 3x0.75x54, 2x1x41, 3x1.5x27, 4x2x20, 4x2.5x16, 6x3x13, 6x3.5x11, 6x4x10	6
30	Gill Net: (Double) 5" mesh, 12 (hobbled to 8') x 200 x 2 nets = 400T	6
29	Gill Net: (Double) 5" mesh, 18 (hobbled to15') x 200 x 2 nets = 400T	6
28	Gill Net: (Double) 5" mesh, 21 (hobbled to18) x 200 x 2 nets = 400T	6
27	Gill Net: 3" mesh, 15' (hobbled to 12') x 150	6
26	Gill Net: 5" mesh, 12' (hobbled to 8') x 200'	6
25	Gill Net: 5" mesh, 18' (hobbled to 15') x 200'	6
24	Gill Net: 5" mesh, 21'(hobbled to 18') x 200'	6
23	Gill Net: Floating, 1.25, 1.5 mesh, 6x50 panel, TL=100'	6
22	Gill Net: Exp .75, 1, 1.5, 1.5, 2 mesh, 5x25 panel, TL=125'	6
21	Gill Net: Exp, .75, 1, 1.25, 1.5, 2 mesh,5x25 panel, TL=125'	6
20	Gill Net: Exp, .75, 1, 1.5, 2 mesh, 4x25 panel,TL=100'	6
19	Gill Net: Sinking 1.75, 2 mesh, 6X50 panel, TL=100'	6
18	Gill Net: Floating, 0.75, 1 mesh, 6x50 panel, TL=100'	6

Appendix 2.5 (cont…)

GearSpec:	GearSpecName:	GearType:
17	Gill Net: Sinking, 0.5, 0.75 mesh, 6x50 panel, TL=100'	6
16	Gill Net: Exp. 0.75, 1, 1.5, 2, 2.5 mesh, 8x20 panel, TL=100'	6
94	Seine: Unknown Seine	4
60	Seine: minnow seine 8'x4'	4
36	Seine: Bag seine, 10 m x 1.2 m, 3-5 mm mesh	4
91	Trap Nets: Unknown Trap Net	3
52	Trap Nets: Ohio-style trapnet, 4' lead height	3
50	Trap Nets: Ohio-style trapnet, 22' lead height	3
49	Trap Nets: Ohio-style trapnet, 10' lead height	3
12	Trap Nets: Ohio-style trapnet, 6' lead height	3
11	Trap Nets: Ohio-style trapnet, 14' lead height	3
10	Trap Nets: Missouri-style trapnet	3
90	Electrofishing: Unknown Electrofishing	1
63	Electrofishing: Smith-Root Catfish Zapper	1
51	Rolling Electrofishing Boat	1
9	Electrofishing: AC backpack	1
8	Electrofishing: DC backpack	1
7	Electrofishing: stream pull-behind with AC current	1
6	Electrofishing: stream pull-behind with DC current	1
5	Electrofishing: std. Stream boat with AC current	1
4	Electrofishing: Zodiac stream boat with DC current	1
3	Electrofishing: std. stream boat with DC current	1
2	Electrofishing: std. 17' boat with AC current	1
1	Electrofishing: std. 17' boat with DC current	1

Appendix 2.6: Gear type codes

GearType:	GearTypeName:	GearEntity:
1	Electrofishing	F
3	Hoop or Trap Nets	F
4	Seine	F
6	Gill Net	F
7	Trawl - Fish	F
10	Trammel Net	F
11	Traps	F
12	Poisons	F
13	Explosives and Concussion	F
14	Angling-Fish	F
15	Water Quality Meter	W
16	Plankton Sampler	P
17	Water Collection Device	W
18	Trapnet lead (only)	F
19	Acoustic survey (hydroacoustics)	F
99	No Gear Used	F
20	Plankton Sampler - Water	W
21	Water Collection Device - Plankton	P
22	Data Logger	W
23	Angling - Creel	A
24	Trawl - Plankton	P

Appendix 2.7: Location codes

Location:	Lake:
01001	HOCKING RIVER
01400	CLEAR CREEK
02000	SCIOTO RIVER
02038	HONEY CREEK
02110	ALUM CREEK
02200	BIG DARBY CREEK
02300	DEER CREEK TAILWATER
02500	PAINT CREEK
02530	ROCKY FORK CREEK
02600	SALT CREEK
02610	LITTLE SALT CREEK
02700	SCIOTO BRUSH CREEK
02800	SUNFISH CREEK
03000	LAKE ERIE: GRAND RIVER
04000	LAKE ERIE: MISC WEST TRIBS
04001	MAUMEE RIVER
04100	AUGLAIZE RIVER
05000	LAKE ERIE: SANDUSKY RIVER
05001	SANDUSKY RIVER
06000	OHIO RIVER TRIBS: MUSKINGUM TO MAHONING
06400	LITTLE MUSKINGUM RIVER
07000	LAKE ERIE: ASH TO CONN
08001	LITTLE BEAVER CREEK
08100	NORTH FORK LITTLE BEAVER CREEK
08300	WEST FORK LITTLE BEAVER CREEK
09000	OHIO R TRIBS SCIOTO TO HOCK
10000	OHIO RIVER TRIBS LITTLE MIAMI TO SCIOTO RIVER
11000	LITTLE MIAMI RIVER
11209	COWAN CREEK
12000	LAKE ERIE: HURON RIVER
13000	LAKE ERIE: ROCKY RIVER
14000	GREAT MIAMI RIVER
14100	MAD RIVER
14122	DEER CREEK
14138	MAC-O-CHEE
14200	STILLWATER RIVER
14414	PAINT CREEK TAILWATER
15000	LAKE ERIE: CHAGRIN RIVER
16000	LAKE ERIE: OTTER CREEK TRIBS

Appendix 2.7 (cont…)

Location:	Lake:
17000	MUSKINGUM RIVER
17200	LICKING RIVER
17650	KOKOSING RIVER
17750	CLEAR FORK OF MOHICAN RIVER
17751	PINE RUN
17761	CEDAR FORK
17800	WILLS CREEK
18000	MAHONING RIVER
18018	WEST BRANCH MAHONING RIVER
19000	LAKE ERIE: CUYAHOGA RIVER
20000	LAKE ERIE: BLACK RIVER
2004L	LAKE MOSIER
200ZL	LAKE DAUGHERTY (FOSTORIA #1)
21000	LAKE ERIE: VERMILION RIVER
22000	WABASH RIVER
23000	OHIO RIVER TRIBS: MUDDY TO MILL CREEK
24000	OHIO RIVER
24054	OHIO RIVER: NEW CUMBERLAND POOL
24084	OHIO RIVER: PIKE ISLAND POOL
24127	OHIO RIVER: HANNIBAL POOL
24162	OHIO RIVER: WILLOW ISLAND POOL
24204	OHIO RIVER: BELLEVILLE POOL
24237	OHIO RIVER: RACINE POOL
24279	OHIO RIVER: GALLIPOLIS POOL
24341	OHIO RIVER: GREENUP POOL
24437	OHIO RIVER: MELDAHL POOL
24531	OHIO RIVER: MARKLAND POOL
24606	MARKLAND
24631	OHIO RIVER: SMITHLAND POOL
24720	MCALPINE
24731	OHIO RIVER: CANNELTON POOL
24918	J.T. MEYER
5463291	5463291 (AEP POND MM29)
5463341	5463341 (AEP POND MM34)
5463401	5463401 (AEP POND MB40)
5463411	5463411 (AEP POND MB41)
5463421	5463421 (AEP POND MB42)
5463431	5463431 (AEP POND NB43)
80101	ALUM CREEK LAKE

Appendix 2.7 (cont…)

Location:	Lake:
80102	BUCKEYE LAKE
80103	DEER CREEK LAKE
80104	DELAWARE LAKE
80105	GREENFIELD LAKE
80106	GRIGGS RESERVOIR
80107	HARGUS LAKE
80108	HOOVER RESERVOIR
80109	INDIAN LAKE
80110	KISER LAKE
80111	KNOX LAKE
80112	MADISON LAKE
80113	MT. GILEAD LAKES
80114	KOKOSING LAKE
80115	OAKTHORPE LAKE
80116	O'SHAUGHNESSY RESERVOIR
80117	ROCKMILL LAKE
80118	RUSH CREEK LAKE
80119	ANTRIM LAKE
80121	RICHWOOD LAKE
80197	WDST1 PRIVATE PONDS
80199	WDST1 OTHER IMPOUNDMENTS
802001	CROSROADS INDUSTRIAL PONDS
802002	DAUGHERTY LAKE FOSTORIA #1
802003	GEIRTZ LAKE
802004	MOSIER LAKE FOSTORIA #4
802005	PEARSON METROPARKS
802006	KILLDEER POND #30
802007	KILLDEER POND #33
802008	HANCOCK COUNTY WETLANDS
802009	MONROEVILLE RESERVOIR
80201	ALDRICH POND
80202	ALLEND POND
80203	AMANN RESERVOIR
80204	AMICK RESERVOIR
80205	ARCHBOLD RESERVOIR #1
80206	ARCHBOLD RESERVOIR #2
80207	ATTICA RESERVOIR
80208	BEAVER CREEK RESERVOIR
80209	BELLEVUE RESERVOIR #4

Appendix 2.7 (cont…)

Location:	Lake:
80210	BELLEVUE RESERVOIR #5
80211	BRESLER RESERVOIR
80212	BUCYRUS RESERVOIR #1
80213	CHARLES MILL RESERVOIR
80214	CLEARFORK RESERVOIR
80215	DELTA RESERVOIR #1
80216	DESHLER RESERVOIR #1
80217	EVERGREEN LAKE
80218	FERGUSON RESERVOIR
80219	FINDLAY RESERVOIR #1
80220	FINDLAY RESERVOIR #2
80221	GREENWICH RESERVOIR
80222	HAMLER RESERVOIR
80223	HARRISON LAKE
80224	INDEPENDENCE DAM
80225	KILLDEER PONDS
80226	KILLDEER RESERVOIR
80227	LAKE LE COMTE
80228	LEIPSIC RESERVOIR
80229	LIMA LAKE
80230	LOST CREEK RESERVOIR
80231	MC COMB RESERVOIR #1
80232	MC COMB RESERVOIR #2
80233	METZGER RESERVOIR
80234	NETTLE LAKE
80235	NEW LONDON RESERVOIR
80236	NEW WASHINGTON RESERVOIR #1
80237	NORTH BALTIMORE RESERVOIR
80238	NORWALK RESERVOIR #1
80239	NORWALK RESERVOIR #2
80240	NORWALK RESERVOIR #3
80241	OTTAWA RESERVOIR
80242	OTTOVILLE QUARRIES
80243	OXBOW LAKE
80244	PAULDING PONDS
80245	PAULDING RESERVOIR
80246	PLEASANT HILL RESERVOIR
80247	POWERS RESERVOIR
80248	RACCOON CREEK RESERVOIR

Appendix 2.7 (cont…)

Location:	Lake:
80249	RILEY RESERVOIR
80250	SCHOONOVER LAKE
80251	SPORTSMAN LAKE
80252	SWANTON RAILROAD RESERVOIR
80253	SWANTON W.W. RESERVOIR
80254	UPPER SANDUSKY RESERVOIR
80255	VAN BUREN RESERVOIR
80256	VAN WERT RESERVOIR #1
80257	VAN WERT RESERVOIR #2
80258	WAUSEON RESERVOIR #1
80259	WAUSEON RESERVOIR #2
80260	WILLARD RESERVOIR
80261	LAKE MEL
80262	LAKE US
80263	JERRY'S POND
80264	HOGBACK POND
80265	LOU'S POND
80266	CLEM'S POND
80267	ED'S POND
80268	LAKE ANN
80269	LAKE SUE
80270	LAKE LAVERE
80271	LAKE LA SU AN
80272	LAKE WOOD DUCK
80273	LAKE TEAL
80274	ALLEN LAKE
80276	BUCYRUS RESERVOIR #2
80277	OUTHWAITE RESERVOIR (BUCYRUS 4)
80278	DELTA RESERVOIR #2
80279	DESHLER RESERVOIR #2
80280	FULTON POND
80281	OLANDER LAKE
80282	MCCOMB RESERVOIR #2
80283	NEW WASHINGTON RESERVOIR #2
80284	SHELBY RESERVOIR #1
80285	SHELBY RESERVOIR #2
80286	RESTHAVEN POND #01
80287	RESTHAVEN POND #02
80288	RESTHAVEN POND #06

Appendix 2.7 (cont…)

Location:	Lake:
80289	RESTHAVEN POND #07
80290	RESTHAVEN POND #08
80291	RESTHAVEN POND #10
80292	RESTHAVEN POND #11
80293	VETERAN'S MEMORIAL RESERVOIR
80294	MAUMEE BAY STATE PARK POND
80295	MILLER BLUE HOLE
80297	WDST2 PRIVATE PONDS
80298	WDST2 OTHER UPGROUND
80299	WDST2 OTHER IMPOUNDMENTS
80301	AQUILLA LAKE
80302	ATWOOD LAKE
80303	BEACH CITY RESERVOIR
80304	BEREA QUARRY
80305	BERLIN LAKE
80306	CAMDEN LAKE
80307	CANAL FULTON
80308	CLENDENING LAKE
80309	DALE WALBORN RESERVOIR
80310	DEER CREEK RESERVOIR
80311	EAST BRANCH RESERVOIR
80312	EAST PALESTINE RESERVOIR
80313	FINDLEY LAKE
80314	FRIENDSHIP PARK LAKE
80315	GUILFORD LAKE
80316	HIGHLANDTOWN LAKE
80317	HINCKLEY LAKE
80318	JEFFERSON LAKE
80319	JEFFERSON RESERVOIR
80320	KIPTON RESERVOIR
80321	LAKE MEDINA
80322	LAKE PARK
80323	LEESVILLE LAKE
80324	MILL CREEK LAKE
80325	LAKE MILTON
80326	MOGADORE RESERVOIR
80327	MOSQUITO LAKE
80328	NIMISILA RESERVOIR
80329	OBERLIN RESERVOIR

Appendix 2.7 (cont…)

Location:	Lake:
80330	EAST RESERVOIR - PORTAGE LAKE
80331	WEST RESERVOIR - PORTAGE LAKE
80332	TURKEYFOOT -PORTAGE LAKE
80333	NORTH RESERVOIR - PORTAGE LAKE
80334	LONG LAKE - PORTAGE LAKE
80335	PUNDERSON LAKE
80336	PYMATUNING LAKE
80337	SHADOW LAKE
80338	SHREVE LAKE
80339	SPENCER LAKE
80340	SPRINGFIELD LAKE
80341	TAPPAN LAKE
80342	WALLACE RESERVOIR
80343	WELLINGTON RESERVOIR SOUTH
80344	WELLINGTON UPGROUND RESERVOIR
80345	WEST BRANCH RESERVOIR (MICHAEL J. KI
80346	ZEPERNICK LAKE
80347	ZOAR LAKE
80348	NEW LYME LAKE
80357	LADUE RESERVOIR
80358	SILVER CREEK LAKE
80361	RUFF POND
80362	ISMOND POND
80364	CHIPPEWA LAKE
80397	WDST3 PRIVATE PONDS
80398	WDST3 OTHER UPGROUND
80399	WDST3 OTHER IMPNDMNTS
80401	BELMONT LAKE
80403	BLUE ROCK LAKE (CUTLER LAKE)
80404	BURR OAK LAKE
80405	CLOUSE LAKE
80406	CROOKSVILLE RESERVOIR EAST
80407	CROOKSVILLE RESERVOIR SOUTH
80408	DILLON LAKE
80409	FORKED RUN LAKE
80410	FOX LAKE
80411	JACKSON CITY RESERVOIR (HAMMERTOWN LAKE)
80412	JACKSON LAKE
80413	LAKE ALMA

Appendix 2.7 (cont…)

Location:	Lake:
80414	LAKE HOPE
80415	LAKE LOGAN
80416	LAKE WHITE
80417	NEW LEXINGTON RESERVOIR
80418	PIEDMONT LAKE
80419	PIKE LAKE
80420	PINE LAKE
80421	ROSS LAKE
80422	SALT FORK LAKE
80423	SENECA LAKE (SENECAVILLE)
80424	LAKE SNOWDEN
80426	DOW LAKE
80427	TAR HOLLOW LAKE
80428	TYCOON LAKE
80429	VESUVIUS LAKE
80430	VETO LAKE
80431	WELLSTON RESERVOIR
80432	WILLS CREEK LAKE
80433	WOLF RUN LAKE
80435	TURKEY CREEK LAKE
80436	MONROE LAKE
80437	OHIO POWER PONDS
80438	ROSE LAKE
80439	SCIOTO TRAIL AREA LAKES
80440	THE WILDS PONDS
80441	MUNRO BASIN
80442	RIO GRANDE RESERVOIR
80443	ST. CLAIRSVILLE RESERVOIR
80444	TIMBRE RIDGE LAKE
80467	CALDWELL LAKE
80468	STEWART HOLLOW LAKE
80490	ROOSEVELT LAKE
80497	WDST4 PRIVATE PONDS
80499	WDST4 OTHER IMPNDMNTS
80500	NEERS POND
80501	ACTON LAKE
80502	ADAMS LAKE
80503	CAESAR CREEK LAKE
80504	C.J. BROWN RESERVOIR

Appendix 2.7 (cont…)

Location:	Lake:
80505	CLARK LAKE
80506	COWAN LAKE
80507	DARKE WILDLIFE AREA PONDS
80508	DECKER LAKE
80509	EAST FORK LAKE
80510	EASTWOOD LAKE
80511	ENGLEWOOD DAM
80512	GRAND LAKE ST. MARYS
80513	GRANT LAKE
80514	HILLSBORO RESERVOIR
80515	LAKE LORAMIE
80516	OLDAKER PONDS
80517	PAINT CREEK LAKE
80518	REID PARK PONDS
80519	ROCKY FORK LAKE
80520	RUSH RUN LAKE
80521	SPRING VALLEY LAKE
80522	STONELICK LAKE
80523	TAWAWA LAKE
80524	BRUSH LAKE
80525	ECHO LAKE
80526	HOSTERMAN LAKE
80589	SWIFT RUN LAKE
80597	WDST5 PRIVATE PONDS
80599	WDST5 OTHER IMPNDMNTS
80600	LAKE ERIE
80601	HURON WEST (LAKE ERIE)
80602	HURON TO FAIRPORT (LAKE ERIE)
80603	FAIRPORT EAST
80604	SANDUSKY BAY
82010	LAMERJACK LAKE (FOSTORIA NUMBER 3)
82011	MOTTRAM LAKE (FOSTORIA NUMBER 3)
80359	LITTLE TURTLE POND
80370	PESTOS LAKE

Appendix 2.8: Condition codes

MkCondition:	MkConditionDesc:
1	Good
2	Dead
3	Poor
4	Unknown

Appendix 2.9: Mark Type Codes

MkType:	MkTypeDesc:
0	No Previous Mark
1	Left Pelvic Clip
2	Right Pelvic Clip
3	Left Pectoral Clip
4	Right Pectoral Clip
5	Top Caudal Clip
6	Bottom Caudal Clip
7	Adipose Clip
8	Dorsal Hole Punch
10	PIT Tag
20	Coded Wire Tag
30	Floy Anchor Tag
40	Opercular Tag
50	Jaw Tag
60	Telemetry Transmitter

Appendix 2.10: Sex Codes

Sex:	**SexDescription:**
1	MALE
2	FEMALE
3	IMMATURE
4	UNKNOWN

Appendix 2.11: Species code and common name of Ohio fishes.

