U.S. Environmental Protection Agency
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Athens, Georgia

OPERATING PROCEDURE

Title: **Fish Field Sampling**

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Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the SESD Document Control Coordinator on the SESD local area network (LAN).

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SESDPROC-512-R4, *Fish Field Sampling*, replaces SESDPROC-512-R3. **Cover Page:** The Ecological Assessment Branch Chief was changed from Bill Cosgrove to the Field Services Branch Chief, John Deatrick. The FQM was changed from Liza Montalvo to Hunter Johnson. **Revision History:** Changes were made to reflect the current practice of only including the most recent changes in the revision history.	February 4, 2015
SESDPROC-512-R3, *Fish Field Sampling*, replaces SESDPROC-512-R2.	April 14, 2011
SESDPROC-512-R2, *Fish Field Sampling*, replaces SESDPROC-512-R1.	December 18, 2009
SESDPROC-512-R1, *Fish Field Sampling*, replaces SESDPROC-512-R0.	November 1,2007
SESDPROC-512-R0, *Fish Field Sampling*, Original Issue	February 05, 2007

TABLE OF CONTENTS

1 General Information

1.1 Purpose

This document provides general procedures, methods, and considerations to be used and observed while collecting fish in freshwater, marine and estuarine environments.

1.2 Scope/Application

The procedures contained in this document are to be used by field personnel when collecting fish in freshwater, marine and estuarine environments. Upon the realization that any of the procedures described in this document cannot be used other methods may be implemented to ensure collection. Any other procedure or methods of collection used that are not described in this document must be documented in the field log book and subsequent investigation report, along with circumstances requiring its use. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document Control Coordinator is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 References

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

United States Environmental Protection Agency (USEPA). 1999. Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. EPA 841-B-99-002. Office of Water, Washington, DC.

USEPA. 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Third Edition. EPA 823-B-00-007. Office of Science and Technology, Office of Water, Washington, DC.

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version.

1.5 Taxonomic References

Boschung, H. T. and R. L., Mayden. 2004. Fishes of Alabama. Smithsonian Books, Birmingham, AL.

Marcy, B. C., D. E. Fletcher, F. D. Martin, M. H. Paller, M. J. M. Reichert. 2005. Fishes of the Middle Savannah River Basin with Emphasis on the Savannah River Site. University of Georgia Press. Athens, GA.

Menhinick, E. F. 1991. The Freshwater Fishes of North Carolina. North Carolina Wildlife Resources Commission, Raleigh, N.C.

Murphy, B. R. and D. W. Willis. 1996. Fisheries Techniques. American Fisheries Society. Bethesda, MD.

Jenkins, R. E. and N. M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries. Society, Bethesda, MD.

Page, L. M. and B. M. Burr. 1991. A Field Guide to Freshwater Fishes. Houghton Mifflin Co., Boston, MA.

1.6 General Precautions

1.6.1 Safety

All members of the sampling crew should be able to swim and be certified in Cardiopulmonary resuscitation (CPR) as well as first aid. Depending on the Data Quality Objectives (DQO) certain samples may be frozen or preserved with ethanol or formalin. Proper safety precautions must be observed when working with either preservative. Refer to the Science and Ecosystem Support Division's (SESD) Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. When using this procedure, minimize exposure to potential health hazards through the use of protective clothing, eye wear and gloves.

1.6.2 Procedural Precautions

The following precautions should be considered when performing fish collections:

- Care in handling of organisms during collection is necessary to ensure specimens are not being contaminated. This includes handling fish with latex gloves and storing fish in a sealed clean plastic bag on wet ice for no more than forty-eight hours before filleting.
- Care should be taken not to damage fish, particularly when collecting fish for use in IBI (Index of Biotic Integrity) determinations, to ensure proper taxonomic identification.
- Sample specimens that are sacrificed and subject to identification at a later date should be properly fixated with formalin and preserved in ethanol.
- Collected samples for tissue analysis should be stored in a secure location to preclude conditions, such as desiccation, which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples will conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as bills of lading, will be retained by the project leader and stored in a secure place.

2 Sampling Considerations

2.1 Summary of Procedure

The use of collection techniques described below should provide fish that are suitable for use in ecological assessments, tissue analyses and other relevant studies. The following procedures for fish collection are designed to minimize effects on the chemical and physical integrity of the sample. The following techniques are to be used as general guidelines and may be used in conjunction with one another as sample locations and DQO's may differ at each location. In all cases proper collection permits will be obtained from the issuing State or agency.

