

Center for Quantitative Fisheries Ecology

PROTOCOL

PREPARATION OF OPERCULA FOR AGE ESTIMATION OF

TAUTOG

Tautoga onitis

Contents

Equipment and supplies	1
Introduction	3
Structure of tautog opercula	3
Tautog operculum preparation for age determination	3

Equipment and supplies

Item/Model	Number/Use
VWR [®] hot plate	1
Dissecting forceps	2 pairs- (1) 8-inch and (1) 4-inch, broad-tipped forceps, for handling opercula
1500-ml glass beaker	1
Paper towels	1
CQFE tautog operculum storage box (cardboard)	
Sharpie [®] Ultra Fine Point Permanent Marker	1
Extra coin envelopes	each for one fish opercula

Introduction

The following is a protocol for the preparation of opercula from tautog (*Tautoga onitis*) for age estimation. This protocol is to be used after the protocol for collecting tautog biometric data and extracting opercula and sagittal otoliths. This protocol will first briefly introduce the structure of tautog opercula, and then describe the detailed process of cleaning and storing them.

Structure of tautog opercula

A tautog operculum is a small, bony flap that protects the fish's gills. It is assembled by four bones: the preopercle, opercle, interopercle, and the subopercle. Since the opercle is the largest of the opercular bones and is used for ageing (Hereafter, referred to as "operculum").

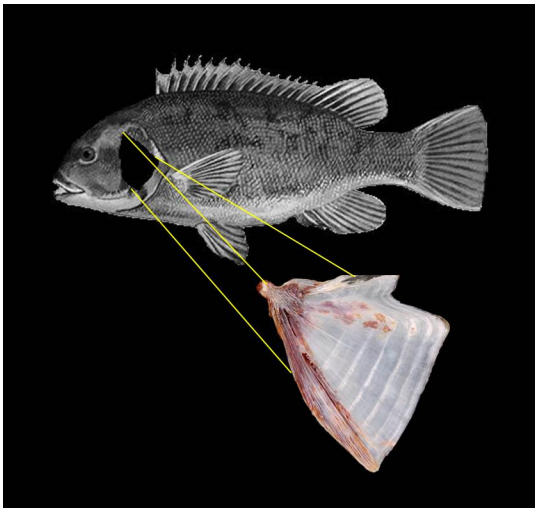


Figure 1: Tautog operculum position

The operculum is a triangle-shaped bone that is posterior to the eye and mouth and positioned on each of the fish's lateral sides (Figure 1), joined to the fish via a ball-and-socket hinge. This hinge enables the operculum to easily open and close. Opercu-

lar growth begins here and each successive year, new growth is added.

[Click here](#) to find the detailed descriptions on how to remove tautog operculum at the CQFE website.

Tautog operculum preparation for age determination



Figure 2: The set-up for cleaning opercula.

Opercula that need to be processed are kept in the freezer. Remove them from the freezer to allow them to thaw. With the VWR[®] hot plate on the wet-lab dissection table, fill a 1500-ml beaker with tap water, set it on the hot plate and heat it to a temperature that is just below boiling (Figure 2). Remove the first operculum from its envelope while the water is warming. The operculum will most likely have frozen skin and cartilage matter still attached to it (Figure 3).

If the envelope is still intact and the data is readable, it can be used again. **If not (most likely), copy the data to a new**

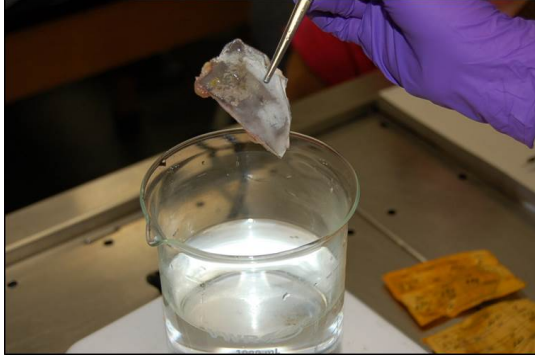


Figure 3: Boiling frozen operculum

envelope and discard the old one. Begin "boiling" the operculum; it should take about 5-6 minutes to loosen the attached material. Using the 8-inch forceps, remove the operculum from the beaker; take off the skin and cartilage using the 4-inch, broad-tipped forceps (Figure 4).

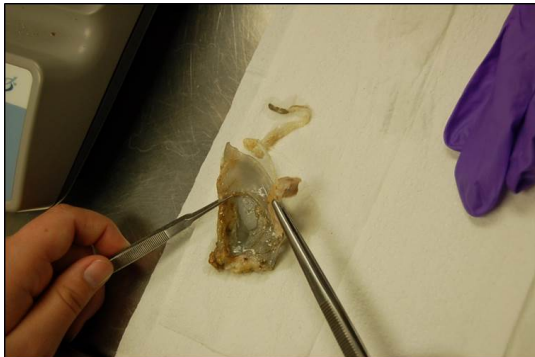


Figure 4: Removing skin and connective tissue from operculum.

If some of the matter will not come off, a longer time of boiling may be required. After finishing cleaning, dry the clean operculum and store in its data-matching, legible, and intact envelope. Record the Age and Growth Identification Number (AGID) on the bottom-right corner of the envelope using a red ink pen. The envelopes are in order by AGID and bound with rubber bands. Put the envelopes with the clean opercula in a cardboard storage box. Usually use one rubber band for 5 ~ 10 envelopes and one box for 50 ~ 75 en-

velopes depending on the size of each operculum.

Figure 5 shows a clean operculum with 7 annuli numbered. Historic markers are recorded in this growth like reproduction checks and annuli. Annuli represent the speeding up and slowing down of growth in response to changing seasons; a translucent band corresponds to faster growth, i.e., warmer months, and an opaque band corresponds to slow growth, i.e., winter months. An opaque band is counted as one annulus, and this fish was 7 years old.



Figure 5: Clean operculum with 7 annuli numbered

Photographs

James Davies, Karen Underkoffler, and Christina Morgan.

Prepared by

James Davies, William Persons, Christina Morgan, Hongsheng Liao, Cynthia Jones, Steve Bobko, Eric Robillard, Karen Underkoffler, Jessica Gilmore, and Allison Roberts.

Production date

October 7, 2015