5.0 Length and Weight Measurement of Finfish.

5.1 Introduction:

This template is intended for use by instructors to train the Department of Fisheries and Oceans (DFO) staff and students to weigh and measure finfish. The training session is designed with salmonids as the teaching model. Modifications to the template may be required when applying this training session to different species. Templates are used to provide the minimum requirements necessary in a training exercise, but the instructor may add additional material.

An experienced instructor must demonstrate the methods outlined in this template, and trainees must be deemed qualified in carrying out the procedures, before they can be permitted to perform this procedure on fish without an instructor present. Hands-on training of staff is a requirement for facility approval by the Canadian Council on Animal Care, of which DFO is a member. This template is part of a comprehensive DFO Science Branch series on training for users of aquatic research animals.

5.2 Rationale:

In scientific research it is common to obtain weight and length measurements of finfish to monitor growth and body condition changes over the course of experimental studies. Animal handling must be minimized to decrease the risk of injury during handling as this will predispose the fish to subsequent morbidity and mortality.

5.3 Authority:

The type of measurements that are made and units used for measurement are at the discretion of the principal investigator. Information on types and frequency of handling are the responsibility of the staff or consultant veterinarian or the Animal Care Committee.

5.4 Goals for this training exercise:

1. Learn to weigh and measure finfish.
2. Understand the difference between fork length, standard length and total length.
3. Demonstrate gentle handling of fish when live fish are used for the session.
4. Understand how to calculate condition factor.

5.5 Theoretical training – to be completed before hands on session

1. Completed ‘The Experimental Fish’.
2. CCAC guidelines: Section H, Experimental Procedures 1. Handling and Restraint plus section 1.3.1 Handling injuries.
3. If live fish are to be used then completion of the anatomy and anaesthesia templates or demonstrated training and experience in these areas is required.
4. WHMIS Training.

5. Summary Theory material provided with this template (Appendix A).

5.6 Details of the Procedure:

1. Measure standard length, total length and fork length.
2. Weigh the fish.
3. Calculate condition factor.
4. Emphasize gentle handling when live fish are used in the training exercise.

5.6.1 Time estimate:

Set up: 1 hour
Teaching: 1 hour

5.6.2 Equipment Required

- 10 Fish per participant or group of participants (fish can be alive or dead)
- Measuring board
- Scale (electronic or mechanical, scale should be representative of the common types of equipment available for use at the facility)
- Gloves
- Disinfectant
- Data sheet
- Calculator

If using live fish:

- TMS™
- $NaHCO_3$ if freshwater fish are used
- Dip nets
- Buckets
- Air stones and compressed air
- Thermometer
- Dissolved oxygen meter
- Mucus protectant (e.g. Vidalife™)
- Calculator

5.6.3 Procedure:

5.6.3.1 Before the procedure:

- Prepare equipment and datasheets in advance.

- If live animals are used they must be fasted for 18 – 72 hours prior to handling.

- Prepare anaesthesia and recovery baths **or** combine this exercise with the euthanasia template and use dead specimens.

5.6.3.2 Weight and length measurements:

- If live anaesthetized fish are used in the exercise then handling must be limited. If the fish are dead, they can be weighed and measured by multiple trainees.
- All equipment that comes in contact with live fish must be wet down first to minimize cuticle damage during the handling procedure.
- Fish must not be held out of the water for more than 30 seconds.
- One trainee completes the measurements while another records the data on Chart 1; this will limit the amount of time the fish is held out of the water.
- Measure standard, total, and fork length for each fish, record length in centimetres and millimetres.
- Measure lengths to the closest millimetre and record one significant digit e.g. 12.2 cm.
- Tare scale and weigh fish in grams, record one significant digit e.g. 23.5 grams.
- Return the fish to a recovery bath or its home tank and monitor the recovery process.
- Repeat the procedure on rest of the fish in the group.

