New Mexico Environment Department
Surface Water Quality Bureau

Standard Operating Procedure

for

FISH COMMUNITY SAMPLING

Approval Signatures

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1.0 Purpose and Scope

The purpose of this document is to describe the process of fish collection for fish community studies (as opposed to fish tissue collection for contaminant studies). NMED/SWQB only collects fish for community studies in lotic waters.

2.0 Responsibilities

Personnel who conduct fish community sampling and data validation and verification activities or who supervise those who do are responsible for implementing this procedure. All fish collection activities require a permit from the New Mexico Department of Game and Fish and/or the U.S. Fish and Wildlife Service (depending on the species to be collected). The NMDGF and/or the USFWS should be contacted prior to sampling if any listed species may be encountered, as per the terms of the collection permits. Fish identification should be conducted by a qualified fisheries biologist (Barbour, 1999).

3.0 Background and Precautions

SWQB collects fish community data to 1) determine existing aquatic life use designation (e.g. cold water, warm water etc.) in support of UAA's or standards proposals, and 2) develop fish related IBIs (Index of Biotic Integrity). IBIs use relative abundance and diversity metrics to evaluate the overall quality of the fish assemblage at a particular station. Relative abundance is calculated as the number of individuals that exhibit a particular characteristic (e.g., gravel spawners) divided by the total number of individuals captured. Population size and/or density measures are not used in fish IBIs because they can vary substantially due to natural environmental variation, rather than primarily as a result of anthropogenic degradation (Karr and Chu 1999).

SWQB collects voucher specimens so if there are any subsequent questions as to identifications of species, they can be verified. All collection data are provided to the Museum of Southwestern Biology, the regional clearinghouse for fish collections. NMED, as well as other agencies and researchers, request data from their records.

Fish are sometimes collected for purposes other than the purposes described above. In such cases, the collection methods may be modified from this method with approval of the Program Manager and the QA Officer. Best professional judgment should be exercised to determine sampling methodology and to ensure that safety concerns are addressed.

Safety recommendations for electrofishing are included in the Bureau's Job Hazard Analysis document.

4.0 Definitions

None

5.0 Equipment and Supplies

The following list includes equipment and supplies for backpack electrofishing or seining used for a typical fish community sampling effort (as well some equipment for specialized studies):

- Electrofisher and accessories
- Electrofisher batteries
- Chargers (if necessary)
- Dip nets
- Aquarium nets
- Seine and brails
- Buckets
- Aerators and extra batteries
- Live cars
- Field notebook
- Pencil
- Polarized sunglasses
- Waders
- Measuring board
- Scales
- Whirl packs
- Formalin
- Field tags
- Sharpie
- Magnifying lens
- Conductivity meter
- Measuring tapes (100 m, 30 m)
- Collection permit(s)
- GPS unit
- Camera
- Field guide(s)
- Clipboard
- Data forms
- Dissection kit
- Sonde, data logger, cable, probe guard
- 95% ETOH (for invert or genetic samples)
- Small vials (for genetic samples)
- MSB field forms, field tags

6.0 Fish Community Sampling Process

For fish community collection activities, electrofishing is the preferred method of capture. One backpack electrofisher is usually adequate for streams up to approximately three meters in width. Larger streams may require two backpack electrofishers or a bank/tote barge shocker. If two electrofishers are used, they should be set at equivalent voltages and all other settings (frequency, pulse width, pulse duration, etc.) should be the same. For larger rivers, boat-mounted electrofishing may be conducted. Assistance of other agencies (e.g., NMDGF, USFWS) should be considered when necessary or desirable.

Equipment used must be suitable for the specific conductance (SC) of the water. Backpack electrofishers are usually adequate for SC up to 1,500 microsiemens per centimeter (µS/cm); bank or tote barge shockers are necessary for higher SC. Seining is an acceptable technique in streams with high SC and fine sediment substrates.

6.1 Sampling Sites and Season

Reach length is dependent on stream size. Typically, a stream reach of 40 times the average wetted width will be sampled for fish, or a minimum of 100 meters. All available habitat types (pool, riffle, and run) are sampled. Sampling is performed within the index period (15 Aug to 15 Nov) after any spawning migration has ceased, when young-of-the-year fish are large enough to be reliably identified in the field, and when streams are low and clear.

6.2 Sampling Methods

1. Collection via electrofishing begins at a shallow riffle or other barrier at the downstream end of the reach. When electrofishing, the reach is sampled in an upstream direction to prevent creating turbidity in the area to be sampled. Sampling proceeds to a similar barrier at the upstream end of the reach. Block nets at either end of the sampled reach may be used if there is no physical barrier (e.g., shallow riffle, cascade) at the upstream and downstream ends of the reach. Only a single pass of the reach is required for SWQB's sampling purposes. If seining is conducted it is best performed in a downstream direction.