Species Code	Species Name
1000	Lamprey (general)
1001	Silver Lamprey
1002	Northern Brook Lamprey
1003	Ohio Lamprey
1004	Mountain Brook Lamprey
1005	Sea Lamprey
1006	Least Brook Lamprey
1007	American Brook Lamprey
4001	Paddlefish
8000	Sturgeon (general)
8001	Lake Sturgeon
8002	Shovelnose Sturgeon
10000	Gar (general)
10001	Alligator Gar
10002	Shortnose Gar
10003	Spotted Gar
10004	Longnose Gar
15001	Bowfin
18000	Hiodon (general)
18001	Goldeye
18002	Mooneye
18003	Skipjack Herring
20000	Clupeids (general)
20002	Alewife
20003	Gizzard Shad
20004	Theadfin Shad
25000	Salmonids (general)
25001	Brown Trout
25002	Rainbow Trout
25003	Brook Trout
25004	Lake Trout
25005	Coho Salmon
25006	Chinook Salmon
25007	Cisco
25008	Lake Whitefish
30001	Rainbow Smelt
34001	Mudminnow
37000	Pike Family

Appendix 2.11 (cont...)

Species Code	Species Name
37001	Grass Pickerel
37002	Chain Pickerel
37003	Northern Pike
37004	Muskellunge
37005	Tiger Muskie
37006	Grass Pickerel X Chain Pickerel
40000	Sucker Family
40001	Blue Sucker
40002	Bigmouth Buffalo
40003	Black Buffalo
40004	Smallmouth Buffalo
40005	Quillback Carpsucker
40006	River Carpsucker
40007	Highfin Carpsucker
40008	Silver Redhorse
40009	Black Redhorse
40010	Golden Redhorse
40011	Shorthead Redhorse
40012	Greater Redhorse
40013	River Redhorse
40014	Harelip Redhorse
40015	Hog Sucker
40016	White Sucker
40017	Longnose Sucker
40018	Spotted Sucker
40019	Chubsucker
40020	Creek Chubsucker
40900	Suckers (general)
40901	Buffalo fishes (general)
40902	Carpsuckers (general)
40903	Redhorse suckers (general)
43001	Common Carp
43002	Goldfish
43003	Golden Shiner
43004	Hornyhead Chub
43005	River Chub
43006	Silver Chub
43007	Bigeye Chub
43008	Streamline Chub
43009	Gravel Chub

Appendix 2.11 (cont…)

Species Code	Species Name
43010	Speckled Chub
43011	Blacknose Dace
43012	Longnose Dace
43013	Creek Chub
43014	Tonguetied Minnow
43015	Suckermouth Minnow
43016	Southern Redbelly Dace
43017	Redside Dace
43018	Rosyside Dace
43019	Pugnose Minnow
43020	Emerald Shiner
43021	Silver Shiner
43022	Rosyface Shiner
43023	Redfin Shiner
43024	Rosefin Shiner
43025	Striped Shiner
43026	Common Shiner
43027	River Shiner
43028	Spottail Shiner
43029	Blackchin Shiner
43030	Bigeye Shiner
43031	Steelcolor Shiner
43032	Spotfin Shiner
43033	Bigmouth Shiner
43034	Sand Shiner
43035	Mimic Shiner
43036	Ghost Shiner
43037	Blacknose Shiner
43038	Pugnose Shiner
43039	Silverjaw Minnow
43040	MS Silvery Minnow
43041	Bullhead Minnow
43042	Fathead Minnow
43043	Bluntnose Minnow
43044	Central Stonroller
43045	Carp X Goldfish
43046	Popeye Shiner
43047	Grass Crap
43048	Red Shiner

Appendix 2.11 (cont…)

Species Code	Species Name
43049	Common X Rosyface
43050	Striped Shiner X River Chub
43051	River Chub X Stoneroller
43052	Striped Shiner X Rosyface
43053	Creek Chub X Redside Dace
43054	Striped Shiner X Creek Chub
43055	Common Shiner X River Chub
43056	Blacknose Dace X Stoneroller
43057	Striped Shiner X Stoneroller
43058	Common Shiner X Stoneroller
43059	Striped Shiner X Hornyhead Chub
43060	Common Shiner X Striped Shiner
43061	Striped Shiner X Rosefin Shiner
43062	Creek Chub X S. Redbelly Dace
43063	Channel Shiner
43064	Striped X Silver
43071	Whitetail Shiner
43079	Silver Carp
43901	Shiners (general)
43902	Chubs (general)
43903	Dace (general)
43904	Minnows (general)
43999	Hybrid X Minnow
47000	Catfishes (general)
47001	Blue Catfish
47002	Channel Catfish
47003	White Catfish
47004	Yellow Bullhead
47005	Brown Bullhead
47006	Black Bullhead
47007	Flathead Catfish
47008	Stonecat Madtom
47009	Mountain Madtom
47010	Northern Madtom
47011	Scioto Madtom
47012	Brindled Madtom
47013	Tadpole Madtom
47014	Yellow Bullhead X Brown Bullhead
47015	Brown Bullhead X Black Bullhead

Appendix 2.11 (cont…)

Species Code	Species Name
47901	Blue, Channel, Flathead, White catfishes
47902	Bullheads (general)
47903	Madtoms (general)
50001	American Eel
54000	Western Banded Killifish
54001	Eastern Banded Killifish
54002	Blackstripe Topminnow
54901	Northern Studfish
57001	Mosquitofish
60001	Burbot
63001	Trout-perch
68001	Pirate Perch
70001	Brook Silverside
74001	White Bass
74002	Striped Bass
74003	White Perch
74005	Striped Bass x White Bass (general)
74015	White Bass (male) x Striped Bass (female)
74025	Striped Bass (male) x White bass (female)
77000	Sunfish Family
77001	White Crappie
77002	Black Crappie
77003	Rock Bass
77004	Smallmouth Bass
77005	Spotted Bass
77006	Largemouth Bass
77007	Warmouth
77008	Green Sunfish
77009	Bluegill
77010	Orangespot
77011	Longear Sunfish
77012	Redear Sunfish
77013	Pumpkinseed
77014	Bluegill X Pumpkinseed
77015	Green X Bluegill
77016	Green Sunfish X Pumpkinseed
77017	Longear Sunfish X Bluegill

Appendix 2.11 (cont…).

Species Code	Species Name
77018	Bluegill X Orangespot
77019	Green Sunfish X Orangespot
77020	Pumpkinseed X Longear Sunfish
77021	Green Sunfish X Longear Sunfish
77022	Orangspotted X Pumpkinseed
77023	Longear X Orangespotted
77024	Green Sunfish X Warmouth
77025	Warmouth X Pumpkinseed
77994	sunfish (panfish, general)
77995	Black Basses (general)
77996	Crappie (general)
77997	Lepomis and sunfish hybrids
77998	Green Sunfish X Hybrid
77999	Hybrid x sunfish
80000	Perch Family
80001	Sauger
80002	Walleye
80003	Yellow Perch
80004	Dusky Darter
80005	Blackside Darter
80006	Longhead Darter
80007	Slenderhead Darter
80008	River Darter
80009	Channel Darter
80010	Gilt Darter
80011	Log Perch
80012	Crystal Darter
80013	Sand Darter
80014	Johnny Darter
80015	Greenside Darter
80016	Banded Darter
80017	Variegate Darter
80018	Spotted Darter
80019	Bluebreasted Darter
80020	Tippecanoe Darter
80021	Iowa Darter
80022	Rainbow Darter
80023	Orangethroated Darter
80024	Fantail Darter
80025	Least Darter

Appendix 2.11 (cont...)

Species Code	Species Name
80026	Saugeye
80027	Rainbow X Orangethroat
80901	Walleye, sauger, and saugeye
80902	Darters (general)
85001	Freshwater Drum
87001	Round Goby
87002	Tubenose Goby
90000	Sculpin Family
90001	Spoonhead Sculpin
90002	Mottled Sculpin
90003	Slimy Sculpin
90004	Deepwater Sculpin
95001	Brook Stickleback
95002	3-spine Stickleback
99000	All reservoir prey fishes
99001	Carp and all suckers
99002	non-bluegill sunfishes
99990	Non Fish Sampling
99999	Anything

Appendix 2.12: Aging structure (Struc) codes

Code	Description
S	Scale
O	Otolith
F	Fin Spine
J	Jaw

Appendix 2.13: Substrate codes

Substrate	SubstrateDesc	Substrate Definition
CS	COBLE/SAND	
OS	ORGANIC	Organic material including muck and coarse detritus
RS	ROCK	
H	SHALE	
SS	SAND	Gritty texture when rubbed between fingers, .06-2 mm

Appendix 2.14: Zooplankton codes

Code	Description
BOSMI	bosmina
BYTHO	bythotrephes
CALAN	calanoid
CERIO	ceriodaphnia
CHAOB	chaoborus
CHYDO	chydorus
CLADO	cladoceron
COPEP	copepod
CYCLO	cyclopoid
DAPHN	daphnia
DIAPH	diaphanosoma
HARPA	harpactacoid
LEPTO	leptodora
MODAP	moinadaphnia
MOINA	moina
NAUP	nauplius
OSTRA	ostracod
SCAPH	scapholebrius
SIMOC	simocephalus
ZEBVE	zebra mussel veliger larva -- introduced spp.
CORBI	Corbicula -- introduced spp.
DAPLU	Daphnia lumholtzi -- introduced spp.

Appendix 2.15: Invertebrate codes

Code	Description
ACARI	acarina
AMPHI	amphipod
ANISO	anisoptera
ANNEL	annelid
APHID	aphididae
ARACH	arachnid
ARGUL	argulus
BIVAL	bivalve
CERAT	ceratapogonidae
CHIRO	chironomid
COLEO	coleoptera
COLLE	collembola
CORIX	corixidae
CRAYF	crayfish
DIPTE	diptera
EPHEM	ephemeroptera
GERRI	gerridae
HEMIP	hemiptera
HEPTA	heptageniidae
HEXAG	hexageniidae
HYDRA	hydracarina
HYMEN	hymenoptera
ISOPO	isopod
LEECH	leech
LEPID	lepidoptera
NEMAT	nematode
NEURO	neuroptera
NOTON	notonectidae
ODONA	odonata
PLECO	plecoptera
SALDI	saldidae
SCIRT	scirtidae
TERRI	terrestrial insect
TICK	tick
TRICH	trichoptera
VALVA	valvata
WORM	worm
ZYGOP	zygoptera
THRIP	thrip
MITE	mite
CRICK	cricket

Appendix 3: Field Data Forms

Description of OFIS Field Forms (current 7/1/2004)

FIELD FORMS ARE LOCATED ON THE "M" DRIVE FOR PRINTING.

Form Number	Description
1	Trip Meta-Data Form
	Variable Descriptions for Trip, Sampling, and Fish Variables (back of forms 2 and 3)
2	Sample Data Form
3	Catch Data Form
4	Water Quality Data Form
5	Fish Collection Taly Sheet
6	Mean Length at Age Data
7	Sample Labels
8	Group Catch Data
9	

Form 1: Trip Meta-Data
ODNR, Division of Wildlife
Inland Management System

Form Current: 9/1/2003

Project*	Date*	Location*

Crew _____ **Target*** _____

IMS Sampling (circle one): YES NO

Purpose: _____

_____

_____

Comments: _____

_____

_____

_____

Trip Meta-Data Variables

Project – ODNR, DOW project code (ex. FIDR07)

Date – date, in month, day, year (mm/dd/yyyy)

Location – name of the waterbody sampled, or code number (ex. Alum Creek Lake, or 80101)

Crew - TARS code, or descriptive code not exceeding six characters as determined by investigator (ex. WDST1)

Target – species name, fish group name, or code for either that is targeted by the sampling effort (ex. largemouth bass or 77006; black bass general or 77995)

IMS Sampling- Is this an IMS survey, or another type of data collection (YES or NO)

Purpose – primary reason for sampling (ex. evaluate 14-inch length limit for largemouth bass)

Comments – any point of interest related to the sampling event (ex. water elevation at 952 feet and falling; boat broke down halfway through the evening; sampling crew included Tom Hall, Marty Lundquist, and Elmer Heyob; storm passed through before sampling began)

***required by the database**

Form 2 and 3: Sample Data and Catch Data

Trip Variables

Project – ODNR, DOW project code (ex. FIDR07)
Date – date, in month, day, year (mm/dd/yyyy)
Location – name of the waterbody sampled, or code number (ex. Alum Creek Lake, or 80101)

Sample Variables

Stime - starting time of sampling in military hours (ex. 1:31 PM= 13:31)
SampNo - number used to identify sample, typically consecutive starting at 1 for the project, date, and location
SampSite - name given to site up to six characters long (ex. A01, or RM0135)
UTM E- UTM Easting (ex. 372364)
UTM N- UTM Northing (ex. 4420403)
UTM Zone- UTM Zone for sampling area (ex. 17)
Etype - type of effort used (T=time; D=distrance; A=area; V=volume)
Effort - sampling effort in minutes (ex. 24 hours=1440 minutes)
GearSpec - specific type of gear used for sampling (ex. 17' reservoir electrofishing boat, or code=001)
GearID - gear inventory number (optional for all gear except electrofishing boats)
SurfTemp - surface temperature in C
Secchi - water transparency measured as visible Secchi depth (cm)
SurfCond - surface conductivity, measured as micro siemens

Fish Variables

FishID - fish identification number unique within the project, date, and location
Struc – the fish structure used to age fish (S=scale, O=otolith, F=fin structure, J=jaw)
Species - name of species, or 5-digit species code
Length - length of fish (mm)
Weight - weight of fish (g)
Sex - sex of fish (1=male; 2=female; 3=immature; 4=unknown)
MKCODE - a combination of variable codes described below
TagNo - specific numeric, or alpha-numeric tag identification (i.e. the number on a floy tag)

MKCODE Explanation

The fish marking code, **MKCODE, is a combination of four codes** which indicate the type of tag an untagged, or re-tagged fish is tagged with (first bracket), the type of tag a recaptured fish is bearing (second bracket), the condition of the recaptured fish (third bracket), and the number of times a fish has been recaptured (fourth bracket).

EXAMPLE: In the example below, a largemouth bass (FISHID=5; LENGTH=452 mm; WEIGHT=1200 g; SEX=4;) was tagged with a Floy Anchor Tag (30), was not a recapture (0), was released alive (1), and had never been recaptured before (0). The Floy Anchor Tag Number (TAGNO) is DOW147199. Brackets that are not used are left blank.

FISHID	SPECIES	LENGTH	WEIGHT	SEX	MKCODE	TAGNO
5	Largemouth Bass	452 mm	1200 g	4	**(30) (0) (1) (0)**	DOW147199

First Bracket (MKTYPE)

Code	Description
1	Left Pelvic Clip
2	Right Pelvic Clip
3	Left Pectoral Clip
4	Right Pectoral Clip
5	Top Caudal
6	Bottom Caudal
7	Adipose
8	Dorsal Hole Punch
10	PIT Tag
20	Coded Wire Tag
30	Floy Anchor Tag
40	Opercular Tag
50	Jaw Tag
60	Telemetry Transmitter

Second Bracket (MKRECAP)

Code	Description
1	Left Pelvic Clip
2	Right Pelvic Clip
3	Left Pectoral Clip
4	Right Pectoral Clip
5	Top Caudal
6	Bottom Caudal
7	Adipose
8	Dorsal Hole Punch
10	PIT Tag
20	Coded Wire Tag
30	Floy Anchor Tag
40	Opercular Tag
50	Jaw Tag
60	Telemetry Transmitter

Third Bracket (MKCONDITION)

Code	Description
1	Alive
2	Dead
3	Poor

The **Fourth Bracket (MKCAPTURE)** is simply the number of times that you have recaptured a particular fish (99= unknown).

NOTE: Also available, but not listed on the field forms, are the variables **PRIORMK**, the year when a fish was previouly marked (yyyy), and **TAG2,** a variable for double-tagging a fish.

Form 2: Sample Data

ODNR, Division of Wildlife

Inland Management System

Form Current: 9/1/2003 **Page _____ of _____**

Project*	Date*	Location*

Etype* _____ **GearSpec*** _____

Record Temperature, Secchi, and Conductivity data for first sample of day in the boxes below:

Sampno ___ **SurfTemp** _____C **Secchi** _____cm **SurfCond** _____mSiem

Samp No	Samp Site	UTM Zone	UTM East	UTM North	STime	Effort

Comments: _____

Form 3: Catch Data

ODNR, Division of Wildlife
Inland Management System

Form Current: 9/1/2003 **Page _____ of _____**

Project*	**Date***	**Location***

Samp No*	Fish ID	Species	Length (mm)	Weight (g)	Samp No*	Fish ID	Species	Length (mm)	Weight (g)

* required by the database

Form 4 : Water Quality Data
ODNR, Division of Wildlife
Inland Management System

Form Current: 9/1/2003 **Page _____ of _____**

Project*	**Date***	**Location***

Samp No*_____ **Samp Site _____** **UTM Zone _____** **UTM E _____**
UTM N _____

Stime* _____ **Etype* _____** **Effort _____** **GearSpec* _____**

SurfTemp _____ **Secchi _____** **SurfCond _____** **GearID _____**

ReadDepth	Temp	DO

ReadDepth	Temp	DO

Samp No*_____ **Samp Site _____** **UTMS Zone _____** **UTM E _____**
UTM N _____

Stime* _____ **Etype* _____** **Effort _____** **GearSpec* _____**

SurfTemp _____ **Secchi _____** **SurfCond _____** **GearID _____**

ReadDepth	Temp	DO

ReadDepth	Temp	DO

*required by the database

Form 5: Fish Collection Tally Sheet

ODNR, Division of Wildlife

Inland Management System

Form Current: 9/1/2003 **Page _____ of _____**

Project*	Date*	Location*

Crew _____ **Target*** _____

CM Class	Weight	Age/Growth
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		

CM Class	Weight	Age/Growth
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
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61		
62		
63		
64		
65		
66		
67		
68		

Comments: _____

Form 6: Mean Length At Age Data
ODNR, Division of Wildlife
Inland Management System

Form Current: 9/1/2003 **Page _____ of _____**

Project*	Date*	Location*

Struc ___ Reader _____ Mag _____ Species _____

FishID	Age	FishID	Age	FishID	Age

Comments: _____

_____

_____

_____

Project: _____

Date: _____

Location: _____

SampleNo: _____

Comments: _____

_____

_____

Project: _____

Date: _____

Location: _____

SampleNo: _____

Comments: _____

_____

_____

Project: _____

Date: _____

Location: _____

SampleNo: _____

Comments: _____

_____

_____

Project: _____

Date: _____

Location: _____

SampleNo: _____

Comments: _____

_____

_____

Project: _____

Date: _____

Location: _____

SampleNo: _____

Comments: _____

_____

_____

Project: _____

Date: _____

Location: _____

SampleNo: _____

Comments: _____

_____

_____

Form 8: Group Catch Data

ODNR, Division of Wildlife
Inland Management System

Form Current: 9/1/2003 **Page _____ of _____**

Project*	Date*	Location*

SampNo*	GroupID	Species	Centimeter class	Total number of fish	Total weight (g) of fish

* required by the database

Appendix 4: Analysis Reference Tables

Appendix 4.1: Length categories used for calculation of stock density indicies.

