

Groundwater Spring and Habitat influence on Fish Communities in the Buck Creek System, KY

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Introduction

A species of Darter known as the Buck Darter (*Etheostoma nebra*) was once thought to be a population of Striped Darters (*Etheostoma virgatum*) until 2015 when it was described as a different species based on morphological, geographic, and genetic differences. Historical records have shown that the range of the Buck Darter, which used to be found all over the Buck Creek System, has significantly shrunk. It is now only found in two small tributaries: Big Spring Branch and Stewart Branch¹. The locations that the Buck Darter is currently found in are known to have a large number of streams in their watershed areas: Big Spring Branch and Stewart Branch. It is not yet known what caused the Buck Darter to decline or if any characteristics of the streams they remain in have allowed the Buck Darter to survive.



Photo: male Buck Darter (*Etheostoma nebra*) breeding colors

The focus of this study was to understand the streams within the Buck Creek system and how similar the historical and current locations of the Buck Darter are. We examined variables from the habitat, hydrology, land use, and fish communities.

Methods

The community data was collected using the plot sampling method described by Compton and Taylor in 2013. Each reach that was sampled was 120 meters long and was separated into twelve plots. Each plot was then separated into three subplots that measured 2x5 meters with a 5 meter buffer between each plot. Only one of the subplots was sampled for each plot, and random number generator was used to determine which of the subplots would be sampled. The subplots were sampled using a backpack electroshocker to stun the fish and allow them to be captured and processed.²

The habitat data was collected for each subplot sampled. Flow rate, depth, and substrate type were taken at the four corners and the center of each subplot. Canopy was determined using a densiometer at the center of each subplot. The largest particle, presence of large woody debris, and maximum depth were also noted for each subplot, as was the wetted with which was measured at the top of the subplot.

Catchment areas and land use composition of those catchment areas were determined using ArcMap.

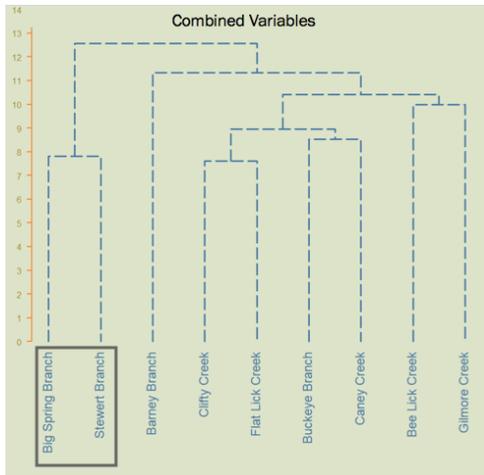
Results

A hierarchical cluster analysis was performed on the streams using all the variables that were collected for habitat, hydrology, land use, and fish communities. This produced a dendrogram that

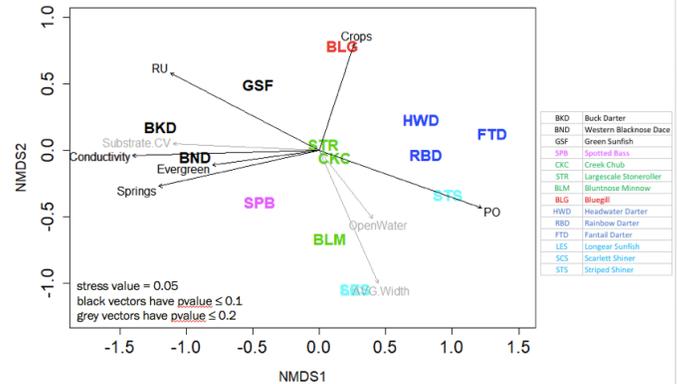
¹ Near and Thomas 2015

² Compton and Taylor 2012

sorts the streams based on how similar they are. The closer together the streams appear on the dendrogram the more similar they are and the further up they split off the more dissimilar they are. Stewart Branch and Big Spring Branch were determined to be most similar to each other and because the split off from the other streams so high up, they were determined to be very dissimilar to the historical sites.



An ordination with environmental fitting was also performed to indicate which variables were associated with which fish. The darker arrows indicate more statistically significant associations than the lighter ones. We can see that conductivity, RU (number of runs), number of springs, and proportion of evergreen forest in watershed are strongly associated with the Buck Darter (abbreviated BKD). Coefficient of variation in substrate (substrate.CV) had a weaker association with the buck darter. The placement of the buck darter away from the other darters (in dark blue) on the ordination suggests that they do not associate with one another.



Conclusions

The main conclusion that can be drawn is that there has been a nonrandom decay of the range of the Buck Darter. Something about those two streams has allowed them to remain there. The ordination suggests that conductivity and the number of springs could be factors in the survival of the species. The data also suggests that because the Buck Darter does not associate with any other darter species, they may have been out competed in their historical locations. More research is needed to investigate these associations and how they may affect the Buck Darter and its range.

References

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