INTEGRATED TAXONOMIC TECHNIQUES FOR MARINE BIODIVERSITY CONSERVATION

ICAR Sponsored SHORT COURSE

18-28 February 2025

Organized by
Indian Council of Agricultural Research
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

CMFRI Training Manual Series No.48/2025

Course Manual

ICAR Sponsored Short course on

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ICAR - Central Marine Fisheries Research Institute
(Indian Council of Agricultural Research)
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Extraction of Otoliths -Practical guidelines

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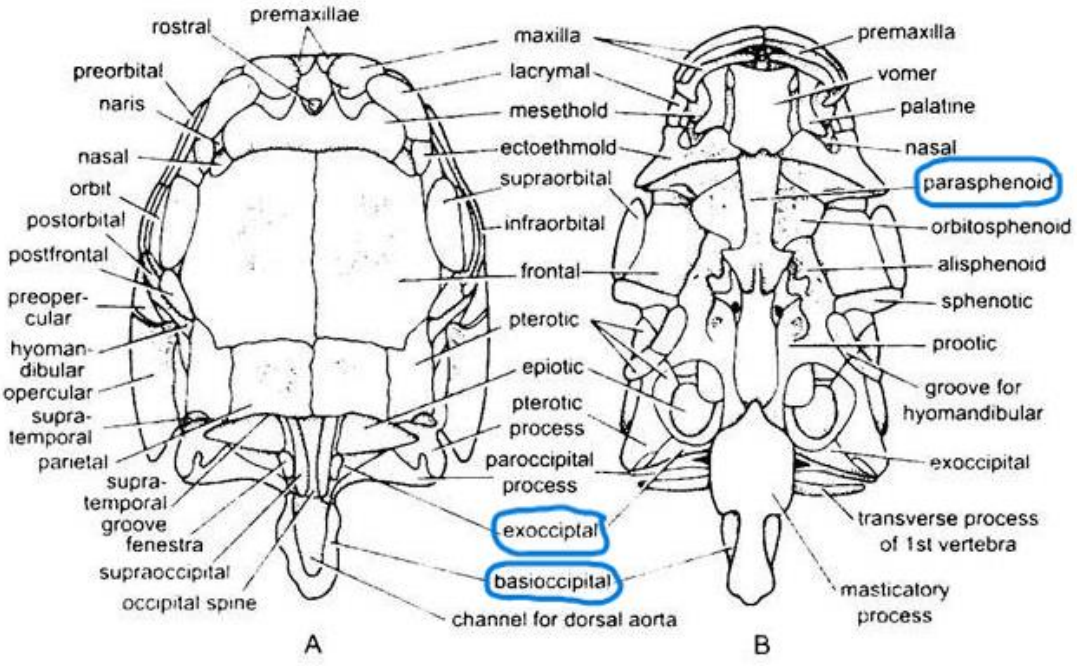
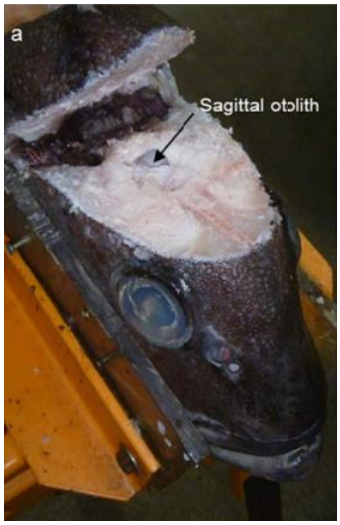
Otoliths are small calcium carbonate structures found in the inner ear of fish and are used for age determination. Place the fish on a clean dissecting tray with its dorsal (top) side facing upward. If large, secure the fish to prevent slipping. Feel for the bony part of the head just behind the eyes; this is where the otoliths are located. Use a sharp knife or scalpel to cut through the top of the skull. Make a small incision from just behind the eyes towards the middle of the head. Be careful not to damage the otoliths. Carefully lift or remove the skull bone to expose the brain. The otoliths are located beneath the brain in the inner ear chambers. Use forceps or tweezers to extract the otoliths gently. There are typically three pairs of otoliths: the sagittae (largest), lapilli, and asterisci. The sagittae otoliths are commonly used for aging studies. Rinse with clean water or ethanol to remove any tissue or debris. Airdry or store in a labeled vial for further analysis.

Sagittal otoliths are located within the otic capsule that forms the ventral, posterior portion of the cranium. The otic capsule is made up predominantly of the exoccipital, basioccipital and parasphenoid bones. Sagittal otoliths are most commonly extracted either 1) dorsally by opening the cranium using a sawing device, or 2) ventrally by removing the gills to expose the otic capsule which can be levered opened using bone cutters or scissors.