	Length Category (mm)					
Species	Stock	Quality	Preferred	Memorable	Trophy	Source
Black crappie	130	200	250	300	380	2
Bluegill	80	150	200	250	300	2
Channel catfish	280	41	610	710	910	2
Flathead Catfish	350	510	710	860	1020	3
Hybrid striped bass	200	300	380	510	630	2
Largemouth bass	200	300	380	510	630	2
Muskellunge	510	760	970	1070	1270	2
Sauger	200	300	380	510	630	2
Saugeye	230	350	460	560	690	1
Smallmouth bass	180	280	350	430	510	2
Spotted bass	180	280	350	430	510	2
Striped bass	300	510	760	890	1140	2
Walleye	250	380	510	630	760	2
White bass	150	230	300	380	460	2
White crappie	130	200	250	300	380	2
Yellow perch	130	200	250	300	380	2

1 Flammang et al. (1991)
2 Gabelhouse (1984)
3 Quinn (1991)

Appendix 4.2: Parameter estimates of standard weight (Ws) equations used for calculation of relative weight (Wr).

Species	Intercept	Slope	Min TL (mm)	Source
Black crappie	-5.618	3.345	100	Neumann and Murphy (1991)
Bluegill	-5.374	3.316	80	Hillman (1982)
Channel catfish	-5.8	3.294	70	Brown et al. (1995)
Hybrid striped bass	-5.201	3.139	115	Brown and Murphy (1991)
Largemouth bass	-5.316	3.191	150	Wege and Anderson (1978)
Muskellunge	-6.066	3.325	380	Neumann and Willis (1994)
Sauger	-5.492	3.187	70	C. S. Guy, Montana State University, unpublished
Saugeye	-5.692	3.266	170	Flammang et al. (1993)
Smallmouth bass	-5.329	3.2	150	Kolander et al. (1993)
Spotted bass	-5.392	3.215	100	Wiens et al. (1996)
Striped bass	-4.924	3.007	150	Brown and Murphy (1991)
Walleye	-5.453	3.18	150	Murphy et al. (1990)
White bass	-5.066	3.081	115	Brown and Murphy (1991)
White crappie	-5.642	3.332	100	Neumann and Murphy (1991)
Yellow perch	-5.386	3.23	100	Willis et al (1991)

Appendix 4.3: Fraser-Lee intercept values (a) used in length-at-age back calculations.

Species	Intercept (a)	Source
Black Crappie	35	1
Bluegill	20	1
Largemouth Bass	20	1
Sauger	55	1
Saugeye	55	1
Smallmouth Bass	35	1
Striped Bass	25	2
White Bass	40	3
White Crappie	35	1
Walleye	55	1
Yellow Perch	30	1

1: Carlander (1982) TAFS 111:332-336
2: Carlander (1997) Handbook of Freshwater Fish Biology
3: Beck et al. (1997) NAJFM 17:488-492

Appendix 5: Examples of Recording Fish Marking

Reporting Fish Marking (Tagging) Data in the Field and Database

The following are examples of reporting fish tagging data from the field with codes used in the Ohio Fisheries Information System (OFIS). These examples are not all-inclusive. Please keep in mind that study objectives dictate the choice of tagging strategies, not the database, and that good meta-data and project descriptions will be the key to understanding some of these data in the future.

Definitions

Batch mark - a generic mark that is placed on a fish in the hatchery or field that can only distinguish the fish as part of a particular group (examples include fin clips, fish staining, elastomers, blank coded wire tags, and genetic marks).

Unique mark - a mark that is placed on a fish in the hatchery or field that uniquely identifies it from other fish (examples include numeric Floy, PIT, and jaw tags).

General Overview (Example from Data Sheet 2.0)

MkCode Explanation

The fish marking code, **MkCode, is a combination of four codes** which indicate the type of mark an unmarked, or re-marked fish is identified with (first bracket), the type of tag a recaptured fish is bearing (second bracket), the condition of the recaptured fish (third bracket), and the number of times a fish has been recaptured (fourth bracket).

EXAMPLE: In the example below, a largemouth bass (FishID=5; Length=452 mm; Weight=1200 g; Sex=4;) was marked with a Floy anchor tag (MkType=30), was not a recapture (MkRecap=0), was released alive (MkCondition=1), and had never been recaptured before (MkCapture=0). The Floy anchor tag number (TagNo) is DOW147199. Brackets that are not used are left blank.

FishID	Species	Length	Weight	Sex	MkCode	TagNo
5	Largemouth Bass	452 mm	1200 g	4	**(30) (0) (1) (0)**	DOW147199

First Bracket (MkType) (MkCondition)

Code	Description
0	Not previously marked
1	Left Pelvic Clip
2	Right Pelvic Clip
3	Left Pectoral Clip
4	Right Pectoral Clip
5	Top Caudal
6	Bottom Caudal
7	Adipose
8	Dorsal Hole Punch
10	PIT Tag
20	Coded Wire Tag
30	Floy Anchor Tag
40	Opercular Tag
50	Jaw Tag
60	Telemetry Transmitter

Second Bracket (MkRecap)

Code	Description
0	Not previously marked
1	Left Pelvic Clip
2	Right Pelvic Clip
3	Left Pectoral Clip
4	Right Pectoral Clip
5	Top Caudal
6	Bottom Caudal
7	Adipose
8	Dorsal Hole Punch
10	PIT Tag
20	Coded Wire Tag
30	Floy Anchor Tag
40	Opercular Tag
50	Jaw Tag
60	Telemetry Transmitter

Third Bracket

Code	Description
1	Alive
2	Dead
3	Poor

The **Fourth Bracket (MkCapture)** is simply the number of times that you have recaptured a particular fish (99=unknown).

***NOTE:** Also available are **PriorMk**, previous year marked plus a MkType code (yyyy_ _), **Tag2,** a variable for double-tagging a fish, and **TransNo** for telemetry tag serial numbers.

*PriorMk, Tag2 and TransNo are not currently listed on field data forms because the rarely needed.

Overview of Examples

First Capture of Hatchery Batch-Marked Fish

1) ***No New Marks.*** Channel catfish were fin clipped with an adipose fin clip (batch mark) in a hatchery during 1999 and released into a reservoir. These fish were later captured, released alive, and no additional marks were added.

2) ***Batch Marks in the Field.*** Channel catfish were fin clipped with an adipose fin clip in a hatchery during 1999 and released into a reservoir. These fish were later captured, marked with a left pectoral fin clip, and released alive.

3) ***Unique Marks in the Field.*** Channel catfish were fin clipped with an adipose fin clip in a hatchery during 1999 and released into a reservoir. These fish were later recaptured, marked with a uniquely numbered Floy anchor tag, and released alive.

First Capture of Unmarked Fish in the Field that are Being Marked

1) ***Batch Marks.*** Largemouth bass were captured by electrofishing, the left pectoral fin was clipped, and the fish were released alive.

2) ***Unique Marks in the Field.*** A largemouth bass was captured by electrofishing, a uniquely-numbered Floy anchor tag was implanted, and the fish was released alive.

3) ***A Combination of Batch and Unique Marks in the Field.*** A saugeye was captured by electrofishing, the right pectoral fin was clipped, then the fish was marked with a uniquely numbered Floy tag, and released alive. This was done to determine tag loss.

4) ***A Combination of Batch Marks in the Field.*** Muskellunge were captured in trapnets during April 1999 and marked with a left pectoral fin clip, and recaptured during April 2000 and marked with a right pelvic fin clip prior to release. This was done to report the second capture of batch-marked fish.

5) ***A Combination of Unique Marks in the Field.*** A telemetry transmitter was placed in a saugeye and the fish was also tagged with a Floy anchor tag.

Recaptures of Marked Fish

1) ***Recapture of Batch-Marked Fish.*** Largemouth bass marked with a left pectoral fin clip during prior sampling were recaptured and released alive. No new marks were added.

2) ***First Recapture of Uniquely-Marked Fish.*** A largemouth bass marked with a uniquely-numbered Floy tag during prior sampling was recaptured and released alive. No new marks were added.

3) ***Second Recapture of Uniquely-Marked Fish.*** A largemouth bass marked with a uniquely-numbered Floy tag during prior sampling was recaptured for the second time and released alive. No new marks were added.

4) ***Recapture of a Fish Marked with a Combination of Batch and Unique Marks.*** A saugeye previously marked with both a right pectoral fin clip and a unique Floy tag was captured and released alive. No new marks were added.

5) ***Recapture of a Fish Marked with a Combination of Batch Marks.***
Muskellunge previously marked with a left pectoral fin clip during 1999 and a right pelvic clip during 2000 were recaptured during 2001 and released alive. No new marks were added.

EXAMPLES: First Capture of Hatchery Batch-Marked Fish

1) ***No New Marks.*** Channel catfish were fin clipped with an adipose fin clip (batch mark) in a hatchery during 1999 and released into a reservoir. These fish were later captured, released alive, and no additional marks were added.

VARIABLE	CODE	EXPLANATION
MkType	0	the fish was not marked in the field
MkRecap	0	the fish was not previously marked in the field
MkCondition	1	the fish was released alive
MkCapture	99	99, because the number of times that a batch-marked fish has been recaptured cannot be determined
TagNo		leave blank, because batch-marked fish do not have unique numbers
PriorMk	199907	this is the year that the fish was tagged in the hatchery (1999) plus the code for an adipose fin clip (07) used to separate batch-marked fish from the hatchery from wild fish sampled
Tag2		not applicable

MkCode Variables **Additional Marking**

MkType	MkRecap	MkCondition	MkCapture	TagNo	PriorMk	Tag2
0	0	1	99		199907	

2) ***Batch Marks in the Field.*** Channel catfish were fin clipped with an adipose fin clip in a hatchery during 1999 and released into a reservoir. These fish were later captured, marked with a left pectoral fin clip, and released alive.

VARIABLE	CODE	EXPLANATION
MkType	3	the left pectoral fin was clipped in the field
MkRecap	0	the fish was not previously marked in the field
MkCondition	1	the fish was released alive
MkCapture	99	99, because the number of times that a batch-marked fish has been recaptured cannot be determined
TagNo		leave blank, because batch-marked fish do not have unique numbers
PriorMk	199907	this is the year that the fish was tagged in the hatchery (1999) plus the code for an adipose fin clip (07) used to separate batch-marked fish from the hatchery from wild fish sampled
Tag2		not applicable

MkCode Variables **Additional Marking**

MkType	MkRecap	MkCondition	MkCapture	TagNo	PriorMk	Tag2
3	0	1	99		199907	

1) ***Unique Marks in the Field.*** Channel catfish were fin clipped with an adipose fin clip in a hatchery during 1999 and released into a reservoir. These fish were later recaptured, marked with a uniquely numbered Floy anchor tag, and released alive.

VARIABLE	CODE	EXPLANATION
MkType	30	Floy anchor tag was applied in the field
MkRecap	0	the fish was not previously marked in the field
MkCondition	1	the fish was released alive
MkCapture	99	99, because the number of times that a batch-marked fish has been recaptured cannot be determined
TagNo	ODW028	unique number of the Floy anchor tag
PriorMk	199907	this is the year that the fish was tagged in the hatchery (1999) plus the code for an adipose fin clip (07) used to separate batch-marked fish from the hatchery from wild fish sampled
Tag2		not applicable

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
30	0	1	99	ODW028	199907	

EXAMPLES: First Capture of Unmarked Fish in the Field that are Being Marked

1) ***Batch Marks.*** Largemouth bass were captured by electrofishing, the left pectoral fin was clipped, and the fish were released alive.

VARIABLE	CODE	EXPLANATION
MkType	3	the left pectoral fin was clipped in the field
MkRecap	0	the fish was not previously marked in the field
MkCondition	1	the fish was released alive
MkCapture	0	the fish was sampled in the field for the first time (99 if the fish already had a batch mark)
TagNo		leave blank, because batch-marked fish do not have unique numbers
PriorMk		leave blank because there was no prior mark
Tag2		not applicable

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
3	0	1	0			

1) ***Unique Marks in the Field.*** A largemouth bass was captured by electrofishing, a uniquely-numbered Floy anchor tag was implanted, and the fish was released alive.

VARIABLE	CODE	EXPLANATION
MkType	30	because a Floy anchor tag was implanted
MkRecap	0	the fish was not previously marked in the field
MkCondition	1	the fish was released alive
MkCapture	0	the fish was sampled in the field for the first time (99 if the fish already had a batch mark)
TagNo	DOW1572	unique number of the Floy anchor tag
PriorMk		leave blank because there was no prior mark
Tag2		not applicable

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
30	0	1	0	DOW1572		

2) ***A Combination of Batch and Unique Marks in the Field.*** A saugeye was captured by electrofishing, the right pectoral fin was clipped, then the fish was marked with a uniquely numbered Floy tag, and released alive. This was done to determine tag loss.

VARIABLE	CODE	EXPLANATION
MkType	30	because a Floy anchor tag was implanted
MkRecap	0	the fish was not previously marked in the field
MkCondition	1	the fish was released alive
MkCapture	0	the fish was sampled in the field for the first time (99 if the fish already had a batch mark)
TagNo	DOW931	unique number of the Floy anchor tag
PriorMk		leave blank because there was no prior mark
Tag2	4	the fish was marked with a right pectoral fin clip in addition to the Floy tag

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
30	0	1	0	DOW931		4

1) ***A Combination of Batch Marks in the Field.*** Muskellunge were captured in trapnets during April 1999 and marked with a left pectoral fin clip, and recaptured during April 2000 and marked with a right pelvic fin clip prior to release. This was done to report the second capture of batch-marked fish.

VARIABLE	CODE	EXPLANATION
MkType	2	the fish was marked with a right pelvic fin clip
MkRecap	3	the fish was previously marked with a left pectoral fin clip
MkCondition	1	the fish was released alive
MkCapture	99	because we do not know how many times this batch marked fish was recaptured
TagNo		leave blank because there was no prior mark
PriorMk	199903	the year that the fish was originally fin clipped (1999) plus the code for a left pectoral fin clip (03)
Tag2	3	because the fish was also marked with a left pectoral fin clip

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
2	3	1	99		199903	3

2) ***A Combination of Unique Marks in the Field.*** A telemetry transmitter was placed in a saugeye and the fish was also tagged with a Floy anchor tag.

VARIABLE	CODE	EXPLANATION
MkType	60	the fish had a telemetry transmitter implanted
MkRecap	0	the fish was previously unmarked
MkCondition	1	the fish was released alive
MkCapture	0	the fish was sampled in the field for the first time
TagNo	ODW32	unique number of the Floy anchor tag
PriorMk		leave blank because there was no prior mark
Tag2	30	Because the fish was also marked with a Floy anchor tag in addition to the telemetry transmitter
TransNo	B703224	Manufacturer serial number from the telemetry transmitter

MkCode Variables				Additional Marking			
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**	**TransNo**
60	0	1	0	ODW32		30	B70324

EXAMPLES: Recaptures of Marked Fish

1) ***Recapture of Batch-Marked Fish.*** Largemouth bass marked with a left pectoral fin clip during prior sampling were recaptured and released alive. No new marks were added.

VARIABLE	CODE	EXPLANATION
MkType	3	the fish was marked with left pectoral fin clip
MkRecap	3	the fish was previously marked with a left pectoral fin clip
MkCondition	1	the fish was released alive
MkCapture	99	Because we do not know how many times this batch marked fish was recaptured
TagNo		unique number of the Floy anchor tag
PriorMk		report the year the fish was marked if certain and the type of mark (optional), or leave blank
Tag2		leave blank

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
3	3	1	99			

2) ***First Recapture of Uniquely-Marked Fish.*** A largemouth bass marked with a uniquely-numbered Floy tag during prior sampling was recaptured and released alive. No new marks were added.

VARIABLE	CODE	EXPLANATION
MkType	30	the fish was released with a Floy anchor tag in place
MkRecap	30	the fish was previously marked with a Floy anchor tag
MkCondition	1	the fish was released alive
MkCapture	1	Because this is the first time that the fish was recaptured
TagNo	DOW521	unique number of the Floy anchor tag
PriorMk		report the year the fish was marked if certain and the type of mark (optional), or leave blank
Tag2		leave blank

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
30	30	1	1	DOW521		

1) ***Second Recapture of Uniquely-Marked Fish.*** A largemouth bass marked with a uniquely-numbered Floy tag during prior sampling was recaptured for the second time and released alive. No new marks were added.

VARIABLE	CODE	EXPLANATION
MkType	30	the fish was released with a Floy anchor tag in place
MkRecap	30	the fish was previously marked with a Floy anchor tag
MkCondition	1	the fish was released alive
MkCapture	2	because this is the first time that the fish was recaptured
TagNo	DOW521	unique number of the Floy anchor tag
PriorMk		report the year the fish was marked if certain and the type of mark (optional), or leave blank
Tag2		leave blank

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
30	30	1	2	DOW521		

2) ***Recapture of a Fish Marked with a Combination of Batch and Unique Marks.*** A saugeye previously marked with both a right pectoral fin clip and a unique Floy tag was captured and released alive. No new marks were added.

VARIABLE	CODE	EXPLANATION
MkType	30	the fish was released with a Floy anchor tag in place
MkRecap	30	the fish was previously marked with a Floy anchor tag
MkCondition	1	the fish was released alive
MkCapture	1	because this is the first time that the fish was recaptured
TagNo	DOW822	unique number of the Floy anchor tag
PriorMk		report the year the fish was marked if certain and the type of mark (optional), or leave blank
Tag2	4	the fish was marked with a right pectoral fin clip in addition to the Floy anchor tag

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
30	30	1	1	DOW822		4

1) ***Recapture of a Fish Marked with a Combination of Batch Marks.*** Muskellunge previously marked with a left pectoral fin clip during 1999 and a right pelvic clip during 2000 were recaptured during 2001 and released alive. No new marks were added.

VARIABLE	CODE	EXPLANATION
MkType	*	the fish was released with a Floy anchor tag in place
MkRecap	*	the fish was previously marked with a Floy anchor tag
MkCondition	1	the fish was released alive
MkCapture	99	If unknown
TagNo		leave blank
PriorMk	199903	the year that the fish was originally fin clipped (1999) plus the code for a left pectoral fin clip (03)
Tag2	*	the fish was marked with a right pectoral fin clip in addition to the Floy anchor tag

MkCode Variables				Additional Marking		
MkType	**MkRecap**	**MkCondition**	**MkCapture**	**TagNo**	**PriorMk**	**Tag2**
*	*	1	99		199903	

*If we follow a procedure such as this, or begin using combinations of batch marks, we will need an additional fin clip code for combinations. We can address these situations as they arise.