2.2 Gear Selection

Before selection of sampling gear, consideration should be given to biological and environmental factors that influence gear efficiency. Characteristics of the fish community being sampled are among the biological factors affecting efficiency. Susceptibility to gear varies among fish species due to differences in morphology, physiology, and behavior. Environmental factors to be considered are the size and depth of the water body to be sampled along with previous and current weather conditions, water temperature, and conductivity. General guidelines for the use of active (moving gear or nets to capture fish) and passive (fish move into stationary collection device) collection gears for fishes are found in sections 3 and 4.

2.3 Quality Control

Assure that samples are properly labelled and preserved. Fish collected for tissue analysis may be stored in clear plastic bags in coolers on wet ice for no more than forty-eight hours. Fish from multiple collection sites may be stored in the same cooler as long as each sample is stored in a clean separate plastic bag. In studies were fish length and weight are measured, length should be measured in millimeters (mm), weight in grams (g) and recorded in logbook.

A library of basic taxonomic literature is essential in aiding in the identification of specimens. The taxonomic publications in common use should be stored in the fish processing lab. These references are listed in the references section in this procedure. In addition, voucher specimens should be retained for verification from additional sources, if necessary.

2.4 Records

Records generated will include field notes, recorded in a bound waterproof logbook (in accordance with SESD Operating Procedure for Logbooks, SESDPROC-010), field data sheets for physical characterizations, digital photographs, custody tags, completed chain-of-custody forms, lab bench sheets and, if needed, completed receipt for sample forms.

3 Active Collection Methods

3.1 Electrofishing

Electrofishing is a form of active sampling with the use of electricity. It allows the user to collect fish in different types of water bodies dependent on the specific gear type chosen i.e. backpack, barge, or boat electrofishers. Before selection of electrofishing gear, consideration should be given to biological and environmental factors that influence gear efficiency.

Characteristics of fish community being sampled are among the biological factors affecting efficiency. Susceptibility to electrofishing varies among fish species due to differences in morphology, physiology, and behavior. Typically large fish are more vulnerable than small fish, bony fish are more susceptible than cartilaginous fish and fish with smaller vestigial scales (e.g., ictalurids) are more susceptible than those with large scales such as cyprinids.

WATER CONDUCTIVITY is the most IMPORTANT variable. When conductivity is low it is harder to pass electricity between the electrodes. When conductivity is high (higher than the fish tissue) current passes around the fish and they are not affected. Ideal conditions are met when the conductivity is high, but lower than the conductivity of the fish tissue. Water temperature affects fish activity and conductivity as both activity and conductivity increase with an increase in temperature. Turbidity can also affect efficiency as fish are not as easily seen. Other environmental factors that should be taken into consideration when selecting a gear type are the size and depth of the water body.

While conducting electrofishing polarized sunglasses should be worn. They allow the user to see into the water better and thus increase efficiency. Also, depending on conditions, while wading in shallow streams they allow to user to identify potential hazards and habitat structure.

Above all else consider the SAFETY for YOU and your TEAM. ELECTRIC CURRENT IS LETHAL. The best safety precautions are those that minimize contact with charged water and decrease the probability of electrocution and drowning. People conducting electrofishing surveys should wear a PFD (personal floatation device) at all times when in a boat or wading in deep or swift water, wear rubber boots or waders, wear rubber gloves and be certified in CPR.

3.1.1 Boat Electrofisher

Generally, boat electrofishers are used when the water body is larger or too deep to be wadeable. Typically reservoirs, lakes, and larger rivers require the use of a boat electrofisher. Boat size can also affect your capability to access an area or waterbody. Larger boats work well in larger water bodies such as Clarks Hill and Russell Reservoirs as their maneuverability is not as restricted. Smaller boats 14' or less are generally better suited for smaller ponds and rivers.

Boat setup:

- Gas powered AC generator used as power source
- Control box allows manipulation of current (AC vs. DC), output voltage and pulsing.
- Positive electrodes (anode) at the bow of boat, negative electrode (cathode) usually the boats hull or a cable hanging over side.

3.1.2 Barge Electrofisher

Barge electrofishers are typically used in streams or rivers when the water body is wadeable but not accessible by boat. The use of a barge electrofisher requires a minimum of 3 people. One person is in charge of the barge and monitoring the output and SAFETY of the others while the other 2 people actively electrofish. Ideally another 2 or more individuals would help by netting.

Barge setup:

- Gas powered AC generator used as power source
- Control box allows manipulation of current (AC vs. DC), output voltage and pulsing.
- Positive electrodes (anode) handheld pole with ring, negative electrode (cathode) usually a small 12" x 12" metal plate under the bow or cable hanging over side.