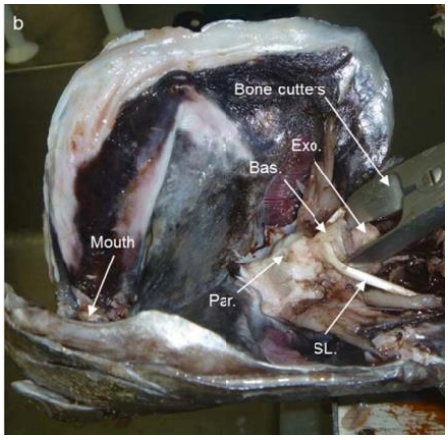


Skull. A- Dorsal view B- Ventral View

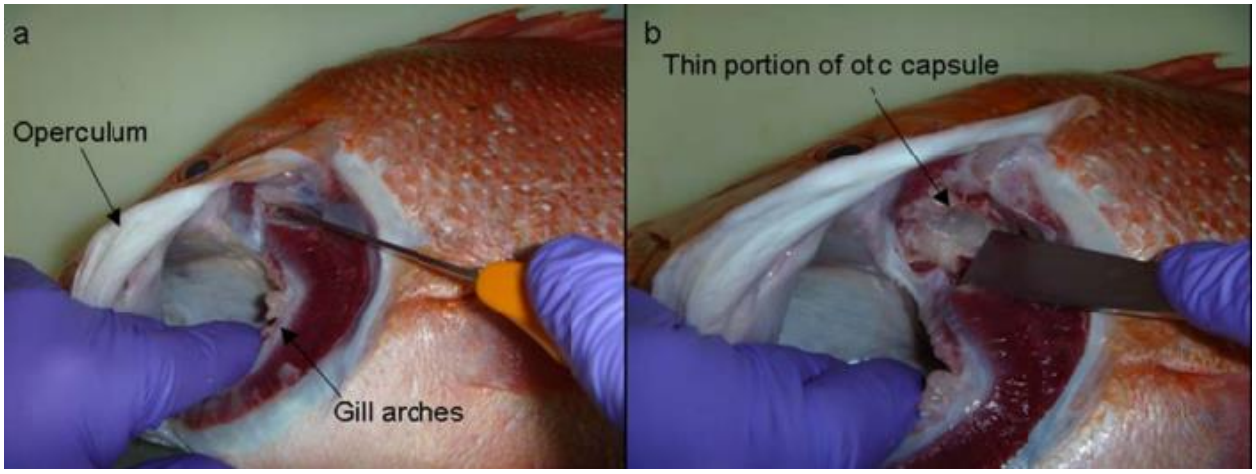


1) Dorsal extraction of sagittal otoliths through an incision that opens the top of the head at the base of the nape above the eyes.

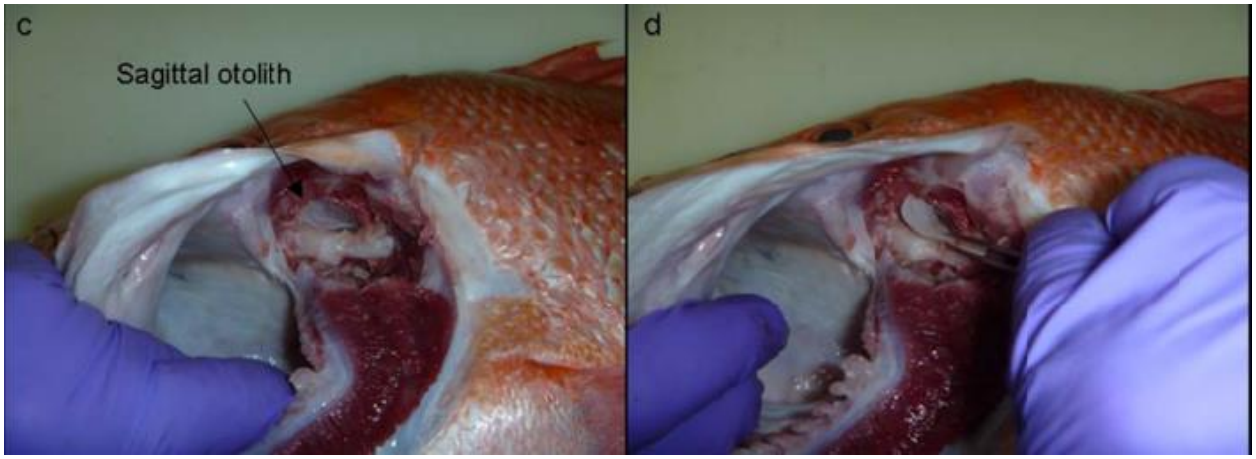
2) Ventral extraction of sagittal otoliths at the base of the cranium (anterior to left) through the otic capsule (comprised of the exoccipital (Exo.), basioccipital (Bas.) and parasphenoid (Par.) bones) by cutting the suture between the basioccipital and exoccipital bones at about a 45° angle using bone cutters and levering open. SL - subopercular ligament.



3) Lateral extraction of otoliths involving an initial incision at the dorsal junction of the gill arches and parasphenoid process under the operculum (b) using a chisel to shave off the thin lateral portion of the basioccipital bone of the otic capsule.



(c) the left sagittal otolith is visible within the otic capsule; and (d) otolith removed using forceps.



Reference:

Wakefield, C. B., Boddington, D. K., & Newman, S. J. (2016). Rapid lateral extraction of otoliths that maintains the integrity of fish product to improve access to catches and reduce potential sampling biases. The Open Fish Science Journal, 9(1).