Appendix 6: OFIS SAS Programs

IMS1.sas .....A6 - 2
IMS2.sas A6-25
BCalc.sas A6-

IMS1.sas

```
/*****************************************************************/
/*                          IMS1.SAS                             */
/*****************************************************************/
/* THIS PROGRAM CALCULATES VARIOUS DESCRIPTIVE STATISTICS FOR IMS  */
/* DATA COLLECTED ON A PARTICULAR RESERVOIR. USE THIS PROGRAM IF   */
/* THERE WERE NO GROUPED FISH INCLUDED IN THE SAMPLE.              */
/*****************************************************************/

OPTIONS CENTER DATE NUMBER PAGESIZE=74 LS=128;
LIBNAME LIBRARY 'C:\OFIS ANALYSIS';
/*******************************************************/
/*   INSERT THE FILENAME IN THE SPACE PROVIDED BELOW    */
/*******************************************************/
FILENAME RAW 'C:\OFIS ANALYSIS\addfilename.TXT';

/*******************************************************************/
/* THIS SECTION INPUTS RAW IMS DATA, CALCULATES RELATIVE WEIGHTS,    */
/* AND CONVERTS GEAR CODES.                                          */
/*******************************************************************/

DATA IMS;
  INFILE RAW LRECL=270 MISSOVER;
  INPUT MONTH 15-17 DAY 18-20 YEAR 21-25 RESERVOIR 26-35 TARGET 36-45
SAMPL_NO 46-55
    E_TYPE $ 66-70 EFFORT 71-80 GEAR 131-135 SPECIES 191-220 LENGTH
221-230
    WEIGHT 231-240 AGE 261-270;
  NO_INDIV=1;
  IF 4 LE MONTH LE 6 THEN DO;
    IF GEAR=1 THEN GEAR=11;
   IF GEAR=3 THEN GEAR=13;
   IF GEAR=6 THEN GEAR=16;
  END;
  IF 9 LE MONTH LE 11 THEN DO;
    IF GEAR=1 THEN GEAR=21;
   IF GEAR=3 THEN GEAR=23;
   IF GEAR=6 THEN GEAR=26;
  END;
/*******************************************************/
/*              CALCULATES RELATIVE WEIGHTS            */
/*******************************************************/
  IF SPECIES=74005 THEN DO;
    IF LENGTH LT 115 THEN REL_WGHT=.;
    IF LENGTH GE 115 THEN REL_WGHT=WEIGHT/(10**(-
5.201+3.139*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77001 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
    IF LENGTH GE 100 THEN REL_WGHT=WEIGHT/(10**(-
5.642+3.332*LOG10(LENGTH)))*100;
  END;
```

```
  IF SPECIES=77002 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
    IF LENGTH GE 100 THEN REL_WGHT=WEIGHT/(10**(-
5.618+3.345*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77004 THEN DO;
    IF LENGTH LT 150 THEN REL_WGHT=.;
    IF LENGTH GE 150 THEN REL_WGHT=WEIGHT/(10**(-
5.329+3.200*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77005 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
    IF LENGTH GE 100 THEN REL_WGHT=WEIGHT/(10**(-
5.392+3.215*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77006 THEN DO;
    IF LENGTH LT 150 THEN REL_WGHT=.;
    IF LENGTH GE 150 THEN REL_WGHT=WEIGHT/(10**(-
5.528+3.273*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77009 THEN DO;
    IF LENGTH LT 80 THEN REL_WGHT=.;
    IF LENGTH GE 80 THEN REL_WGHT=WEIGHT/(10**(-
5.374+3.316*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=80002 THEN DO;
    IF LENGTH LT 150 THEN REL_WGHT=.;
    IF LENGTH GE 150 THEN REL_WGHT=WEIGHT/(10**(-
5.453+3.180*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=80026 THEN DO;
    IF LENGTH LT 170 THEN REL_WGHT=.;
    IF LENGTH GE 170 THEN REL_WGHT=WEIGHT/(10**(-
5.692+3.266*LOG10(LENGTH)))*100;
  END;
/*******************************************************/
/* ASSIGNES LENGTH GROUPS BASED ON S-Q, Q-P, AND P-M    */
/* SIZE CATEGORIES                                      */
/*******************************************************/
  IF SPECIES=47002 THEN DO;
    IF 280 LE LENGTH LT 410 THEN DO;
     LGTH_GRP=1;
   END;
    IF 410 LE LENGTH LT 610 THEN DO;
     LGTH_GRP=2;
   END;
    IF 610 LE LENGTH LT 710 THEN DO;
     LGTH_GRP=3;
   END;
  END;
  IF SPECIES=74001 THEN DO;
    IF 150 LE LENGTH LT 230 THEN DO;
     LGTH_GRP=1;
   END;
    IF 230 LE LENGTH LT 300 THEN DO;
```

```
    LGTH_GRP=2;
  END;
   IF 300 LE LENGTH LT 380 THEN DO;
    LGTH_GRP=3;
  END;
END;
IF SPECIES=74005 OR SPECIES=77006 THEN DO;
   IF 200 LE LENGTH LT 300 THEN DO;
    LGTH_GRP=1;
  END;
   IF 300 LE LENGTH LT 380 THEN DO;
    LGTH_GRP=2;
  END;
   IF 380 LE LENGTH LT 510 THEN DO;
    LGTH_GRP=3;
  END;
END;
IF 77001 LE SPECIES LE 77002 THEN DO;
   IF 130 LE LENGTH LT 200 THEN DO;
    LGTH_GRP=1;
  END;
   IF 200 LE LENGTH LT 250 THEN DO;
    LGTH_GRP=2;
  END;
   IF 250 LE LENGTH LT 300 THEN DO;
    LGTH_GRP=3;
  END;
END;
IF 77004 LE SPECIES LE 77005 THEN DO;
   IF 180 LE LENGTH LT 280 THEN DO;
    LGTH_GRP=1;
  END;
   IF 280 LE LENGTH LT 350 THEN DO;
    LGTH_GRP=2;
  END;
   IF 350 LE LENGTH LT 430 THEN DO;
    LGTH_GRP=3;
  END;
END;
IF SPECIES=77009 THEN DO;
   IF 80 LE LENGTH LT 150 THEN DO;
    LGTH_GRP=1;
  END;
   IF 150 LE LENGTH LT 200 THEN DO;
    LGTH_GRP=2;
  END;
   IF 200 LE LENGTH LT 250 THEN DO;
    LGTH_GRP=3;
  END;
END;
IF SPECIES=80002 THEN DO;
   IF 250 LE LENGTH LT 380 THEN DO;
    LGTH_GRP=1;
  END;
   IF 380 LE LENGTH LT 510 THEN DO;
```

```
      LGTH_GRP=2;
    END;
     IF 510 LE LENGTH LT 630 THEN DO;
      LGTH_GRP=3;
    END;
   END;
   IF SPECIES=80026 THEN DO;
     IF 230 LE LENGTH LT 350 THEN DO;
      LGTH_GRP=1;
    END;
     IF 350 LE LENGTH LT 460 THEN DO;
      LGTH_GRP=2;
    END;
     IF 460 LE LENGTH LT 560 THEN DO;
      LGTH_GRP=3;
    END;
   END;
   CM_GRP=CEIL(LENGTH/10);
   IF GEAR=11 OR GEAR=21 THEN EFFORT=ROUND(EFFORT/60,.01);
   IF GEAR=13 OR GEAR=23 THEN DO;
     IF E_TYPE='T' THEN EFFORT=1;
   END;
   IF GEAR=16 OR GEAR=26 THEN EFFORT=ROUND(EFFORT/60,.1);
RUN;

PROC SORT DATA=IMS;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO E_TYPE EFFORT SPECIES NO_INDIV
CM_GRP
    LENGTH WEIGHT AGE;
RUN;

/*****************************************************************/
/* THIS SECTION CALCULATES EFFORT, CPUE, AND DESCRIPTIVE          */
/* STATISTICS (OF CPUE, LENGTH, WEIGHT, AND RELATIVE WEIGHT) FOR  */
/* ALL GEAR TYPES.                                                */
/*****************************************************************/

/*******************************************************/
/*                        EFFORT                       */
/*******************************************************/

PROC MEANS DATA=IMS MAX NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  VAR EFFORT;
  OUTPUT OUT=EFFORT1 (DROP=_TYPE_ _FREQ_) MAX=EFFORT;
RUN;

PROC MEANS DATA=EFFORT1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET;
  VAR EFFORT;
  OUTPUT OUT=EFFORT2 (DROP=_TYPE_ _FREQ_) SUM=EFFORT;
RUN;

/*******************************************************/
/*                    CATCH                            */
```

```
/*******************************************************/

DATA FISH1;
  SET IMS;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF E_TYPE='N' OR SPECIES=99999 THEN DELETE;
RUN;

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH1 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV;
RUN;

/*******************************************************/
/*                     CPUE                            */
/*******************************************************/

DATA CPUE1;
  MERGE CATCH1 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=NO_INDIV/EFFORT;
RUN;

PROC SORT DATA=CPUE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

/*******************************************************/
/*             MEANS FOR LENGTH, WEIGHT, AND WR        */
/*******************************************************/

DATA FISH2;
  SET IMS;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF SPECIES=99999 THEN DELETE;
RUN;

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC UNIVARIATE DATA=FISH2 NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR LENGTH WEIGHT REL_WGHT;
  FREQ NO_INDIV;
  OUTPUT OUT=STATS N=N_LGTH N_WT MEAN=MEAN_L MEAN_W MEAN_WR
    MAX=MAX_L MAX_W;
RUN;

/*******************************************************/
```

```
/*            MERGES SUMMARY CPUE AND MEANS              */
/*******************************************************/

DATA SUMM1;
  MERGE CPUE1 STATS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  RMEAN_W=ROUND(MEAN_W);
  RMEAN_WR=ROUND(MEAN_WR);
RUN;

PROC PRINT DATA=SUMM1 SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET EFFORT;
  ID SPECIES;
  VAR NO_INDIV N_LGTH MAX_L N_WT MAX_W RMEAN_W RMEAN_WR;
  LABEL NO_INDIV='NUMBER*(CPUE)' N_LGTH='NUMBER*(LENGTH)'
MAX_L='MAXIMUM*LENGTH'
    N_WT='NUMBER*(WEIGHT)' MAX_W='MAXIMUM*WEIGHT' RMEAN_W='MEAN*WEIGHT'
RMEAN_WR='MEAN RELATIVE*WEIGHT';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'TOTAL NUMBERS OF INDIVIDUALS AND DESCRIPTIVE STATISTICS BASED
ON BODY WEIGHT(G) AND LENGTH (MM).';
  TITLE2 'EFFORT IS EXPRESSED AS HOURS FOR ELECTROFISHING AND
GILLNETTING, AND NET-NIGHTS FOR TRAPNETTING.';
RUN;

/*****************************************************************/
/* THIS SECTION CALCULATES DESCRIPTIVE STATISTICS RELATED TO      */
/* SAMPLING PRECISION                                             */
/*****************************************************************/

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
RUN;

PROC MEANS DATA=FISH2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH2 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV;
RUN;

DATA SUMM2;
  MERGE EFFORT1 CATCH2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF NO_INDIV=. THEN NO_INDIV=0;
  KEEP YEAR RESERVOIR GEAR TARGET SAMPL_NO EFFORT NO_INDIV;
RUN;

PROC PRINT DATA=SUMM2 SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET;
  ID SAMPL_NO;
  VAR EFFORT NO_INDIV;
  LABEL SAMPL_NO='SAMPLE*NUMBER' NO_INDIV='CATCH*(ALL SPECIES)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT.;
  TITLE1 'EFFORT AND CATCH SUMMARY BY SAMPLE.';
```

```
  TITLE2 'EFFORT IS EXPRESSED AS HOURS FOR ELECTROFISHING AND
GILLNETTING, AND NET-NIGHTS FOR TRAPNETTING.';
  TITLE3 'MISSING EFFORT VALUES REPRESENT SAMPLES WHERE EFFORT WAS
COMPROMISED.';
RUN;

/*******************************************************/
/*          DETERMINES EFFORT BY SAMPLE                */
/*******************************************************/

DATA CCF_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=26;
  IF TARGET=80901;
  SPECIES=47002;
RUN;

DATA WHB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=26;
  IF TARGET=80901;
  SPECIES=74001;
RUN;

DATA HYB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=16 OR GEAR=26;
  IF TARGET=74000 OR TARGET=80901;
  SPECIES=74005;
RUN;

DATA WHC_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=23;
  IF TARGET=77996;
  SPECIES=77001;
RUN;

DATA BLC_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=23;
  IF TARGET=77996;
  SPECIES=77002;
RUN;

DATA SMB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77995;
```

```
  SPECIES=77004;
RUN;

DATA SPB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77995;
  SPECIES=77005;
RUN;

DATA LMB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77995;
  SPECIES=77006;
RUN;

DATA BGL_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77994;
  SPECIES=77009;
RUN;

DATA WLY_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=21 OR GEAR=26;
  IF TARGET=80901;
  SPECIES=80002;
RUN;

DATA SGY_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=21 OR GEAR=26;
  IF TARGET=80901;
  SPECIES=80026;
RUN;

DATA EFFORT3;
  SET CCF_EFF WHB_EFF HYB_EFF WHC_EFF BLC_EFF SMB_EFF SPB_EFF LMB_EFF
BGL_EFF WLY_EFF SGY_EFF;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
RUN;

/*******************************************************/
/*              DETERMINES CATCH BY SAMPLE             */
/*******************************************************/

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES;
```

```
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH3 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV;
RUN;

/*******************************************************/
/*            CATCH-PER-UNIT-EFFORT BY SAMPLE          */
/*******************************************************/

DATA CPUE2;
  MERGE EFFORT3 CATCH3;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES;
  CPUE_NO=NO_INDIV/EFFORT;
  IF EFFORT=. THEN DELETE;
  IF CPUE_NO=. THEN CPUE_NO=0;
  KEEP YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES CPUE_NO;
RUN;

PROC SORT DATA=CPUE2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

/*******************************************************/
/*                 MEAN CATCH BY YEAR                  */
/*******************************************************/

PROC MEANS DATA=CPUE2 N MEAN VAR STDERR MIN MAX NOPRINT;
  VAR CPUE_NO;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  OUTPUT OUT=CPUE3 (DROP=_TYPE_ _FREQ_) N=N MEAN=M_CPUE VAR=VAR
STDERR=STDERR
    MIN=MIN MAX=MAX;
RUN;

DATA SUMM3;
  SET CPUE3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF M_CPUE=0 THEN DELETE;
  RM_CPUE=ROUND(M_CPUE,.01);
  RMIN=ROUND(MIN,.01);
  RMAX=ROUND(MAX,.01);
  RM_SE=ROUND(STDERR,.01);
  RSE_MEAN=ROUND(STDERR/M_CPUE*100,.1);
  RSE_10=ROUND(.1**-2*M_CPUE**-2*VAR);
  RSE_20=ROUND(.2**-2*M_CPUE**-2*VAR);
RUN;

PROC SORT DATA=SUMM3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC PRINT DATA=SUMM3 NOOBS SPLIT='*';
```

```
  BY YEAR RESERVOIR GEAR TARGET;
  ID SPECIES;
  VAR N RM_CPUE RMIN RMAX RM_SE RSE_MEAN RSE_20 RSE_10;
  LABEL N='NUMBER OF*SAMPLES' RM_CPUE='MEAN*CPUE' RMIN='MINIMUM*CPUE'
RMAX='MAXIMUM*CPUE'
    RM_SE='STANDARD*ERROR' RSE_MEAN='RELATIVE STANDARD*ERROR'
RSE_20='SAMPLE SIZE*(RSE=20%)'
    RSE_10='SAMPLE SIZE*(RSE=10%)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE 'SUMMARY OF NETTING AND ELECTROFISHING SAMPLING STATISTICS.';
RUN;

/*******************************************************************/
/*          THIS SECTION CALCULATES PSD'S AND RSD'S                */
/*******************************************************************/

DATA PSD1;
  SET FISH2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF SPECIES=47002 OR SPECIES=74001 OR SPECIES=74005 OR 77001 LE
SPECIES LE 77002 OR
    77004 LE SPECIES LE 77006 OR SPECIES=77009 OR SPECIES=80002 OR
SPECIES=80026;
  IF GEAR=21 THEN DELETE;
  IF LENGTH=. THEN DELETE;
  IF SPECIES=47002 AND LENGTH GE 280 THEN ST=NO_INDIV;
  IF SPECIES=74001 AND LENGTH GE 150 THEN ST=NO_INDIV;
  IF SPECIES=74005 AND LENGTH GE 200 THEN ST=NO_INDIV;
  IF (77001 LE SPECIES LE 77002) AND LENGTH GE 130 THEN ST=NO_INDIV;
  IF (77004 LE SPECIES LE 77005) AND LENGTH GE 180 THEN ST=NO_INDIV;
  IF SPECIES=77006 AND LENGTH GE 200 THEN ST=NO_INDIV;
  IF SPECIES=77009 AND LENGTH GE 80 THEN ST=NO_INDIV;
  IF SPECIES=80002 AND LENGTH GE 250 THEN ST=NO_INDIV;
  IF SPECIES=80026 AND LENGTH GE 230 THEN ST=NO_INDIV;
  IF SPECIES=47002 AND LENGTH GE 410 THEN QU=NO_INDIV;
  IF SPECIES=74001 AND LENGTH GE 230 THEN QU=NO_INDIV;
  IF SPECIES=74005 AND LENGTH GE 300 THEN QU=NO_INDIV;
  IF (77001 LE SPECIES LE 77002) AND LENGTH GE 200 THEN QU=NO_INDIV;
  IF (77004 LE SPECIES LE 77005) AND LENGTH GE 280 THEN QU=NO_INDIV;
  IF SPECIES=77006 AND LENGTH GE 300 THEN QU=NO_INDIV;
  IF SPECIES=77009 AND LENGTH GE 150 THEN QU=NO_INDIV;
  IF SPECIES=80002 AND LENGTH GE 380 THEN QU=NO_INDIV;
  IF SPECIES=80026 AND LENGTH GE 350 THEN QU=NO_INDIV;
  IF SPECIES=47002 AND LENGTH GE 610 THEN PR=NO_INDIV;
  IF SPECIES=74001 AND LENGTH GE 300 THEN PR=NO_INDIV;
  IF SPECIES=74005 AND LENGTH GE 380 THEN PR=NO_INDIV;
  IF (77001 LE SPECIES LE 77002) AND LENGTH GE 250 THEN PR=NO_INDIV;
  IF (77004 LE SPECIES LE 77005) AND LENGTH GE 350 THEN PR=NO_INDIV;
  IF SPECIES=77006 AND LENGTH GE 380 THEN PR=NO_INDIV;
  IF SPECIES=77009 AND LENGTH GE 200 THEN PR=NO_INDIV;
  IF SPECIES=80002 AND LENGTH GE 510 THEN PR=NO_INDIV;
  IF SPECIES=80026 AND LENGTH GE 460 THEN PR=NO_INDIV;
RUN;
```

```
PROC SORT DATA=PSD1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC MEANS DATA=PSD1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR NO_INDIV ST QU PR;
  OUTPUT OUT=PSD2 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV NO_ST NO_QU NO_PR;
RUN;

DATA PSD3;
  SET PSD2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NO_ST=. THEN NO_ST=0;
  IF NO_QU=. THEN NO_QU=0;
  IF NO_PR=. THEN NO_PR=0;
  PSD=ROUND(NO_QU/NO_ST*100);
  RSD=ROUND(NO_PR/NO_ST*100);
  IF NO_ST GT 1 THEN DO;
    LL_PSD=ROUND((PSD/100-1.96*SQRT(PSD/100*(1-PSD/100)/(NO_ST-
1)))*100);
    UL_PSD=ROUND((PSD/100+1.96*SQRT(PSD/100*(1-PSD/100)/(NO_ST-
1)))*100);
    LL_RSD=ROUND((RSD/100-1.96*SQRT(RSD/100*(1-RSD/100)/(NO_ST-