2. Capture stunned fish using dip nets with mesh small enough to prevent escape of fish 20 mm total length (TL) or larger. If the mesh is too small, it is difficult to move the net through the water fast enough to capture fish. A 5 to 6 mm (3/16 to 1/4 inch) mesh is ideal. Water must be clear enough to enable effective capture in dip nets. If water is too turbid for effective dip net use, a seine with a 5 to 6 mm mesh may be used by stretching it across the stream and shocking a short distance above the seine, sweeping the electrode down into the seine, repeating this process in an upstream direction until the reach is completely sampled (indicate in field notes if this variation is necessary). Small aquarium nets are useful for capturing small fish, particularly in cobble substrates.

3. Indicate on the data forms the length of the reach sampled and its proportion of habitat types (pool, riffle, and run). If electrofishing, indicate the number of seconds the electrofisher was passing current through the water (indicated by the timer on the electrofisher) and the settings (voltage, pulse type, pulse duration, etc.). If seining, indicate the length, width, and mesh size of the seine.

4. Move the fish from the dip net or seine to a bucket for later identification and quantification. Identify and count fish frequently enough to prevent mortality due to oxygen stress or other causes. If possible, aerate the bucket using a portable battery operated aerator and/or replace the water in the bucket with fresh water to reduce oxygen stress. Alternately, a "live car" (a mesh container placed in the stream) may be used to alleviate the necessity of aeration or water replacement. If it is necessary to stop and count fish before the reach is completely sampled, it should be done at a physical barrier or a block net should be placed at the location. After processing, replace the fish in the stream well downstream (upstream, if seining) of the physical barrier/block net to avoid recapture.

5. Identify fish in the field. Total number of each species captured is enumerated and recorded in the appropriate field on the data form. Record visual observations of external anomalies

(deformities, fin erosion, lesions, tumors, etc.), and any other pertinent notes or comments. SWQB presently measures the length of only salmonids for calculation of certain metrics used in coldwater streams. A subsample of other species may be measured (length and/or weight) if necessary, depending upon the objectives of the study. Ensure that individuals measured represent an unbiased subsample or measure all fish captured. Indicate on data forms if standard, fork, or total length (TL) is taken (SWQB typically uses TL).

6. Take voucher specimens of all fish species captured, with the exception of State or federally listed species (the NMDGF and/or the USFWS should be contacted prior to sampling if any listed species may be encountered, as per the terms of the collection permits). In the event that listed species are not vouchered, photographs may be taken provided the fish are not unreasonably stressed. Vouchers are placed in a Whirl-pak® or equivalent type of container in a 10% buffered formalin solution. Fish from each sampling station are kept in separate containers and clearly labeled with a piece of paper inscribed with the field number of the collection placed in the bag. Deposit the vouchers at the Museum of Southwestern Biology, Division of Fishes, at the University of New Mexico in Albuquerque, NM. Complete the Museum field collection forms (printed on archival paper, available from the Museum) with black archival quality ink (India ink or Uniball Deluxe®) and submit with the voucher specimens. Contact the Division of Fishes at the Museum for details before sampling.

7. Fill out fish sampling, physical characterization/water quality, and habitat field sheets completely while in the field. These forms are modified versions of those available in *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (Barbour et al., 1999). Habitat field sheets may be excluded if a separate habitat survey has been performed in the sampled reach.

8. Properly disinfect all field gear (waders, boots, live wells, nets, etc.) following the procedures outlined in SOP 8.1 “Cleaning of Sampling Equipment”.

7.0 Quality Assurance/Quality Control

Questionable records are prevented by requiring the presence of at least one experienced fish taxonomist on every field effort (Barbour, 1999).

Before leaving the sampling site, all forms will be checked for completeness. The forms are initialed and dated by the reviewer in the space provided at the top of the form.

Vouchers are sent to the Division of Fishes at the Museum of Southwestern Biology, where a second taxonomist will verify field identifications. The Museum will send a report to the collector. The collector should review the report and ensure agreement for each identification. In the event that the collector and the Museum disagree, the collector should contact the Museum and resolve the disagreement, either by having the Museum reevaluate its identification, or by reexamining the voucher and coming to agreement.

8.0 Related Forms

- *Fish Sampling Field Data Sheet*
- *Physical Characterization/Water Quality Field Data Sheet*
- *Fish Collection Equipment Checklist*

9.0 Revision History

Revision 1 – 04/03/2013 – Minor edits in terminology.
Original – 08/09/2013

REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: Periphyton, benthic macroinvertebrates and fish, Second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Karr, J.R. and E.W. Chu. 1999. Restoring Life in Running Waters; Better Biological Monitoring. Island Press, Washington, D.C. 206 pp.