3.1.3 Backpack Electrofisher

Backpack electrofishers are typically used in smaller wadeable rivers and streams. They can be utilized with other backpack shockers, block nets and seines to increase efficiency. A minimum of two people is required to operate a backpack electrofisher. One person will wear the backpack electrofisher and the other will net. Optimally one should block off the ends of the reach to minimize escapement and sample moving upstream to minimize effects of turbidity.

Backpack setup:

- 24 volt large or small capacity battery.
- Backpack unit is the control box DC current only.
- Positive electrodes (anode) handheld pole with ring, negative electrode (cathode) usually a cable hanging off the rear of the backpack electrofisher.

3.1.4 Other Active Gears

Other active gears used to capture fish include trawls, dredges, surrounding nets (i.e. purse seines), cast nets and angling. Each of these gears will have an ideal set of circumstances in which they are effective. Trawls, dredges, and surrounding nets are typically used in open water for pelagic species. Cast nets can be used at depths up to 15 feet and can be efficient at collecting other species such as shrimp. Angling can be used as a general sampling method or to supplement catch from another gear and may be used in a wide variety of situations.

4 Passive Collection Methods

4.1 Passive Techniques

Passive techniques do not involve the movement of the sampling gear to collect fish. These gears are typically anchored and stationary allowing fish to move into them. Passive techniques can be grouped by their method of capture: entanglement, entrapment, and angling. Entanglement gear captures fish by ensnaring or tangling (i.e. gill and trammel nets). Entrapment gear captures organisms as they enter an enclosed area and are unable to escape. Entrapment devices include hoop nets, fyke nets, slat traps, and crap pots. Angling methods involve setting an individual or line of stationary hooks that are baited such as a trotline. When selecting a passive gear for use, selectivity of the gear must be considered based on the target species.

4.2 Entanglement Gear

Gill and trammel nets are considered entanglement gears that capture fish by ensnaring or tangling. When selecting these gears careful consideration should be given to gear selectivity. These gears can be set at the surface or submerged.

4.2.1 Gill Nets

Gill nets consist of a vertical panel(s) of mesh with a float line on top and lead weights on bottom. The size of the mesh can vary and is expressed in bar or stretch measure. Nets that have more than one panel of different size mesh are experimental gill nets and can capture a wide variety of size classes. Typically gill nets are set in shallow waters on the surface or submerged up to 50 meters. When choosing a site to set gill nets consideration should be given to target species and submerged obstructions such as trees that may interfere with collection or retrieval of nets.

4.2.2 Trammel Nets

Trammel nets are typically constructed of three parallel mesh panels of netting suspended from a float line with a lead line on bottom. The outer panels consist of a larger mesh while the inner panel mesh is smaller and hangs longer and lose compared to the outer panels. Fish will pass through the outer panel into the middle in which they push through the second outer panel thus, capturing themselves in a pocket of mesh. Trammel nets are generally used for larger fish in shallow lakes or reservoir and can also be fished in rivers by letting them drift with the current. If drifting trammel nets, they should be carefully watched in order to avoid obstructions and retrieve fish upon immediate capture.

4.3 Entrapment Gear

Common entrapment devises are: hoop nets, fyke nets and traps (i.e. slat traps and crab pots). Entrapment devises are designed to capture aquatic organisms as they enter the gear through their own movement. Generally, organisms may be attracted to the entrapment gear by baiting it or the gears ability to create cover. Knowledge of your target species is important when selecting a type of entrapment gear.

4.3.1 Hoop & Fyke Nets

Hoop and fyke nets are constructed of wooden, steel, plastic, or fibreglass hoops which are connected by netting to for a cylindrical net with funnel shaped entrances between each hoop. Hoop net are generally designed for use in riverine habitats by staking the entrance out upstream and allowing the current to hold the net open. Fyke nets are designed for use in lakes or reservoirs as they also incorporate a panel or wing that protrudes from the mouth of the net that acts as a barrier to funnel fish into the net. Hoop nets can also be utilized in ponds and lakes and can be baited.

4.3.2 Traps

Generally, traps are small, portable, and rigid with an opening that allows for the target species to enter. They are generally designed to capture bottom dwelling fish, crustaceans, and species that are fond of tight cover (i.e. catfish). Traps are usually connected to a surface float or can be tethered to shore and are typically baited.

4.3.3 Angling

Angling with hook and line can also be an effective way to collect fish samples depending on the target species. Trotlines and limb lines are among the passive techniques that can be used as the primary method for capture or to supplement others. Trotlines are typically a long line with a multitude of baited hooks. The trotline is anchored at both ends and set in the water for a period of time. Limb lines are baited hooks that are attached to tree limbs or stakes on the shore. Both these methods can be used in rivers, lakes, and reservoirs.