1)))*100);
    UL_RSD=ROUND((RSD/100+1.96*SQRT(RSD/100*(1-RSD/100)/(NO_ST-
1)))*100);
  END;
RUN;

PROC PRINT DATA=PSD3 SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET;
  ID SPECIES;
  VAR NO_INDIV NO_ST NO_QU NO_PR LL_PSD PSD UL_PSD LL_RSD RSD UL_RSD;
  LABEL NO_INDIV='NUMBER OF*INDIVIDUALS' NO_ST='NUMBER OF*STOCK-
SIZED*FISH'
    NO_QU='NUMBER OF*QUALITY-SIZED*FISH' NO_PR='NUMBER OF*PREFERRED-
SIZED*FISH'
    LL_PSD='PSD*LOWER*LIMIT' UL_PSD='PSD*UPPER*LIMIT' RSD='RSD-P'
    LL_RSD='RSD-P*LOWER*LIMIT' UL_RSD='RSD-P*UPPER*LIMIT';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'PSD AND RSD-P VALUES WITH ASSOCIATED 95% CONFIDENCE LIMITS.';
  TITLE2 'FOR EACH SPECIES THE STOCK, QUALITY, AND PREFERRED SIZES (MM)
ARE:';
  TITLE3 '280, 410, AND 610 FOR CHANNEL CATFISH, 150, 230, AND 300 FOR
WHITE BASS, 200, 300, AND 380 FOR HYBRID-STRIPED BASS,';
  TITLE4 '130, 200, AND 250 FOR WHITE CRAPPIE AND BLACK CRAPPIE, 180,
280, AND 350 FOR SMALLMOUTH BASS AND SPOTTED BASS,';
  TITLE5 '200, 300, AND 380 FOR LARGEMOUTH BASS, 80, 150, AND 200 FOR
BLUEGILL,';
  TITLE6 '250, 380, AND 510 FOR WALLEYE, AND 230, 350, AND 450 FOR
SAUGEYE.';
RUN;
```

```
/*****************************************************************/
/* THIS SEGMENT CALCULATES CPUE AND RELATIVE WEIGHTS (WITH 95%     */
/* CONFIDENCE INTERVALS) BY VARIOUS SIZE CATEGORIES.               */
/*****************************************************************/

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH4 (DROP=_TYPE_ _FREQ_) SUM=NO_CPUE;
RUN;

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
RUN;

PROC MEANS DATA=FISH2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH5 (DROP=_TYPE_ _FREQ_) SUM=NO_LGTH;
RUN;

PROC MEANS DATA=FISH2 N MEAN STDERR NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  VAR REL_WGHT;
  OUTPUT OUT=WEIGHT1 (DROP=_TYPE_ _FREQ_) N=N MEAN=MEAN_RW
STDERR=STDERR;
RUN;

DATA LENGTH1;
  MERGE CATCH4 CATCH5 WEIGHT1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  IF LGTH_GRP=. THEN DELETE;
  IF GEAR=11 THEN DO;
    IF 77004 LE SPECIES LE 77006 OR SPECIES=77009;
  END;
  IF GEAR=21 THEN DELETE;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026;
  END;
  RMEAN_RW=ROUND(MEAN_RW);
  RSTDERR=ROUND(STDERR);
RUN;

DATA CPUE4;
  MERGE LENGTH1 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
  IF N=2 THEN T=12.706; IF N=3 THEN T=4.303; IF N=4 THEN T=3.182;
  IF N=5 THEN T=2.776;  IF N=6 THEN T=2.571; IF N=7 THEN T=2.447;
  IF N=8 THEN T=2.365;  IF N=9 THEN T=2.306; IF N=10 THEN T=2.262;
```

```
  IF N=11 THEN T=2.228; IF N=12 THEN T=2.201; IF N=13 THEN T=2.179;
  IF N=14 THEN T=2.160; IF N=15 THEN T=2.145; IF N=16 THEN T=2.131;
  IF N=17 THEN T=2.120; IF N=18 THEN T=2.110; IF N=19 THEN T=2.101;
  IF N=20 THEN T=2.093; IF N=21 THEN T=2.086; IF N=22 THEN T=2.080;
  IF N=23 THEN T=2.074; IF N=24 THEN T=2.069; IF N=25 THEN T=2.064;
  IF N=26 THEN T=2.060; IF N=27 THEN T=2.056; IF N=28 THEN T=2.052;
  IF N=29 THEN T=2.048; IF N GE 30 THEN T=1.960;
  U_LIMIT=ROUND(MEAN_RW+T*STDERR);
  L_LIMIT=ROUND(MEAN_RW-T*STDERR);
RUN;

DATA SUMM4;
  SET CPUE4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.001);
RUN;

PROC PRINT DATA=SUMM4 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID LGTH_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH N RMEAN_RW RSTDERR
L_LIMIT U_LIMIT;
  LABEL LGTH_GRP='SIZE*CATEGORY' NO_CPUE='NUMBER*(CPUE)'
CUM_NO='CUMULATIVE N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)' N='NUMBER*(WR)' RMEAN_RW='MEAN*WR'
RSTDERR='STANDARD*ERROR*(WR)'
    L_LIMIT='LOWER*LIMIT*(WR)' U_LIMIT='UPPER*LIMIT*(WR)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. LGTH_GRP LGTHGRP.;
  TITLE1 'CATCH RATES AND RELATIVE WEIGHTS (WR) BY INCREMENTAL SIZE
CATEGORIES.';
  TITLE2 'LOWER AND UPPER 95% CONFIDENCE LIMITS OF WR VALUES ARE ALSO
INCLUDED.';
  TITLE3 'FOR EACH SPECIES THE STOCK-QUALITY, QUALITY-PREFERRED, AND
PREFERRED-MEMORABLE SIZE CATEGORIES (MM) ARE:';
  TITLE4 '200-299, 300-379, AND 380-509 FOR HYBRID-STRIPED BASS, 130-
199, 200-249, AND 250-299 FOR WHITE CRAPPIE AND BLACK CRAPPIE,';
  TITLE5 '180-279, 280-349, AND 350-429 FOR SMALLMOUTH BASS AND SPOTTED
BASS, 200-299, 300-379, AND 380-509 FOR LARGEMOUTH BASS,';
  TITLE6 '80-149, 150-199, AND 200-249 FOR BLUEGILL, 250-379, 380-509,
AND 510-629 FOR WALLEYE,';
```

```
  TITLE7 'AND 230-349, 350-449, AND 450-559 FOR SAUGEYE.';
RUN;

DATA LENGTH2;
  MERGE CATCH4 CATCH5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  IF LGTH_GRP=. THEN DELETE;
  IF GEAR=26;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026 THEN DELETE;
  END;
RUN;

DATA CPUE5;
  MERGE LENGTH2 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
RUN;

DATA SUMM5;
  SET CPUE5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.01);
RUN;

PROC PRINT DATA=SUMM5 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID LGTH_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH;
  LABEL LGTH_GRP='LENGTH (MM)' NO_CPUE='NUMBER*(CPUE)'
CUM_NO='CUMULATIVE N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. LGTH_GRP LGTHGRP.;
  TITLE1 'CATCH RATES BY INCREMENTAL SIZE CATEGORIES.';
  TITLE2 'FOR EACH SPECIES THE STOCK-QUALITY, QUALITY-PREFERRED, AND
PREFERRED-MEMORABLE SIZES (MM) ARE:';
  TITLE3 '280-409, 410-609, AND 610-709 FOR CHANNEL CATFISH, AND 150-
229, 230-299, AND 300-379 FOR WHITE BASS,';
RUN;
```

```
/*****************************************************************/
/* THIS SECTION CALCULATES CPUE AND RELATIVE WEIGHTS (WITH 95%     */
/* CONFIDENCE INTERVALS) BY 10-MM LENGTH GROUPS.                   */
/*****************************************************************/

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH6 (DROP=_TYPE_ _FREQ_) SUM=NO_CPUE;
RUN;

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=FISH2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH7 (DROP=_TYPE_ _FREQ_) SUM=NO_LGTH;
RUN;

PROC MEANS DATA=FISH2 N MEAN STDERR NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR REL_WGHT;
  OUTPUT OUT=WEIGHT2 (DROP=_TYPE_ _FREQ_) N=N MEAN=MEAN_RW
STDERR=STDERR;
RUN;

DATA LENGTH3;
  MERGE CATCH6 CATCH7 WEIGHT2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  IF CM_GRP=. THEN DELETE;
  IF GEAR=11 THEN DO;
    IF 77004 LE SPECIES LE 77006 OR SPECIES=77009;
  END;
  IF GEAR=21 THEN DELETE;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026;
  END;
  RMEAN_RW=ROUND(MEAN_RW);
  RSTDERR=ROUND(STDERR);
RUN;

DATA CPUE6;
  MERGE LENGTH3 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
  IF N=2 THEN T=12.706; IF N=3 THEN T=4.303; IF N=4 THEN T=3.182;
  IF N=5 THEN T=2.776;  IF N=6 THEN T=2.571; IF N=7 THEN T=2.447;
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```
  IF N=8 THEN T=2.365;  IF N=9 THEN T=2.306; IF N=10 THEN T=2.262;
  IF N=11 THEN T=2.228; IF N=12 THEN T=2.201; IF N=13 THEN T=2.179;
  IF N=14 THEN T=2.160; IF N=15 THEN T=2.145; IF N=16 THEN T=2.131;
  IF N=17 THEN T=2.120; IF N=18 THEN T=2.110; IF N=19 THEN T=2.101;
  IF N=20 THEN T=2.093; IF N=21 THEN T=2.086; IF N=22 THEN T=2.080;
  IF N=23 THEN T=2.074; IF N=24 THEN T=2.069; IF N=25 THEN T=2.064;
  IF N=26 THEN T=2.060; IF N=27 THEN T=2.056; IF N=28 THEN T=2.052;
  IF N=29 THEN T=2.048; IF N GE 30 THEN T=1.960;
  U_LIMIT=ROUND(MEAN_RW+T*STDERR);
  L_LIMIT=ROUND(MEAN_RW-T*STDERR);
RUN;

DATA SUMM6;
  SET CPUE6;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.001);
RUN;

PROC PRINT DATA=SUMM6 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID CM_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH N RMEAN_RW RSTDERR
L_LIMIT U_LIMIT;
  LABEL CM_GRP='LENGTH*(MM)' NO_CPUE='NUMBER*(CPUE)' CUM_NO='CUMULATIVE
N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)' N='NUMBER*(WR)' RMEAN_RW='MEAN*WR'
RSTDERR='STANDARD*ERROR*(WR)'
    L_LIMIT='LOWER*LIMIT*(WR)' U_LIMIT='UPPER*LIMIT*(WR)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. CM_GRP TENMM.;
  TITLE1 'LENGTH FREQUENCIES, CATCH RATES, AND RELATIVE WEIGHTS (WR) BY
10-MM LENGTH CATEGORIES.';
  TITLE2 'LOWER AND UPPER 95% CONFIDENCE LIMITS OF WR VALUES ARE
INCLUDED.';
RUN;

DATA LENGTH4;
  MERGE CATCH6 CATCH7;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  IF CM_GRP=. THEN DELETE;
  IF GEAR=11 THEN DO;
```

```
    IF 77004 LE SPECIES LE 77006 OR SPECIES=77009 THEN DELETE;
  END;
  IF GEAR=16 OR GEAR=23 THEN DELETE;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026 THEN DELETE;
  END;
RUN;

DATA CPUE7;
  MERGE LENGTH4 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
RUN;

DATA SUMM7;
  SET CPUE7;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.01);
RUN;

PROC PRINT DATA=SUMM7 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID CM_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH;
  LABEL CM_GRP='LENGTH (MM)' NO_CPUE='NUMBER*(CPUE)' CUM_NO='CUMULATIVE
N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. CM_GRP TENMM.;
  TITLE1 'LENGTH FREQUENCIES AND CATCH RATES BY 10-MM LENGTH
CATEGORIES';
  TITLE2 'FOR FISH MEASURED FOR LENGTH ONLY.';
RUN;

/*********************************************************************
*  THIS SECTION CALCULATES AGE-SPECIFIC INFORMATION AND ASSIGNS      *
*  AGES TO NON-AGED FISH USING AN AGE-LENGTH KEY.                    *
*********************************************************************/

DATA AGE1;
```

```
  SET FISH2;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=. THEN DELETE;
RUN;

PROC SORT DATA=AGE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

/*******************************************************/
/*        DETERMINES MEAN LENGTH BASED ON AGE          */
/*******************************************************/

PROC MEANS DATA=AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR AGE;
  OUTPUT OUT=AGE2 (DROP=_TYPE_ _FREQ_) N=TOT;
RUN;

PROC MEANS DATA=AGE1 N MEAN STDERR MIN MAX NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
  VAR LENGTH;
  OUTPUT OUT=AGE3 (DROP=_TYPE_ _FREQ_) N=N MEAN=M_LGTH STDERR=STDERR
MIN=MIN MAX=MAX;
RUN;

DATA AGE4;
  MERGE AGE2 AGE3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF N=1 THEN DO;
    MIN=.;
   MAX=.;
  END;
  IF N=2 THEN T=12.706; IF N=3 THEN T=4.303; IF N=4 THEN T=3.182;
  IF N=5 THEN T=2.776;  IF N=6 THEN T=2.571; IF N=7 THEN T=2.447;
  IF N=8 THEN T=2.365;  IF N=9 THEN T=2.306; IF N=10 THEN T=2.262;
  IF N=11 THEN T=2.228; IF N=12 THEN T=2.201; IF N=13 THEN T=2.179;
  IF N=14 THEN T=2.160; IF N=15 THEN T=2.145; IF N=16 THEN T=2.131;
  IF N=17 THEN T=2.120; IF N=18 THEN T=2.110; IF N=19 THEN T=2.101;
  IF N=20 THEN T=2.093; IF N=21 THEN T=2.086; IF N=22 THEN T=2.080;
  IF N=23 THEN T=2.074; IF N=24 THEN T=2.069; IF N=25 THEN T=2.064;
  IF N=26 THEN T=2.060; IF N=27 THEN T=2.056; IF N=28 THEN T=2.052;
  IF N=29 THEN T=2.048; IF N GE 30 THEN T=1.960;
  U_LIMIT=ROUND(M_LGTH+T*STDERR);
  L_LIMIT=ROUND(M_LGTH-T*STDERR);
  PERCENT=ROUND(N/TOT*100,.1);
  R_MLGTH=ROUND(M_LGTH);
  RSTDERR=ROUND(STDERR);
RUN;

DATA SUMM8;
  SET AGE4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_N=N;
```

```
  CUM_PER=PERCENT;
  RETAIN CUM_N CUM_PER;
  GO TO END;
  NOTFIRST:
  CUM_N=CUM_N+N;
  CUM_PER=CUM_PER+PERCENT;
  RETAIN CUM_N CUM_PER;
  END:;
RUN;

PROC PRINT DATA=SUMM8 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  ID AGE;
  VAR N CUM_N PERCENT CUM_PER R_MLGTH RSTDERR L_LIMIT U_LIMIT;
  LABEL N='NUMBER*(LENGTH)' CUM_N='CUMULATIVE N*(LENGTH)'
CUM_PER='CUMULATIVE*PERCENT'
    R_MLGTH='MEAN*LENGTH (MM)' RSTDERR='STANDARD ERROR*(LENGTH)'
L_LIMIT='LOWER LIMIT*(LENGTH)'
    U_LIMIT='UPPER LIMIT*(LENGTH)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'MEAN LENGTHS BASED ON AGE.';
  TITLE2 'LOWER AND UPPER 95% CONFIDENCE LIMITS OF MEAN LENGTH VALUES
ARE INCLUDED.';
RUN;

/*******************************************************/
/*        ASSIGNES AGES TO NON-AGED FISH               */
/*******************************************************/

PROC SORT DATA=AGE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
RUN;

PROC MEANS DATA=AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
  VAR AGE;
  OUTPUT OUT=AGE_N1 (DROP=_TYPE_ _FREQ_) N=N;
RUN;

PROC MEANS DATA=AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=AGE_N2 (DROP=_TYPE_ _FREQ_) N=TOT;
RUN;

DATA AGE_PER1;
  MERGE AGE_N1 AGE_N2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  PER_AGE=N/TOT;
  PERCENT=ROUND(PER_AGE*100,.1);
RUN;

PROC PRINT DATA=AGE_PER1 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
```

```
  ID CM_GRP AGE;
  VAR N PERCENT;
  LABEL CM_GRP='LENGTH*(MM)' N='NUMBER*(AGE)' PERCENT='PERCENT*(AGE)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. CM_GRP TENMM.;
  TITLE 'AGE-FREQUENCIES BASED ON LENGTH.';
RUN;

DATA NO_AGE1;
  SET FISH2;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=.;
RUN;

PROC SORT DATA=NO_AGE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=NO_AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=NOAGE_N1 (DROP=_TYPE_ _FREQ_) N=SUM;
RUN;

DATA AGE_SUM1;
  MERGE AGE_PER1 NOAGE_N1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  N=ROUND(SUM*PER_AGE);
  IF N=. OR N=0 THEN DELETE;
RUN;

PROC SORT DATA=AGE_SUM1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

DATA AGE_SUM2;
  SET AGE_SUM1 AGE_N1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC SORT DATA=AGE_SUM2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

PROC MEANS DATA=AGE_SUM2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
  VAR N;
  OUTPUT OUT=AGE_SUM3 (DROP=_TYPE_ _FREQ_) SUM=SUM;
RUN;

PROC MEANS DATA=AGE_SUM2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR N;
  OUTPUT OUT=AGE_SUM4 (DROP=_TYPE_ _FREQ_) SUM=TOT;
RUN;
```

```
DATA SUMM9;
  MERGE AGE_SUM3 AGE_SUM4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  PERCENT=ROUND(SUM/TOT*100,.1);
  DROP TOT;
RUN;

PROC SORT DATA=SUMM9;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

/*******************************************************/
/*              CALCULATES CPUE BY AGE                 */
/*******************************************************/

DATA AGE5;
  SET FISH1;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=. THEN DELETE;
RUN;

PROC SORT DATA=AGE5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
RUN;

PROC MEANS DATA=AGE5 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
  VAR AGE;
  OUTPUT OUT=AGE_N3 (DROP=_TYPE_ _FREQ_) N=N;
RUN;

PROC MEANS DATA=AGE5 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=AGE_N4 (DROP=_TYPE_ _FREQ_) N=TOT;
RUN;

DATA AGE_PER2;
  MERGE AGE_N3 AGE_N4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  PER_AGE=N/TOT;
RUN;

DATA NO_AGE2;
  SET FISH1;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=.;
RUN;

PROC SORT DATA=NO_AGE2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=NO_AGE2 N NOPRINT;
```

```
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=NOAGE_N2 (DROP=_TYPE_ _FREQ_) N=SUM;
RUN;

DATA AGE_SUM5;
  MERGE AGE_PER2 NOAGE_N2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  N=ROUND(SUM*PER_AGE);
  IF N=. OR N=0 THEN DELETE;
RUN;

PROC SORT DATA=AGE_SUM5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

DATA AGE_SUM6;
  SET AGE_SUM5 AGE_N3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC SORT DATA=AGE_SUM6;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

PROC MEANS DATA=AGE_SUM6 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
  VAR N;
  OUTPUT OUT=AGE_SUM7 (DROP=_TYPE_ _FREQ_) SUM=SUM;
RUN;

DATA SUMM10;
  MERGE EFFORT2 AGE_SUM7;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(SUM/EFFORT,.01);
  DROP EFFORT SUM;
RUN;

PROC SORT DATA=SUMM10;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

DATA SUMM11;
  MERGE SUMM9 SUMM10;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_SUM=SUM;
  CUM_PER=PERCENT;
  CUM_CPUE=CPUE;
  RETAIN CUM_SUM CUM_PER CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_SUM=CUM_SUM+SUM;
  CUM_PER=CUM_PER+PERCENT;
  CUM_CPUE=CUM_CPUE+CPUE;
```

```
  RETAIN CUM_SUM CUM_PER CUM_CPUE;
  END:;
RUN;

PROC PRINT DATA=SUMM11 NOOBS SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  ID AGE;
  VAR SUM CUM_SUM PERCENT CUM_PER CPUE CUM_CPUE;
  LABEL SUM='FREQUENCY' CUM_SUM='CUMULATIVE*FREQUENCY'
CUM_PER='CUMULATIVE*PERCENT'
    CPUE='CATCH PER*EFFORT' CUM_CPUE='CUMULATIVE*CPUE';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'FREQUENCY, PERCENT AND CPUE OF EACH AGE CLASS.';
  TITLE2 'INCLUDED ARE FISH THAT HAD AGES ASSIGNED USING A LENGTH-AGE
KEY.';
  TITLE3 'FISH CAPTURED FROM COMPROMISED SAMPLES WERE NOT INCLUDED IN
CPUE CALCULATIONS.';
RUN;
QUIT;
```

