ONTOGENETIC TROPHIC VARIATION OF SILVER PERCH, *BAIRDIELLA CHRYSOURA*, FROM A NORTH-CENTRAL GULF OF MEXICO ESTUARY

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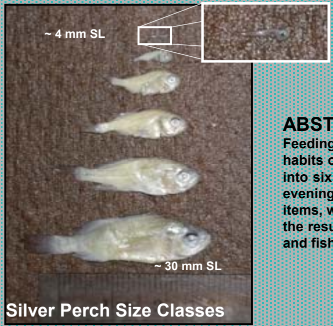

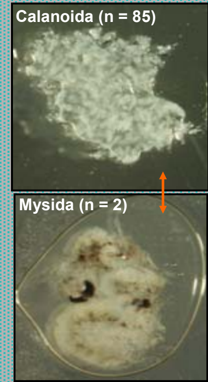

Squashed prey items of = volume

ABSTRACT

Feeding habits of large juvenile and adult silver perch (*Bairdiella chrysoura*) has been extensively researched, but very little information is available concerning feeding in silver perch ≤ 30 mm SL. Ontogenetic changes in feeding habits of silver perch (2.5 – 30.0 mm SL) were examined by comparing the primary food item(s) to the individual's length and mouth gape. These fish were collected in the Mississippi Sound in July of 2003, and then were separated into six 5 mm size classes (n = 15 / size class) for trophic comparisons. Silver perch displayed diel feeding periodicity with the most active feeding occurring from midnight until noon, and then tapering off into the afternoon and evening hours. As silver perch length increased, the number of prey taxa found in their stomachs increased along with the volume and size of the prey items. Calanoid copepods and mysid shrimp were the two most dominant prey items, with mysids becoming more prominent as predator size increased. Increasing predator body length was linearly related to mouth gape (MW = 0.097 [SL] + 0.245; $r2$ = 0.891; p < 0.001; n = 85). These patterns were supported by the results of a UPGMA cluster analysis based on the Bray-Curtis similarity index. Silver perch ≤ 10.0 mm SL primarily preyed upon calanoid copepods, shifting toward mysid shrimp in larger size classes as mouth gape increased and fish became more robust.

INTRODUCTION

The silver perch (*Bairdiella chrysoura*) is one of the top five most abundant species of sciaenids in estuaries along the Gulf of Mexico (GOM) and the Atlantic coast of the United States (Chao and Musick, 1977; Gelwick *et al*., 2001). Previous research on older juveniles and adults has shown silver perch are primarily carnivorous, feeding on benthic invertebrates and small fishes (Carr and Adams, 1973; Chao and Musick, 1977), however trophic variation in earlier life stages has not been characterized.

Silver perch are an essential component of estuarine systems in terms of abundance, residence, and trophic interactions. The specific objectives of this study were to: 1) examine ontogenetic changes in feeding habits of larval and young juvenile (≤ 30 mm SL) fish; and 2) relate feeding to mouth morphology.

METHODS

- We collected silver perch (2.5 to 30 mm SL) in the Mississippi Sound using a plankton net or beam plankton trawl (BPL).
- Fish were preserved (95 % EtOH), weighed (g) and measured (mm BL or SL, TL), and separated into six 5 mm SL size classes (n = 15 from each size class except the largest which contained 10).
- Stomach contents were removed and identified to lowest taxon using a dissecting microscope.
- The prey items were counted and frequency of occurrence determined.
- We measured the volume of prey items using a squash plate of know depth and then determining the area of the squashed prey item. This was accomplished by capturing the image and transporting it to MetaVue™ 5.0 to trace the area.
- Prey body width (nearest 0.01 mm) for the most common prey, and mouth gape (± 0.05 mm) of the silver perch were measured.
- Ontogenetic changes in diets and prey width were examined by comparing the primary food item(s) to the individual's length and mouth gape.
- We also measured stomach fullness over a 24 hr period as a ratio of stomach weight to body weight to estimate the most active period of feeding.

RESULTS

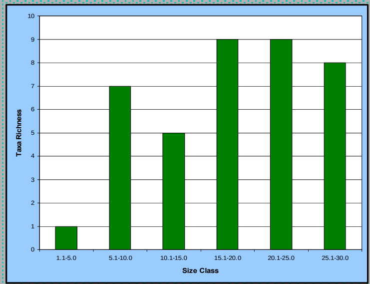

Figure 1: Number of prey taxa per size class (SL mm)

Silver perch appeared to feed most actively at night through the morning (24:00 – 12:00). A cumulative prey curve reached an asymptote in each of the six size classes between 4 and 12 individuals, indicating that the sample size was sufficient to describe the diet. Generally, as the length of the fish increased, the number of prey taxa found in their stomachs increased (Figure 1).