5.6.3.3 After the procedure:

- Monitor the fish closely during recovery for signs of distress.
- Increase monitoring for 2 – 3 weeks after the handling event.
- Disinfect the area where fish were handled (provide trainees with site biosecurity SOP).
- Trainees must wash hands with disinfectant soap.
- Calculate the condition factor using fork length (cm) as the length measurement.
- Calculate the mean length, weight and condition factor for the group.

- Update inventory records to reflect the number of fish euthanized for this session (if any).
- Update drug use records to include anaesthetic use.
- Dead fish must be disposed of appropriately.

Chart 1: Length and Weight Datasheet.

Fish Number	(SL) Standard Length (cm)	(FL) Fork Length (cm)	(TL) Total Length (cm)	Weight (g)	Condition Factor (use FL) $k=\frac{w}{l^3} \times 100$
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Record mean values					

5.7 ACC Notes

- Locally significant differences required in training (e.g. species).

- Authorization required to teach/list of possible instructors for your region.

- Any other requirements for your region.

APPENDIX A: Review Theory for Length and Weight Measurement of Finfish

References:

Calliet, G.M., Love, M.S. and Ebeling, A.W. 1986. Fishes: a field and laboratory manual on their structure, identification, and natural history. Wadsworth Publishing Company, Belmont, California.

Evans, D.H. 1998. The physiology of fishes 2nd ed CRC Press LLC, 2000 N.W. Corporate Blvd., Boca Raton, Florida 33431.

Definitions:

Condition Factor: $k = \frac{\text{(weight in grams)}}{\text{(length in cm)}^3} \times 100$

Condition Factor: Refers to a mathematical formula for determining the physiological state of a fish, including its reproductive capacity. It is calculated by dividing fish weight by length cubed (W/L^3). The heavier a fish for a given length, the higher its condition factor (K).

Fork Length: The distance from the anterior aspect of the snout (or upper lip) to the tip of the medial caudal fin ray.

Morbidity: The condition of being diseased.

Standard Length: The distance from the anterior aspect of the snout (or upper lip) to the end of the caudal peduncle (the caudal base). The caudal base is found by moving the caudal fin laterally against the fish's body; a crease will appear at the junction of the hypural bones and the fin rays.

Total Length: The length from the anterior aspect of the snout (or upper lip) to the posterior tip of the longest caudal fin ray when the caudal fin is spread in a 'natural' position.

- Determine the length measurement (standard, total or fork length) required by the researcher.
- Confirm the number of significant digits that the investigator requires for the weight measurement.
- Measurements are always straight-line projections between two points on the fish's body. The curvature of the fish's body is not to be included in the measurement.
- Condition factor is one parameter that may be considered when making assessments of fish health.

Handling techniques review:

- Fish must be fasted prior to handling.
- Fish must be handled only when necessary and the number of handling episodes must be minimized.
- Fish must not be held out of water for more than 30 seconds; even short periods of time out of the water can damage the gill lamellae.
- All equipment that comes in contact with the fish during handling must be wetted down to protect the fish's mucus coat.
- Mucus protectants such as poly vinyl pyrrolidone (Vidalife™) can be used to help protect the fish's mucus coat.
- Fish must be protected from light, or changes in lighting, during handling.

Example calculations for determining condition factor:

1. Calculate the condition factor for a rainbow trout that has a fork length of 15.0 cm and a weight of 35 g.

$$\frac{(35g)}{(15\ cm)^3} \times 100 = K$$

$$\frac{(35g)}{3375 cm^3} \times 100 = K$$

$0.01037 \times 100 = 1.037\ g/cm^3$
Rounded to two significant digits = 1.04

2. Calculate the condition factor for an Atlantic salmon that has a fork length of 25.2 cm and a weight of 180 g.

$$\frac{(180\ g)}{(25.2\ cm)^3} \times 100 = K$$

$$\frac{180\ g}{16003\ cm^3} \times 100 = K$$

$0.0112 \times 100 = 1.12\ g/cm^3$

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