IMS2.sas

```
/*****************************************************************
/
/*                            IMS2.SAS
*/
/*****************************************************************
/
/* THIS PROGRAM CALCULATES VARIOUS DESCRIPTIVE STATISTICS FOR IMS
*/
/* DATA COLLECTED ON A PARTICULAR RESERVOIR. USE THIS PROGRAM IF
*/
/* THERE ARE GROUPED FISH INCLUDED IN THE SAMPLE.
*/
/*****************************************************************
/

OPTIONS CENTER DATE NUMBER PAGESIZE=74 LS=128;
LIBNAME LIBRARY 'C:\OFIS ANALYSIS';
/*******************************************************/
/*  INSERT THE FILENAMES IN THE SPACES PROVIDED BELOW   */
/*******************************************************/
FILENAME RAW1 'C:\OFIS ANALYSIS\addfilename.TXT';
FILENAME RAW2 'C:\OFIS ANALYSIS\addfilename.TXT';

/*****************************************************************
**/
/* THIS SECTION INPUTS RAW IMS DATA, CALCULATES RELATIVE WEIGHTS,
*/
/* AND CONVERTS GEAR CODES.
*/
/*****************************************************************
**/

DATA IMS1;
  INFILE RAW1 LRECL=270 MISSOVER;
  INPUT MONTH 15-17 DAY 18-20 YEAR 21-25 RESERVOIR 26-35 TARGET 36-
45 SAMPL_NO 46-55
    E_TYPE $ 66-70 EFFORT 71-80 GEAR 131-135 SPECIES 191-220 LENGTH
221-230
    WEIGHT 231-240 AGE 261-270;
  NO_INDIV=1;
  IF 4 LE MONTH LE 6 THEN DO;
    IF GEAR=1 THEN GEAR=11;
      IF GEAR=3 THEN GEAR=13;
      IF GEAR=6 THEN GEAR=16;
  END;
  IF 9 LE MONTH LE 11 THEN DO;
    IF GEAR=1 THEN GEAR=21;
      IF GEAR=3 THEN GEAR=23;
      IF GEAR=6 THEN GEAR=26;
  END;
/*****************************************************/
/*              CALCULATES RELATIVE WEIGHTS            */
```

```
/*******************************************************/
  IF SPECIES=74005 THEN DO;
    IF LENGTH LT 115 THEN REL_WGHT=.;
    IF LENGTH GE 115 THEN REL_WGHT=WEIGHT/(10**(-
5.201+3.139*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77001 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
    IF LENGTH GE 100 THEN REL_WGHT=WEIGHT/(10**(-
5.642+3.332*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77002 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
    IF LENGTH GE 100 THEN REL_WGHT=WEIGHT/(10**(-
5.618+3.345*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77004 THEN DO;
    IF LENGTH LT 150 THEN REL_WGHT=.;
    IF LENGTH GE 150 THEN REL_WGHT=WEIGHT/(10**(-
5.329+3.200*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77005 THEN DO;
    IF LENGTH LT 100 THEN REL_WGHT=.;
    IF LENGTH GE 100 THEN REL_WGHT=WEIGHT/(10**(-
5.392+3.215*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77006 THEN DO;
    IF LENGTH LT 150 THEN REL_WGHT=.;
    IF LENGTH GE 150 THEN REL_WGHT=WEIGHT/(10**(-
5.528+3.273*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=77009 THEN DO;
    IF LENGTH LT 80 THEN REL_WGHT=.;
    IF LENGTH GE 80 THEN REL_WGHT=WEIGHT/(10**(-
5.374+3.316*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=80002 THEN DO;
    IF LENGTH LT 150 THEN REL_WGHT=.;
    IF LENGTH GE 150 THEN REL_WGHT=WEIGHT/(10**(-
5.453+3.180*LOG10(LENGTH)))*100;
  END;
  IF SPECIES=80026 THEN DO;
    IF LENGTH LT 170 THEN REL_WGHT=.;
    IF LENGTH GE 170 THEN REL_WGHT=WEIGHT/(10**(-
5.692+3.266*LOG10(LENGTH)))*100;
  END;
/*******************************************************/
/* ASSIGNES LENGTH GROUPS BASED ON S-Q, Q-P, AND P-M    */
/* SIZE CATEGORIES                                      */
/*******************************************************/
  IF SPECIES=47002 THEN DO;
    IF 280 LE LENGTH LT 410 THEN DO;
        LGTH_GRP=1;
      END;
    IF 410 LE LENGTH LT 610 THEN DO;
```

```
      LGTH_GRP=2;
    END;
  IF 610 LE LENGTH LT 710 THEN DO;
      LGTH_GRP=3;
    END;
END;
IF SPECIES=74001 THEN DO;
  IF 150 LE LENGTH LT 230 THEN DO;
      LGTH_GRP=1;
    END;
  IF 230 LE LENGTH LT 300 THEN DO;
      LGTH_GRP=2;
    END;
  IF 300 LE LENGTH LT 380 THEN DO;
      LGTH_GRP=3;
    END;
END;
IF SPECIES=74005 OR SPECIES=77006 THEN DO;
  IF 200 LE LENGTH LT 300 THEN DO;
      LGTH_GRP=1;
    END;
  IF 300 LE LENGTH LT 380 THEN DO;
      LGTH_GRP=2;
    END;
  IF 380 LE LENGTH LT 510 THEN DO;
      LGTH_GRP=3;
    END;
END;
IF 77001 LE SPECIES LE 77002 THEN DO;
  IF 130 LE LENGTH LT 200 THEN DO;
      LGTH_GRP=1;
    END;
  IF 200 LE LENGTH LT 250 THEN DO;
      LGTH_GRP=2;
    END;
  IF 250 LE LENGTH LT 300 THEN DO;
      LGTH_GRP=3;
    END;
END;
IF 77004 LE SPECIES LE 77005 THEN DO;
  IF 180 LE LENGTH LT 280 THEN DO;
      LGTH_GRP=1;
    END;
  IF 280 LE LENGTH LT 350 THEN DO;
      LGTH_GRP=2;
    END;
  IF 350 LE LENGTH LT 430 THEN DO;
      LGTH_GRP=3;
    END;
END;
IF SPECIES=77009 THEN DO;
  IF 80 LE LENGTH LT 150 THEN DO;
      LGTH_GRP=1;
    END;
  IF 150 LE LENGTH LT 200 THEN DO;
```

```
        LGTH_GRP=2;
      END;
    IF 200 LE LENGTH LT 250 THEN DO;
        LGTH_GRP=3;
      END;
  END;
  IF SPECIES=80002 THEN DO;
    IF 250 LE LENGTH LT 380 THEN DO;
        LGTH_GRP=1;
      END;
    IF 380 LE LENGTH LT 510 THEN DO;
        LGTH_GRP=2;
      END;
    IF 510 LE LENGTH LT 630 THEN DO;
        LGTH_GRP=3;
      END;
  END;
  IF SPECIES=80026 THEN DO;
    IF 230 LE LENGTH LT 350 THEN DO;
        LGTH_GRP=1;
      END;
    IF 350 LE LENGTH LT 460 THEN DO;
        LGTH_GRP=2;
      END;
    IF 460 LE LENGTH LT 560 THEN DO;
        LGTH_GRP=3;
      END;
  END;
  CM_GRP=CEIL(LENGTH/10);
  IF GEAR=11 OR GEAR=21 THEN EFFORT=ROUND(EFFORT/60,.01);
  IF GEAR=13 OR GEAR=23 THEN DO;
    IF E_TYPE='T' THEN EFFORT=1;
  END;
  IF GEAR=16 OR GEAR=26 THEN EFFORT=ROUND(EFFORT/60,.1);
RUN;

PROC SORT DATA=IMS1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO E_TYPE EFFORT SPECIES
NO_INDIV CM_GRP
    LENGTH WEIGHT AGE;
RUN;

/*******************************************************/
/*            IMPORTS GROUPED FISH DATA                */
/*******************************************************/
DATA IMS2;
  INFILE RAW2 LRECL=270 MISSOVER;
  INPUT MONTH 15-17 DAY 18-20 YEAR 21-25 RESERVOIR 26-35 TARGET 36-
45 SAMPL_NO 46-55
    E_TYPE $ 66-70 EFFORT 71-80 GEAR 131-135 SPECIES 191-220
NO_INDIV 221-230;
  IF 4 LE MONTH LE 6 THEN DO;
    IF GEAR=1 THEN GEAR=11;
      IF GEAR=3 THEN GEAR=13;
      IF GEAR=6 THEN GEAR=16;
```

```
  END;
  IF 9 LE MONTH LE 11 THEN DO;
    IF GEAR=1 THEN GEAR=21;
      IF GEAR=3 THEN GEAR=23;
    IF GEAR=6 THEN GEAR=26;
  END;
  IF GEAR=11 OR GEAR=21 THEN EFFORT=ROUND(EFFORT/60,.01);
  IF GEAR=13 OR GEAR=23 THEN DO;
    IF E_TYPE='T' THEN EFFORT=1;
  END;
  IF GEAR=16 OR GEAR=26 THEN EFFORT=ROUND(EFFORT/60,.1);
RUN;

PROC SORT DATA=IMS2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO E_TYPE EFFORT SPECIES
NO_INDIV;
RUN;

DATA IMS;
  SET IMS1 IMS2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO E_TYPE EFFORT SPECIES
NO_INDIV;
RUN;

/*******************************************************************
/
/* THIS SECTION CALCULATES EFFORT, CPUE, AND DESCRIPTIVE
*/
/* STATISTICS (OF CPUE, LENGTH, WEIGHT, AND RELATIVE WEIGHT) FOR
*/
/* ALL GEAR TYPES.
*/
/*******************************************************************
/

/*******************************************************/
/*                        EFFORT                       */
/*******************************************************/

PROC MEANS DATA=IMS MAX NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  VAR EFFORT;
  OUTPUT OUT=EFFORT1 (DROP=_TYPE_ _FREQ_) MAX=EFFORT;
RUN;

PROC MEANS DATA=EFFORT1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET;
  VAR EFFORT;
  OUTPUT OUT=EFFORT2 (DROP=_TYPE_ _FREQ_) SUM=EFFORT;
RUN;

/*******************************************************/
/*                    CATCH                            */
/*******************************************************/
```

```
DATA FISH1;
  SET IMS;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF E_TYPE='N' OR SPECIES=99999 THEN DELETE;
RUN;

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH1 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV;
RUN;

/*******************************************************/
/*                     CPUE                            */
/*******************************************************/

DATA CPUE1;
  MERGE CATCH1 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=NO_INDIV/EFFORT;
RUN;

PROC SORT DATA=CPUE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

/*******************************************************/
/*            MEANS FOR LENGTH, WEIGHT, AND WR         */
/*******************************************************/

DATA FISH2;
  SET IMS;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF SPECIES=99999 THEN DELETE;
RUN;

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC UNIVARIATE DATA=FISH2 NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR LENGTH WEIGHT REL_WGHT;
  FREQ NO_INDIV;
  OUTPUT OUT=STATS N=N_LGTH N_WT MEAN=MEAN_L MEAN_W MEAN_WR
    MAX=MAX_L MAX_W;
RUN;

/*******************************************************/
/*            MERGES SUMMARY CPUE AND MEANS            */
/*******************************************************/
```

```
DATA SUMM1;
  MERGE CPUE1 STATS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  RMEAN_W=ROUND(MEAN_W);
  RMEAN_WR=ROUND(MEAN_WR);
RUN;

PROC PRINT DATA=SUMM1 SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET EFFORT;
  ID SPECIES;
  VAR NO_INDIV N_LGTH MAX_L N_WT MAX_W RMEAN_W RMEAN_WR;
  LABEL NO_INDIV='NUMBER*(CPUE)' N_LGTH='NUMBER*(LENGTH)'
MAX_L='MAXIMUM*LENGTH'
    N_WT='NUMBER*(WEIGHT)' MAX_W='MAXIMUM*WEIGHT'
RMEAN_W='MEAN*WEIGHT' RMEAN_WR='MEAN RELATIVE*WEIGHT';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'TOTAL NUMBERS OF INDIVIDUALS AND DESCRIPTIVE STATISTICS
BASED ON BODY WEIGHT(G) AND LENGTH (MM).';
  TITLE2 'EFFORT IS EXPRESSED AS HOURS FOR ELECTROFISHING AND
GILLNETTING, AND NET-NIGHTS FOR TRAPNETTING.';
RUN;

/*******************************************************************
/
/* THIS SECTION CALCULATES DESCRIPTIVE STATISTICS RELATED TO
*/
/* SAMPLING PRECISION
*/
/*******************************************************************
/

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
RUN;

PROC MEANS DATA=FISH2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH2 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV;
RUN;

DATA SUMM2;
  MERGE EFFORT1 CATCH2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF NO_INDIV=. THEN NO_INDIV=0;
  KEEP YEAR RESERVOIR GEAR TARGET SAMPL_NO EFFORT NO_INDIV;
RUN;

PROC PRINT DATA=SUMM2 SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET;
  ID SAMPL_NO;
  VAR EFFORT NO_INDIV;
  LABEL SAMPL_NO='SAMPLE*NUMBER' NO_INDIV='CATCH*(ALL SPECIES)';
```

```
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT.;
  TITLE1 'EFFORT AND CATCH SUMMARY BY SAMPLE.';
  TITLE2 'EFFORT IS EXPRESSED AS HOURS FOR ELECTROFISHING AND
GILLNETTING, AND NET-NIGHTS FOR TRAPNETTING.';
  TITLE3 'MISSING EFFORT VALUES REPRESENT SAMPLES WHERE EFFORT WAS
COMPROMISED.';
RUN;

/*******************************************************/
/*          DETERMINES EFFORT BY SAMPLE                */
/*******************************************************/

DATA CCF_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=26;
  IF TARGET=80901;
  SPECIES=47002;
RUN;

DATA WHB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=26;
  IF TARGET=80901;
  SPECIES=74001;
RUN;

DATA HYB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=16 OR GEAR=26;
  IF TARGET=74000 OR TARGET=80901;
  SPECIES=74005;
RUN;

DATA WHC_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=23;
  IF TARGET=77996;
  SPECIES=77001;
RUN;

DATA BLC_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=23;
  IF TARGET=77996;
  SPECIES=77002;
RUN;

DATA SMB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
```

```
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77995;
  SPECIES=77004;
RUN;

DATA SPB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77995;
  SPECIES=77005;
RUN;

DATA LMB_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77995;
  SPECIES=77006;
RUN;

DATA BGL_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=11;
  IF TARGET=77993 OR TARGET=77994;
  SPECIES=77009;
RUN;

DATA WLY_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=21 OR GEAR=26;
  IF TARGET=80901;
  SPECIES=80002;
RUN;

DATA SGY_EFF;
  SET EFFORT1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF GEAR=21 OR GEAR=26;
  IF TARGET=80901;
  SPECIES=80026;
RUN;

DATA EFFORT3;
  SET CCF_EFF WHB_EFF HYB_EFF WHC_EFF BLC_EFF SMB_EFF SPB_EFF
LMB_EFF BGL_EFF WLY_EFF SGY_EFF;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
RUN;

/*******************************************************/
/*              DETERMINES CATCH BY SAMPLE             */
/*******************************************************/
```

```
PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH3 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV;
RUN;

/*******************************************************/
/*            CATCH-PER-UNIT-EFFORT BY SAMPLE          */
/*******************************************************/

DATA CPUE2;
  MERGE EFFORT3 CATCH3;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES;
  CPUE_NO=NO_INDIV/EFFORT;
  IF EFFORT=. THEN DELETE;
  IF CPUE_NO=. THEN CPUE_NO=0;
  KEEP YEAR RESERVOIR GEAR TARGET SAMPL_NO SPECIES CPUE_NO;
RUN;

PROC SORT DATA=CPUE2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

/*******************************************************/
/*                MEAN CATCH BY YEAR                   */
/*******************************************************/

PROC MEANS DATA=CPUE2 N MEAN VAR STDERR MIN MAX NOPRINT;
  VAR CPUE_NO;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  OUTPUT OUT=CPUE3 (DROP=_TYPE_ _FREQ_) N=N MEAN=M_CPUE VAR=VAR
STDERR=STDERR
    MIN=MIN MAX=MAX;
RUN;

DATA SUMM3;
  SET CPUE3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF M_CPUE=0 THEN DELETE;
  RM_CPUE=ROUND(M_CPUE,.01);
  RMIN=ROUND(MIN,.01);
  RMAX=ROUND(MAX,.01);
  RM_SE=ROUND(STDERR,.01);
  RSE_MEAN=ROUND(STDERR/M_CPUE*100,.1);
  RSE_10=ROUND(.1**-2*M_CPUE**-2*VAR);
  RSE_20=ROUND(.2**-2*M_CPUE**-2*VAR);
RUN;

PROC SORT DATA=SUMM3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;
```

```
PROC PRINT DATA=SUMM3 NOOBS SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET;
  ID SPECIES;
  VAR N RM_CPUE RMIN RMAX RM_SE RSE_MEAN RSE_20 RSE_10;
  LABEL N='NUMBER OF*SAMPLES' RM_CPUE='MEAN*CPUE'
RMIN='MINIMUM*CPUE' RMAX='MAXIMUM*CPUE'
    RM_SE='STANDARD*ERROR' RSE_MEAN='RELATIVE STANDARD*ERROR'
RSE_20='SAMPLE SIZE*(RSE=20%)'
    RSE_10='SAMPLE SIZE*(RSE=10%)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE 'SUMMARY OF NETTING AND ELECTROFISHING SAMPLING
STATISTICS.';
RUN;

/*******************************************************************
/
/*          THIS SECTION CALCULATES PSD'S AND RSD'S
*/
/*******************************************************************
/

DATA PSD1;
  SET FISH2;
  BY YEAR RESERVOIR GEAR TARGET SAMPL_NO;
  IF SPECIES=47002 OR SPECIES=74001 OR SPECIES=74005 OR 77001 LE
SPECIES LE 77002 OR
    77004 LE SPECIES LE 77006 OR SPECIES=77009 OR SPECIES=80002 OR
SPECIES=80026;
  IF GEAR=21 THEN DELETE;
  IF LENGTH=. THEN DELETE;
  IF SPECIES=47002 AND LENGTH GE 280 THEN ST=NO_INDIV;
  IF SPECIES=74001 AND LENGTH GE 150 THEN ST=NO_INDIV;
  IF SPECIES=74005 AND LENGTH GE 200 THEN ST=NO_INDIV;
  IF (77001 LE SPECIES LE 77002) AND LENGTH GE 130 THEN ST=NO_INDIV;
  IF (77004 LE SPECIES LE 77005) AND LENGTH GE 180 THEN ST=NO_INDIV;
  IF SPECIES=77006 AND LENGTH GE 200 THEN ST=NO_INDIV;
  IF SPECIES=77009 AND LENGTH GE 80 THEN ST=NO_INDIV;
  IF SPECIES=80002 AND LENGTH GE 250 THEN ST=NO_INDIV;
  IF SPECIES=80026 AND LENGTH GE 230 THEN ST=NO_INDIV;
  IF SPECIES=47002 AND LENGTH GE 410 THEN QU=NO_INDIV;
  IF SPECIES=74001 AND LENGTH GE 230 THEN QU=NO_INDIV;
  IF SPECIES=74005 AND LENGTH GE 300 THEN QU=NO_INDIV;
  IF (77001 LE SPECIES LE 77002) AND LENGTH GE 200 THEN QU=NO_INDIV;
  IF (77004 LE SPECIES LE 77005) AND LENGTH GE 280 THEN QU=NO_INDIV;
  IF SPECIES=77006 AND LENGTH GE 300 THEN QU=NO_INDIV;
  IF SPECIES=77009 AND LENGTH GE 150 THEN QU=NO_INDIV;
  IF SPECIES=80002 AND LENGTH GE 380 THEN QU=NO_INDIV;
  IF SPECIES=80026 AND LENGTH GE 350 THEN QU=NO_INDIV;
  IF SPECIES=47002 AND LENGTH GE 610 THEN PR=NO_INDIV;
  IF SPECIES=74001 AND LENGTH GE 300 THEN PR=NO_INDIV;
  IF SPECIES=74005 AND LENGTH GE 380 THEN PR=NO_INDIV;
  IF (77001 LE SPECIES LE 77002) AND LENGTH GE 250 THEN PR=NO_INDIV;
  IF (77004 LE SPECIES LE 77005) AND LENGTH GE 350 THEN PR=NO_INDIV;
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```
  IF SPECIES=77006 AND LENGTH GE 380 THEN PR=NO_INDIV;
  IF SPECIES=77009 AND LENGTH GE 200 THEN PR=NO_INDIV;
  IF SPECIES=80002 AND LENGTH GE 510 THEN PR=NO_INDIV;
  IF SPECIES=80026 AND LENGTH GE 460 THEN PR=NO_INDIV;
RUN;

PROC SORT DATA=PSD1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
RUN;

PROC MEANS DATA=PSD1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR NO_INDIV ST QU PR;
  OUTPUT OUT=PSD2 (DROP=_TYPE_ _FREQ_) SUM=NO_INDIV NO_ST NO_QU
NO_PR;
RUN;

DATA PSD3;
  SET PSD2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NO_ST=. THEN NO_ST=0;
  IF NO_QU=. THEN NO_QU=0;
  IF NO_PR=. THEN NO_PR=0;
  PSD=ROUND(NO_QU/NO_ST*100);
  RSD=ROUND(NO_PR/NO_ST*100);
  IF NO_ST GT 1 THEN DO;