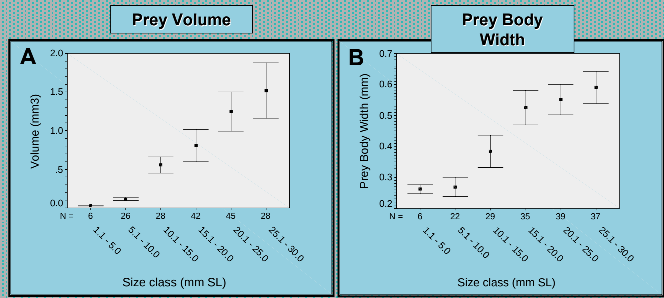

Figure 2: A) Prey volume (mm3) per size class (mm SL), and B) prey body width (mm) per size class (mm SL).

The diet of the fish not only changed in the suite of prey items consumed as the fish increased in size, they also changed in respect to the volume and the size of the prey item (Figure 2A). Prey body width generally increased with increasing predator length (ANOVA: F5,162 = 5.437, p < 0.001); prey body width in size class 3 was significantly different from any other size class (Figure 2B).

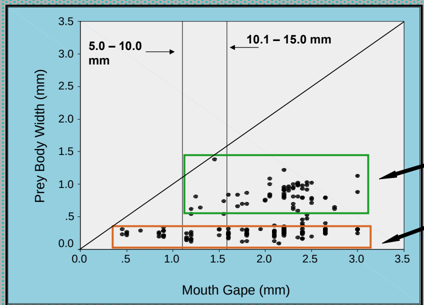

Figure 3: Prey body width (mm) in relation to predator mouth gape (mm) with 1:1 line. Also displayed is the mean mouth gape for size class 2 (1.10 mm) and size class 3 (1.58 mm) silver perch

Increasing predator body length was linearly related to mouth gape (MW = 0.097 [SL] + 0.245; $r2$ = 0.891; p < 0.001; N = 85), which enabled larger (greater body width) prey items to be eaten (Figure 3). The majority of the prey body widths < 0.4 mm were copepods while mysids were > 0.6 mm (Figure 3). The mean mouth gape for size classes 2 and 3 were 1.10 and 1.58 mm, respectively (Figure 3). This coincides with the prey shift from only copepods (size class 1) to mysid shrimp (≥ size class 2) as a major portion of the diet.

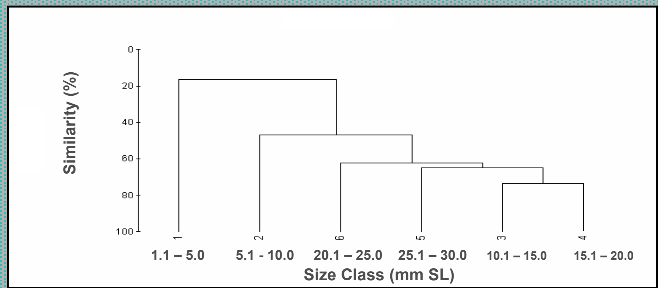

Figure 4: Percent similarity (Bray-Curtis) dendrogram based on UPGMA cluster analysis comparing prey volume (mm3) to size class (mm SL)

The Bray-Curtis coefficient (UPGMA cluster analysis; Figure 4) indicated size classes 3 and 4 were most similar in relation to percent volume of prey items (73.74 %); size class 5 ranked next in similarity (65.08 %) followed by 6 (62.34 %) and 2 (46.89 %) with size class 1 (16.23 %) being least similar. There appears to be an ontogenetic feeding shift around 10 mm SL when comparing the results of the cluster analysis and prey body width.

DISCUSSION AND CONCLUSIONS

Silver perch in the Mississippi Sound displayed diel feeding periodicity where they were most actively feeding at night and into the morning hours possibly following diel planktonic migrations (Steen, 1981; Brooks, 1985).

An ontogenetic shift appears to occur in the diet of silver perch around 10 mm SL with a shift from a post larval feeding to a stage of juvenile feeding. This ontogenetic shift is evident where the mean size of the mouth gape increases between size classes 5.1 – 10.0 mm SL and 10.1 – 15.0 mm SL, and mysids begin to appear in the diet. A distinct dietary shift in silver perch from copepods and few mysids to a diet of mysids, caridean shrimp and penaeid shrimp occurs around 50 mm SL (Carr and Adams,1973; Brooks, 1985). Another dietary shift occurs around 70 mm SL, with fish becoming an important component (Carr and Adams, 1973; Chao and Musick, 1977). Because we only examined individuals up to 30 mm SL, these ontogenetic dietary shifts had not yet occurred. However, the increasing importance of mysids in the diet of silver perch > 15.0 mm SL precedes this ontogenetic shift.

In conclusion, we have found young juveniles of silver perch to display diel feeding periodicity, and to feed primarily on copepods with an ontogenetic shift toward mysid shrimp.

ACKNOWLEGEMENTS

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