

Study 1- Pharyngeal Teeth

Abstract

Morphological differences in the pharyngeal teeth of blacktail shiners (*Cyprinella venusta*) and weed shiners (*Netropis texanus*) were compared using scanning electron microscopy. It was determined that species could be identified using the morphology of the pharyngeal teeth.

Introduction

The pharyngeal teeth are found in the pharynx (throat) directly posterior to the gills. They are composed of modified gill arches with ossified tooth-like structures. They vary in form from caniniform (sharp and piercing) to molariform (nodular). In addition to the buccal (outer) teeth they act as a second set of teeth used for grinding food before it is swallowed. The characteristic differences in the pharyngeal teeth are species specific. They vary in number, size, shape, placement, and orientation. The purpose of this experiment was to determine if the morphological differences between the pharyngeal teeth of weed shiners (*Netropis texanus*) and blacktail shiners (*Cyprinella venusta*) could be used to determine species identification; using specimens collected from the Big Thicket National Preserve while conducting the ATBI (All Taxa Biodiversity Inventory).

Results

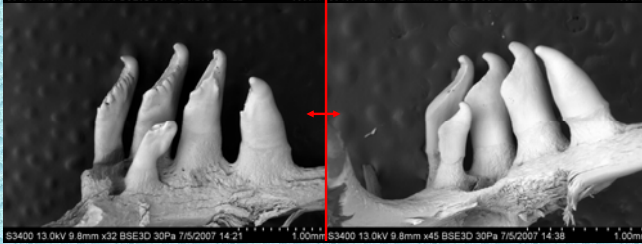
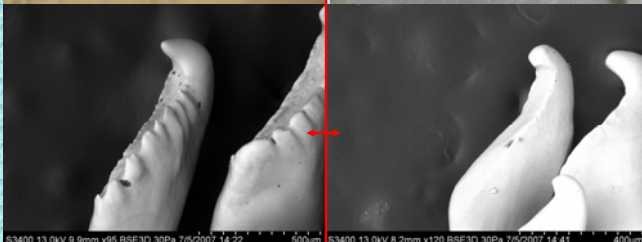
Blacktail Shiner

(95mm Total Length)



Weed Shiner

(86mm TL)



Pharyngeal teeth of the blacktail shiner had prominent cusps (grooves or serrations) on the grinding surfaces, whereas the weed shiner had smooth teeth (not serrated or grooved). Both specimens had a terminal hook present on all teeth examined.

Discussion

The pharyngeal teeth of the blacktail shiner had well-defined cusps. This may provide an advantage for mastication suggesting, blacktail shiners, which were more common at the collection site, may have an evolutionary advantage over the weed shiner. The pharyngeal teeth of the weed shiner were not cusped signifying less need for specialized carnivorous teeth implying a more diverse diet. Placement and size of the teeth were similar for both species.

SEM studies of Pharyngeal Teeth and Gill Rakers in Fish

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Methods

Collection sites: Neches River, Village Creek
GPS: NR:(15R 0394809 3358779) VC:(15R 0378517 3363570)
Dates of collection: June 11, 2007 – June 15, 2007

Specimens were collected by seining and immediately placed in a formalin fixative. After fixing for up to 14 days specimens were transferred to water, then placed in a 40% isopropyl alcohol solution for permanent storage. Under a dissecting microscope, the pharyngeal teeth or gill arches were removed by lifting the operculum and using curved fine forceps to gently break and remove the pharyngeal jaw or gill arch. The Hitachi TM-1000 and Hitachi S-3400N Scanning electron microscopes were used to examine specimens.

Study 2- Gill Rakers

Abstract

The gill rakers of similar species were compared using scanning electron microscopy. Species compared were:

Bantam Sunfish (*Lepomis symmetricus*) v. Bluegill Sunfish (*Lepomis macrochirus*)

Golden Topminnow (*Fundulus chrysotus*) v. Blackstripe Topminnow (*Fundulus notatus*)

Gizzard Shad (*Dorosoma cepedianum*) was used for an outside comparison. It was determined that the microscopic structure of the gill rakers were similar but not identical for species filling comparable niches. These differences can be used to classify subject diet.

Introduction

The gill rakers are a series of bony or cartilaginous protrusions which point forward and inward from the gill arches. These rakers aid in feeding by retaining small prey. They also protect and clean the gill filaments. Their shape and quantity are a good indication of the diet of the fish. Fish which eat large prey such as mollusks or other fish have short, widely spaced gill rakers. Fish which eat small prey have numerous elongated, slender gill rakers, and this type of gill raker prevents the prey from escaping between the gills. Species which feed on plankton (suspension feeders) have the longest, thinnest and most numerous gill rakers, with some species having over 150 on the lower arch alone. (McGrouther, 2004) The purpose of this experiment was to compare the morphology of the gill rakers of bantam sunfish (*Lepomis symmetricus*) v. bluegill sunfish (*Lepomis macrochirus*); golden topminnow (*Fundulus chrysotus*) v. blackstripe topminnow (*Fundulus notatus*); and gizzard shad (*Dorosoma cepedianum*).

Discussion

The golden topminnow and blackstripe topminnow had analogous raker shapes, although the rakers of the golden topminnow were less organized, probably due to the diet of the fish.

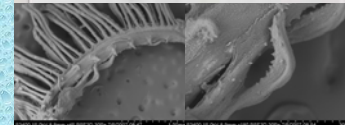
The bantam sunfish and bluegill sunfish had many similarities in raker size and position. The bluegill had more club-like rakers, the bantam had rakers that were more elongated and tapered, again related to specialization while feeding.

Gizzard shad, being suspension feeders, possess a line of thick brush-like strands that cover the gill openings to keep small food from escaping. This raker is a highly specialized structure when compared to the rakers in the other species studied.

Results

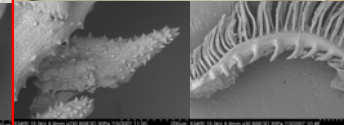
Golden Topminnow

(67mm TL)



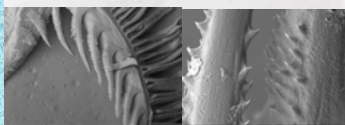
Blackstripe Topminnow

(95mm TL);



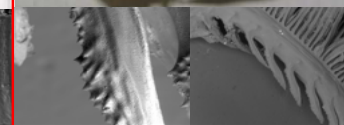
Bantam Sunfish

(70mm TL)



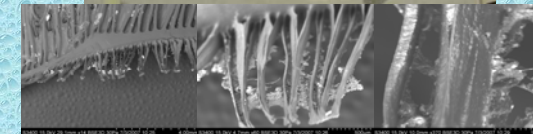
Bluegill Sunfish

(215mm TL)



Gizzard Shad

(165mm TL)



The gill rakers of the golden topminnow and blackstripe topminnow showed small variations; the golden topminnow had more disorganized gill rakers. Rakers of both species were similar in size and shape and had spikes on one side.

The bantam sunfish had smoother tapered and more elongated rakers whereas the rakers of the bluegill were more club-like. Rakers of both species exhibited spikes on only one side.

The gizzard shad had numerous, tightly packed, comb-like rakers; no spikes were observed.

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