    LL_PSD=ROUND((PSD/100-1.96*SQRT(PSD/100*(1-PSD/100)/(NO_ST-
1)))*100);
    UL_PSD=ROUND((PSD/100+1.96*SQRT(PSD/100*(1-PSD/100)/(NO_ST-
1)))*100);
    LL_RSD=ROUND((RSD/100-1.96*SQRT(RSD/100*(1-RSD/100)/(NO_ST-
1)))*100);
    UL_RSD=ROUND((RSD/100+1.96*SQRT(RSD/100*(1-RSD/100)/(NO_ST-
1)))*100);
  END;
RUN;

PROC PRINT DATA=PSD3 SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET;
  ID SPECIES;
  VAR NO_INDIV NO_ST NO_QU NO_PR LL_PSD PSD UL_PSD LL_RSD RSD
UL_RSD;
  LABEL NO_INDIV='NUMBER OF*INDIVIDUALS' NO_ST='NUMBER OF*STOCK-
SIZED*FISH'
    NO_QU='NUMBER OF*QUALITY-SIZED*FISH' NO_PR='NUMBER OF*PREFERRED-
SIZED*FISH'
    LL_PSD='PSD*LOWER*LIMIT' UL_PSD='PSD*UPPER*LIMIT' RSD='RSD-P'
    LL_RSD='RSD-P*LOWER*LIMIT' UL_RSD='RSD-P*UPPER*LIMIT';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'PSD AND RSD-P VALUES WITH ASSOCIATED 95% CONFIDENCE
LIMITS.';
  TITLE2 'FOR EACH SPECIES THE STOCK, QUALITY, AND PREFERRED SIZES
(MM) ARE:';
```

```
  TITLE3 '280, 410, AND 610 FOR CHANNEL CATFISH, 150, 230, AND 300
FOR WHITE BASS, 200, 300, AND 380 FOR HYBRID-STRIPED BASS,';
  TITLE4 '130, 200, AND 250 FOR WHITE CRAPPIE AND BLACK CRAPPIE,
180, 280, AND 350 FOR SMALLMOUTH BASS AND SPOTTED BASS,';
  TITLE5 '200, 300, AND 380 FOR LARGEMOUTH BASS, 80, 150, AND 200
FOR BLUEGILL,';
  TITLE6 '250, 380, AND 510 FOR WALLEYE, AND 230, 350, AND 450 FOR
SAUGEYE.';
RUN;

/*****************************************************************
/
/* THIS SEGMENT CALCULATES CPUE AND RELATIVE WEIGHTS (WITH 95%
*/
/* CONFIDENCE INTERVALS) BY VARIOUS SIZE CATEGORIES.
*/
/*****************************************************************
/

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH4 (DROP=_TYPE_ _FREQ_) SUM=NO_CPUE;
RUN;

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
RUN;

PROC MEANS DATA=FISH2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH5 (DROP=_TYPE_ _FREQ_) SUM=NO_LGTH;
RUN;

PROC MEANS DATA=FISH2 N MEAN STDERR NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  VAR REL_WGHT;
  OUTPUT OUT=WEIGHT1 (DROP=_TYPE_ _FREQ_) N=N MEAN=MEAN_RW
STDERR=STDERR;
RUN;

DATA LENGTH1;
  MERGE CATCH4 CATCH5 WEIGHT1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  IF LGTH_GRP=. THEN DELETE;
  IF GEAR=11 THEN DO;
    IF 77004 LE SPECIES LE 77006 OR SPECIES=77009;
  END;
  IF GEAR=21 THEN DELETE;
  IF GEAR=26 THEN DO;
```

```
    IF SPECIES=80002 OR SPECIES=80026;
  END;
  RMEAN_RW=ROUND(MEAN_RW);
  RSTDERR=ROUND(STDERR);
RUN;

DATA CPUE4;
  MERGE LENGTH1 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
  IF N=2 THEN T=12.706; IF N=3 THEN T=4.303; IF N=4 THEN T=3.182;
  IF N=5 THEN T=2.776;  IF N=6 THEN T=2.571; IF N=7 THEN T=2.447;
  IF N=8 THEN T=2.365;  IF N=9 THEN T=2.306; IF N=10 THEN T=2.262;
  IF N=11 THEN T=2.228; IF N=12 THEN T=2.201; IF N=13 THEN T=2.179;
  IF N=14 THEN T=2.160; IF N=15 THEN T=2.145; IF N=16 THEN T=2.131;
  IF N=17 THEN T=2.120; IF N=18 THEN T=2.110; IF N=19 THEN T=2.101;
  IF N=20 THEN T=2.093; IF N=21 THEN T=2.086; IF N=22 THEN T=2.080;
  IF N=23 THEN T=2.074; IF N=24 THEN T=2.069; IF N=25 THEN T=2.064;
  IF N=26 THEN T=2.060; IF N=27 THEN T=2.056; IF N=28 THEN T=2.052;
  IF N=29 THEN T=2.048; IF N GE 30 THEN T=1.960;
  U_LIMIT=ROUND(MEAN_RW+T*STDERR);
  L_LIMIT=ROUND(MEAN_RW-T*STDERR);
RUN;

DATA SUMM4;
  SET CPUE4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.001);
RUN;

PROC PRINT DATA=SUMM4 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID LGTH_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH N RMEAN_RW
RSTDERR L_LIMIT U_LIMIT;
  LABEL LGTH_GRP='SIZE*CATEGORY' NO_CPUE='NUMBER*(CPUE)'
CUM_NO='CUMULATIVE N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)' N='NUMBER*(WR)'
RMEAN_RW='MEAN*WR' RSTDERR='STANDARD*ERROR*(WR)'
    L_LIMIT='LOWER*LIMIT*(WR)' U_LIMIT='UPPER*LIMIT*(WR)';
```

```
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. LGTH_GRP LGTHGRP.;
  TITLE1 'CATCH RATES AND RELATIVE WEIGHTS (WR) BY INCREMENTAL SIZE
CATEGORIES.';
  TITLE2 'LOWER AND UPPER 95% CONFIDENCE LIMITS OF WR VALUES ARE
ALSO INCLUDED.';
  TITLE3 'FOR EACH SPECIES THE STOCK-QUALITY, QUALITY-PREFERRED, AND
PREFERRED-MEMORABLE SIZE CATEGORIES (MM) ARE:';
  TITLE4 '200-299, 300-379, AND 380-509 FOR HYBRID-STRIPED BASS,
130-199, 200-249, AND 250-299 FOR WHITE CRAPPIE AND BLACK CRAPPIE,';
  TITLE5 '180-279, 280-349, AND 350-429 FOR SMALLMOUTH BASS AND
SPOTTED BASS, 200-299, 300-379, AND 380-509 FOR LARGEMOUTH BASS,';
  TITLE6 '80-149, 150-199, AND 200-249 FOR BLUEGILL, 250-379, 380-
509, AND 510-629 FOR WALLEYE,';
  TITLE7 'AND 230-349, 350-449, AND 450-559 FOR SAUGEYE.';
RUN;

DATA LENGTH2;
  MERGE CATCH4 CATCH5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES LGTH_GRP;
  IF LGTH_GRP=. THEN DELETE;
  IF GEAR=26;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026 THEN DELETE;
  END;
RUN;

DATA CPUE5;
  MERGE LENGTH2 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
RUN;

DATA SUMM5;
  SET CPUE5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.01);
RUN;

PROC PRINT DATA=SUMM5 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID LGTH_GRP;
```

```
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH;
  LABEL LGTH_GRP='LENGTH (MM)' NO_CPUE='NUMBER*(CPUE)'
CUM_NO='CUMULATIVE N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. LGTH_GRP LGTHGRP.;
  TITLE1 'CATCH RATES BY INCREMENTAL SIZE CATEGORIES.';
  TITLE2 'FOR EACH SPECIES THE STOCK-QUALITY, QUALITY-PREFERRED, AND
PREFERRED-MEMORABLE SIZES (MM) ARE:';
  TITLE3 '280-409, 410-609, AND 610-709 FOR CHANNEL CATFISH, AND
150-229, 230-299, AND 300-379 FOR WHITE BASS,';
RUN;

/*******************************************************************
/
/* THIS SECTION CALCULATES CPUE AND RELATIVE WEIGHTS (WITH 95%
*/
/* CONFIDENCE INTERVALS) BY 10-MM LENGTH GROUPS.
*/
/*******************************************************************
/

PROC SORT DATA=FISH1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=FISH1 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH6 (DROP=_TYPE_ _FREQ_) SUM=NO_CPUE;
RUN;

PROC SORT DATA=FISH2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=FISH2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR NO_INDIV;
  OUTPUT OUT=CATCH7 (DROP=_TYPE_ _FREQ_) SUM=NO_LGTH;
RUN;

PROC MEANS DATA=FISH2 N MEAN STDERR NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR REL_WGHT;
  OUTPUT OUT=WEIGHT2 (DROP=_TYPE_ _FREQ_) N=N MEAN=MEAN_RW
STDERR=STDERR;
RUN;

DATA LENGTH3;
  MERGE CATCH6 CATCH7 WEIGHT2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  IF CM_GRP=. THEN DELETE;
```

```
  IF GEAR=11 THEN DO;
    IF 77004 LE SPECIES LE 77006 OR SPECIES=77009;
  END;
  IF GEAR=21 THEN DELETE;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026;
  END;
  RMEAN_RW=ROUND(MEAN_RW);
  RSTDERR=ROUND(STDERR);
RUN;

DATA CPUE6;
  MERGE LENGTH3 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
  IF N=2 THEN T=12.706; IF N=3 THEN T=4.303; IF N=4 THEN T=3.182;
  IF N=5 THEN T=2.776;  IF N=6 THEN T=2.571; IF N=7 THEN T=2.447;
  IF N=8 THEN T=2.365;  IF N=9 THEN T=2.306; IF N=10 THEN T=2.262;
  IF N=11 THEN T=2.228; IF N=12 THEN T=2.201; IF N=13 THEN T=2.179;
  IF N=14 THEN T=2.160; IF N=15 THEN T=2.145; IF N=16 THEN T=2.131;
  IF N=17 THEN T=2.120; IF N=18 THEN T=2.110; IF N=19 THEN T=2.101;
  IF N=20 THEN T=2.093; IF N=21 THEN T=2.086; IF N=22 THEN T=2.080;
  IF N=23 THEN T=2.074; IF N=24 THEN T=2.069; IF N=25 THEN T=2.064;
  IF N=26 THEN T=2.060; IF N=27 THEN T=2.056; IF N=28 THEN T=2.052;
  IF N=29 THEN T=2.048; IF N GE 30 THEN T=1.960;
  U_LIMIT=ROUND(MEAN_RW+T*STDERR);
  L_LIMIT=ROUND(MEAN_RW-T*STDERR);
RUN;

DATA SUMM6;
  SET CPUE6;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.001);
RUN;

PROC PRINT DATA=SUMM6 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID CM_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH N RMEAN_RW
RSTDERR L_LIMIT U_LIMIT;
  LABEL CM_GRP='LENGTH*(MM)' NO_CPUE='NUMBER*(CPUE)'
CUM_NO='CUMULATIVE N*(CPUE)'
```

```
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)' N='NUMBER*(WR)'
RMEAN_RW='MEAN*WR' RSTDERR='STANDARD*ERROR*(WR)'
    L_LIMIT='LOWER*LIMIT*(WR)' U_LIMIT='UPPER*LIMIT*(WR)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. CM_GRP TENMM.;
  TITLE1 'LENGTH FREQUENCIES, CATCH RATES, AND RELATIVE WEIGHTS (WR)
BY 10-MM LENGTH CATEGORIES.';
  TITLE2 'LOWER AND UPPER 95% CONFIDENCE LIMITS OF WR VALUES ARE
INCLUDED.';
RUN;

DATA LENGTH4;
  MERGE CATCH6 CATCH7;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  IF CM_GRP=. THEN DELETE;
  IF GEAR=11 THEN DO;
    IF 77004 LE SPECIES LE 77006 OR SPECIES=77009 THEN DELETE;
  END;
  IF GEAR=16 OR GEAR=23 THEN DELETE;
  IF GEAR=26 THEN DO;
    IF SPECIES=80002 OR SPECIES=80026 THEN DELETE;
  END;
RUN;

DATA CPUE7;
  MERGE LENGTH4 EFFORT2;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(NO_CPUE/EFFORT,.01);
  IF CPUE=. THEN DELETE;
RUN;

DATA SUMM7;
  SET CPUE7;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_NO=NO_CPUE;
  CUM_LGTH=NO_LGTH;
  CUM_CPUE=CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_NO=CUM_NO+NO_CPUE;
  CUM_LGTH=CUM_LGTH+NO_LGTH;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_NO CUM_LGTH CUM_CPUE;
  END:;
  CUM_CPUE=ROUND(CUM_CPUE,.01);
RUN;

PROC PRINT DATA=SUMM7 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES EFFORT;
  ID CM_GRP;
  VAR NO_CPUE CUM_NO CPUE CUM_CPUE NO_LGTH CUM_LGTH;
```

```
  LABEL CM_GRP='LENGTH (MM)' NO_CPUE='NUMBER*(CPUE)'
CUM_NO='CUMULATIVE N*(CPUE)'
    CPUE='CPUE*(NUMBER)' CUM_CPUE='CUMULATIVE*CPUE'
NO_LGTH='NUMBER*(LENGTH)'
    CUM_LGTH='CUMULATIVE N*(LENGTH)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. CM_GRP TENMM.;
  TITLE1 'LENGTH FREQUENCIES AND CATCH RATES BY 10-MM LENGTH
CATEGORIES';
  TITLE2 'FOR FISH MEASURED FOR LENGTH ONLY.';
RUN;

/*******************************************************************
*/
/* THIS SECTION CALCULATES AGE-SPECIFIC INFORMATION AND ASSINGES
*/
/* AGES TO NON-AGED FISH USING AN AGE-LENGTH KEY.
*/
/*******************************************************************
*/

DATA AGE1;
  SET FISH2;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=. THEN DELETE;
RUN;

PROC SORT DATA=AGE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

/*******************************************************/
/*        DETERMINES MEAN LENGTH BASED ON AGE          */
/*******************************************************/

PROC MEANS DATA=AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR AGE;
  OUTPUT OUT=AGE2 (DROP=_TYPE_ _FREQ_) N=TOT;
RUN;

PROC MEANS DATA=AGE1 N MEAN STDERR MIN MAX NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
  VAR LENGTH;
  OUTPUT OUT=AGE3 (DROP=_TYPE_ _FREQ_) N=N MEAN=M_LGTH STDERR=STDERR
MIN=MIN MAX=MAX;
RUN;

DATA AGE4;
  MERGE AGE2 AGE3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF N=1 THEN DO;
    MIN=.;
      MAX=.;
  END;
```

```
  IF N=2 THEN T=12.706; IF N=3 THEN T=4.303; IF N=4 THEN T=3.182;
  IF N=5 THEN T=2.776;  IF N=6 THEN T=2.571; IF N=7 THEN T=2.447;
  IF N=8 THEN T=2.365;  IF N=9 THEN T=2.306; IF N=10 THEN T=2.262;
  IF N=11 THEN T=2.228; IF N=12 THEN T=2.201; IF N=13 THEN T=2.179;
  IF N=14 THEN T=2.160; IF N=15 THEN T=2.145; IF N=16 THEN T=2.131;
  IF N=17 THEN T=2.120; IF N=18 THEN T=2.110; IF N=19 THEN T=2.101;
  IF N=20 THEN T=2.093; IF N=21 THEN T=2.086; IF N=22 THEN T=2.080;
  IF N=23 THEN T=2.074; IF N=24 THEN T=2.069; IF N=25 THEN T=2.064;
  IF N=26 THEN T=2.060; IF N=27 THEN T=2.056; IF N=28 THEN T=2.052;
  IF N=29 THEN T=2.048; IF N GE 30 THEN T=1.960;
  U_LIMIT=ROUND(M_LGTH+T*STDERR);
  L_LIMIT=ROUND(M_LGTH-T*STDERR);
  PERCENT=ROUND(N/TOT*100,.1);
  R_MLGTH=ROUND(M_LGTH);
  RSTDERR=ROUND(STDERR);
RUN;

DATA SUMM8;
  SET AGE4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_N=N;
  CUM_PER=PERCENT;
  RETAIN CUM_N CUM_PER;
  GO TO END;
  NOTFIRST:
  CUM_N=CUM_N+N;
  CUM_PER=CUM_PER+PERCENT;
  RETAIN CUM_N CUM_PER;
  END:;
RUN;

PROC PRINT DATA=SUMM8 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  ID AGE;
  VAR N CUM_N PERCENT CUM_PER R_MLGTH RSTDERR L_LIMIT U_LIMIT;
  LABEL N='NUMBER*(LENGTH)' CUM_N='CUMULATIVE N*(LENGTH)'
CUM_PER='CUMULATIVE*PERCENT'
    R_MLGTH='MEAN*LENGTH (MM)' RSTDERR='STANDARD ERROR*(LENGTH)'
L_LIMIT='LOWER LIMIT*(LENGTH)'
    U_LIMIT='UPPER LIMIT*(LENGTH)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'MEAN LENGTHS BASED ON AGE.';
  TITLE2 'LOWER AND UPPER 95% CONFIDENCE LIMITS OF MEAN LENGTH
VALUES ARE INCLUDED.';
RUN;

/*******************************************************/
/*        ASSIGNES AGES TO NON-AGED FISH               */
/*******************************************************/

PROC SORT DATA=AGE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
RUN;
```

```
PROC MEANS DATA=AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
  VAR AGE;
  OUTPUT OUT=AGE_N1 (DROP=_TYPE_ _FREQ_) N=N;
RUN;

PROC MEANS DATA=AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=AGE_N2 (DROP=_TYPE_ _FREQ_) N=TOT;
RUN;

DATA AGE_PER1;
  MERGE AGE_N1 AGE_N2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  PER_AGE=N/TOT;
  PERCENT=ROUND(PER_AGE*100,.1);
RUN;

PROC PRINT DATA=AGE_PER1 SPLIT='*' NOOBS;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  ID CM_GRP AGE;
  VAR N PERCENT;
  LABEL CM_GRP='LENGTH*(MM)' N='NUMBER*(AGE)'
PERCENT='PERCENT*(AGE)';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT. CM_GRP TENMM.;
  TITLE 'AGE-FREQUENCIES BASED ON LENGTH.';
RUN;

DATA NO_AGE1;
  SET FISH2;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=.;
RUN;

PROC SORT DATA=NO_AGE1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=NO_AGE1 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=NOAGE_N1 (DROP=_TYPE_ _FREQ_) N=SUM;
RUN;

DATA AGE_SUM1;
  MERGE AGE_PER1 NOAGE_N1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  N=ROUND(SUM*PER_AGE);
  IF N=. OR N=0 THEN DELETE;
RUN;

PROC SORT DATA=AGE_SUM1;
```

```
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

DATA AGE_SUM2;
  SET AGE_SUM1 AGE_N1;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC SORT DATA=AGE_SUM2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

PROC MEANS DATA=AGE_SUM2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
  VAR N;
  OUTPUT OUT=AGE_SUM3 (DROP=_TYPE_ _FREQ_) SUM=SUM;
RUN;

PROC MEANS DATA=AGE_SUM2 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  VAR N;
  OUTPUT OUT=AGE_SUM4 (DROP=_TYPE_ _FREQ_) SUM=TOT;
RUN;

DATA SUMM9;
  MERGE AGE_SUM3 AGE_SUM4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  PERCENT=ROUND(SUM/TOT*100,.1);
  DROP TOT;
RUN;

PROC SORT DATA=SUMM9;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

/*******************************************************/
/*              CALCULATES CPUE BY AGE                 */
/*******************************************************/

DATA AGE5;
  SET FISH1;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=. THEN DELETE;
RUN;

PROC SORT DATA=AGE5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
RUN;

PROC MEANS DATA=AGE5 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP AGE;
  VAR AGE;
  OUTPUT OUT=AGE_N3 (DROP=_TYPE_ _FREQ_) N=N;
RUN;
```

```
PROC MEANS DATA=AGE5 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=AGE_N4 (DROP=_TYPE_ _FREQ_) N=TOT;
RUN;

DATA AGE_PER2;
  MERGE AGE_N3 AGE_N4;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  PER_AGE=N/TOT;
RUN;

DATA NO_AGE2;
  SET FISH1;
  BY YEAR RESERVOIR GEAR TARGET;
  IF AGE=.;
RUN;

PROC SORT DATA=NO_AGE2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC MEANS DATA=NO_AGE2 N NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  VAR CM_GRP;
  OUTPUT OUT=NOAGE_N2 (DROP=_TYPE_ _FREQ_) N=SUM;
RUN;

DATA AGE_SUM5;
  MERGE AGE_PER2 NOAGE_N2;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
  N=ROUND(SUM*PER_AGE);
  IF N=. OR N=0 THEN DELETE;
RUN;

PROC SORT DATA=AGE_SUM5;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

DATA AGE_SUM6;
  SET AGE_SUM5 AGE_N3;
  BY YEAR RESERVOIR GEAR TARGET SPECIES CM_GRP;
RUN;

PROC SORT DATA=AGE_SUM6;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

PROC MEANS DATA=AGE_SUM6 SUM NOPRINT;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
  VAR N;
  OUTPUT OUT=AGE_SUM7 (DROP=_TYPE_ _FREQ_) SUM=SUM;
RUN;

DATA SUMM10;
```

```
  MERGE EFFORT2 AGE_SUM7;
  BY YEAR RESERVOIR GEAR TARGET;
  CPUE=ROUND(SUM/EFFORT,.01);
  DROP EFFORT SUM;
RUN;

PROC SORT DATA=SUMM10;
  BY YEAR RESERVOIR GEAR TARGET SPECIES AGE;
RUN;

DATA SUMM11;
  MERGE SUMM9 SUMM10;
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  IF NOT FIRST.SPECIES THEN GO TO NOTFIRST;
  CUM_SUM=SUM;
  CUM_PER=PERCENT;
  CUM_CPUE=CPUE;
  RETAIN CUM_SUM CUM_PER CUM_CPUE;
  GO TO END;
  NOTFIRST:
  CUM_SUM=CUM_SUM+SUM;
  CUM_PER=CUM_PER+PERCENT;
  CUM_CPUE=CUM_CPUE+CPUE;
  RETAIN CUM_SUM CUM_PER CUM_CPUE;
  END:;
RUN;

PROC PRINT DATA=SUMM11 NOOBS SPLIT='*';
  BY YEAR RESERVOIR GEAR TARGET SPECIES;
  ID AGE;
  VAR SUM CUM_SUM PERCENT CUM_PER CPUE CUM_CPUE;
  LABEL SUM='FREQUENCY' CUM_SUM='CUMULATIVE*FREQUENCY'
CUM_PER='CUMULATIVE*PERCENT'
    CPUE='CATCH PER*EFFORT' CUM_CPUE='CUMULATIVE*CPUE';
  FORMAT RESERVOIR LAKEFMT. GEAR GEARFMT. TARGET FISHFMT. SPECIES
FISHFMT.;
  TITLE1 'FREQUENCY, PERCENT AND CPUE OF EACH AGE CLASS.';
  TITLE2 'INCLUDED ARE FISH THAT HAD AGES ASSIGNED USING A LENGTH-
AGE KEY.';
  TITLE3 'FISH CAPTURED FROM COMPROMISED SAMPLES WERE NOT INCLUDED
IN CPUE CALCULATIONS.';
RUN;
```

BACKCALC.sas

```
/*********************************************************************
*                              BACKCALC.SAS                          *
*********************************************************************
*  THIS PROGRAM ESTIMATES LENGTH-AT-AGE FROM ANNULUS MEASUREMENTS   *
*********************************************************************/

OPTIONS CENTER DATE NUMBER LS=128 PAGENO=1;
TITLE1 'LENGTH-AT-AGE BACK CALCULATIONS';
LIBNAME LIBRARY 'C:\OFIS ANALYSIS';
/*******************************************************
*   INSERT THE FILENAME IN THE SPACE PROVIDED BELOW    *
*******************************************************/
FILENAME RAW 'C:\OFIS ANALYSIS\insertfilename.TXT';

DATA BCALC;
INFILE RAW LRECL=270 MISSOVER;
INPUT PROJECT $ 1-7 MONTH 8-18 DAY 19-21 YEAR 22-26 RESERVOIR 27-37
TARGET 38-47 SAMPL_NO 48-57 FISHID 58-67 SPECIES 68-98 LENGTH 99-108
WEIGHT 109-118 SEX 119-128 STRUC $ 129-138 MAGNIFY 139-148 READER
149-158 AGE 159-168 MARGIN 169-178 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11
A12 A13 A14 A15;
  IF STRUC NE 'S' THEN DELETE;
  IF AGE=. THEN DELETE;
  YEARCLAS=YEAR-AGE;

/*************************************************************
*                      INTERCEPT VALUES                      *
*************************************************************/
IF SPECIES=77002 THEN INTERCEPT=35; /* BLACK CRAPPIE */
IF SPECIES=77009 THEN INTERCEPT=20; /* BLUEGILL */
IF SPECIES=20003 THEN INTERCEPT=18; /* GIZZARD SHAD */
IF SPECIES=77006 THEN INTERCEPT=20; /* LARGEMOUTH BASS */
IF SPECIES=80001 THEN INTERCEPT=55; /* SAUGER */
IF SPECIES=80026 THEN INTERCEPT=55; /* SAUGEYE */
IF SPECIES=77004 THEN INTERCEPT=35; /* SMALLMOUTH BASS */
IF SPECIES=74002 THEN INTERCEPT=25  /* STRIPED BASS */
IF SPECIES=80002 THEN INTERCEPT=55; /* WALLEYE */
IF SPECIES=74001 THEN INTERCEPT=40; /* WHITE BASS */
IF SPECIES=77001 THEN INTERCEPT=35; /* WHITE CRAPPIE */
IF SPECIES=80003 THEN INTERCEPT=30; /* YELLOW PERCH  */

/*******************************************************
*           BACK CALCULATION OF FISH LENGTHS           *
*******************************************************/
ARRAY BACKL{*} BCLEN_1-BCLEN_15;
ARRAY INC{*} A1-A15;
 DO A=1 TO 15;
   IF MARGIN=. THEN GO TO SKIP;
    IF INC{A}=0 THEN GO TO SKIP;
     IF AGE=. THEN GO TO SKIP;
      BACKL{A}=INTERCEPT+((LENGTH-INTERCEPT)/MARGIN)*INC{A};
      AGE_BC=(A);
      SKIP:END;
```

```
PROC SORT DATA=BCALC;
 BY RESERVOIR YEAR SPECIES YEARCLAS;
RUN;
/*****************************************************
*   CALCULATION OF MEAN LENGTH-AT-AGE BY YEAR CLASS    *
*****************************************************/
PROC MEANS NOPRINT;
 BY RESERVOIR YEAR SPECIES YEARCLAS;
 VAR BCLEN_1-BCLEN_15;
 OUTPUT  OUT=BCLEN (DROP=_TYPE_ _FREQ_) N=N MEAN=LEN1-LEN15
STDERR=STDERR1-STDERR15;
RUN;
/*************************************************************
*   CALCULATION OF MEAN LENGTH-AT-AGE FOR ALL YEAR CLASSES    *
*************************************************************/
PROC MEANS DATA=BCALC NOPRINT;
   BY RESERVOIR YEAR SPECIES;
   VAR BCLEN1-BCLEN15;
   OUTPUT  OUT=MEANBCL (DROP=_TYPE_ _FREQ_) MEAN=LEN1-LEN15
   STDERR=STDERR1-STDERR15;

RUN;

DATA ALL;
   SET BCLEN MEANBCL;
   LEN1=ROUND(LEN1); LEN2=ROUND(LEN2);LEN3=ROUND(LEN3);
   LEN4=ROUND(LEN4);LEN5=ROUND(LEN5);LEN6=ROUND(LEN6);
   LEN7=ROUND(LEN7);LEN8=ROUND(LEN8);LEN9=ROUND(LEN9);
   LEN10=ROUND(LEN10);LEN11=ROUND(LEN11);LEN12=ROUND(LEN12);
   LEN13=ROUND(LEN13);LEN14=ROUND(LEN14);LEN15=ROUND(LEN15);
   STDERR1=ROUND(STDERR1,0.01); STDERR2=ROUND(STDERR2,0.01);
   STDERR3=ROUND(STDERR3,0.01); STDERR4=ROUND(STDERR4,0.01);
   STDERR5=ROUND(STDERR5,0.01); STDERR6=ROUND(STDERR6,0.01);
   STDERR7=ROUND(STDERR7,0.01); STDERR8=ROUND(STDERR8,0.01);
   STDERR9=ROUND(STDERR9,0.01); STDERR10=ROUND(STDERR10,0.01);
   STDERR11=ROUND(STDERR11,0.01); STDERR12=ROUND(STDERR12,0.01);
   STDERR13=ROUND(STDERR13,0.01); STDERR14=ROUND(STDERR14,0.01);
   STDERR15=ROUND(STDERR15,0.01);
   AGE=YEAR-YEARCLAS;
   FORMAT RESERVOIR LAKEFMT.  SPECIES FISHFMT. YEARCLAS YRCLFMT.;

PROC SORT;
   BY RESERVOIR YEAR SPECIES YEARCLAS;
/****************************************
*      MEAN LENGTH-AT-AGE TABLES       *
****************************************/
PROC PRINT NOOBS SPLIT='*' DATA=ALL;
   TITLE3 'MEAN LENGTH-AT-AGE (mm)';
   TITLE4 'THE "MEAN" ROW IS THE WEIGHTED-MEAN BACK CALCULATED LENGTH
   FOR EACH COLUMN';
   BY RESERVOIR YEAR SPECIES;
   VAR YEARCLAS AGE N LEN1 LEN2 LEN3 LEN4 LEN5 LEN6 LEN7 LEN8 LEN9
   LEN10 LEN11 LEN12 LEN13 LEN14 LEN15;
```

```
   LABEL YEARCLAS='YEAR*CLASS' N='NUMBER' LEN1='LENGTH*AT*AGE1'
   LEN2='LENGTH*AT*AGE2' LEN3='LENGTH*AT*AGE3' LEN4='LENGTH*AT*AGE4'
   LEN5='LENGTH*AT*AGE5' LEN6='LENGTH*AT*AGE6' LEN7='LENGTH*AT*AGE7'
   LEN8='LENGTH*AT*AGE8' LEN9='LENGTH*AT*AGE9'
   LEN10='LENGTH*AT*AGE10' LEN11='LENGTH*AT*AGE11'
   LEN12='LENGTH*AT*AGE12' LEN13='LENGTH*AT*AGE13'
   LEN14='LENGTH*AT*AGE14' LEN15='LENGTH*AT*AGE15';
RUN;
/*****************************************************************
*  TABULATES STANDARD ERRORS ASSOCIATED WITH MEAN LENGTH-AT-AGE  *
*****************************************************************/
PROC PRINT NOOBS SPLIT='*' DATA=ALL;
   TITLE3 'STANDARD ERROR OF BACK CALCULATED MEAN LENGTH-AT-AGE';
   TITLE4 'THE "MEAN" ROW IS THE STANDARD DEVIATION OF THE MEAN BACK
   CALCULATED LENGTH FOR EACH COLUMN';
   BY RESERVOIR YEAR SPECIES;
   VAR YEARCLAS AGE N STDERR1 STDERR2 STDERR3 STDERR4 STDERR5 STDERR6
   STDERR7 STDERR8 STDERR9 STDERR10 STDERR11 STDERR12 STDERR13
   STDERR14 STDERR15;
   LABEL YEARCLAS='YEAR*CLASS' N='NUMBER' STDERR1='STD*ERROR*AGE1'
   STDERR2='STD*ERROR*AGE2' STDERR3='STD*ERROR*AGE3'
   STDERR4='STD*ERROR*AGE4' STDERR5='STD*ERROR*AGE5'
   STDERR6='STD*ERROR*AGE6' STDERR7='STD*ERROR*AGE7'
   STDERR8='STD*ERROR*AGE8' STDERR9='STD*ERROR*AGE9'
   STDERR10='STD*ERROR*AGE10' STDERR11='STD*ERROR*AGE11'
   STDERR12='STD*ERROR*AGE12' STDERR13='STD*ERROR*AGE13'
   STDERR14='STD*ERROR*AGE14' STDERR15='STD*ERROR*AGE15';
RUN;
QUIT;
```