

Infection Rate of *Dactylogyrus* Parasites on *Etheostoma duryi* and *Etheostoma zonale*

Abstract

This project was an analysis of the infection rate of monogenean trematode parasites of the genus *Dactylogyrus* on the Black Darter (*Etheostoma duryi*) and the Banded Darter (*Etheostoma zonale*). Samples of each species of fish were collected from the Flint River during June and July, and their gill arches were removed and examined under a dissecting microscope. The number of parasites found on each fish was recorded, and slides of the found parasites were prepared for species identification and archiving. The parasite load observed on both of these species was relatively low compared to that of other less common species of darter in the Flint River.

Introduction

Darters

Darters are fish in the family Percidae and are known to be especially diverse in the North Alabama region due to geologic stability, habitat diversity, and climatic stability. Some darter populations reside in highly specialized locations¹. The Flint River system in North Alabama is home to darters within the genus *Etheostoma*, including the black darter and the banded darter. These two species are among the more plentiful darters found in the Flint River.



Figure 1: Black darter (*Etheostoma duryi*)
Cressler, A. April 28, 2010.



Figure 2: Banded Darter (*Etheostoma zonale*)
NANFA database. Accessed 06 September, 2011.

Dactylogyrus

Darters are hosts for a monogenean class of parasitic trematodes of the genus *Dactylogyrus* (family Dactylogyridae)². *Dactylogyrus* are flatworms that have elongated bodies equipped with four eyes on the head and a pair of dorsal anchors, as well as 14 marginal hooks which they use to latch onto their host. They are typically found on the gill arches of the darters and complete their entire life cycle on a single host.

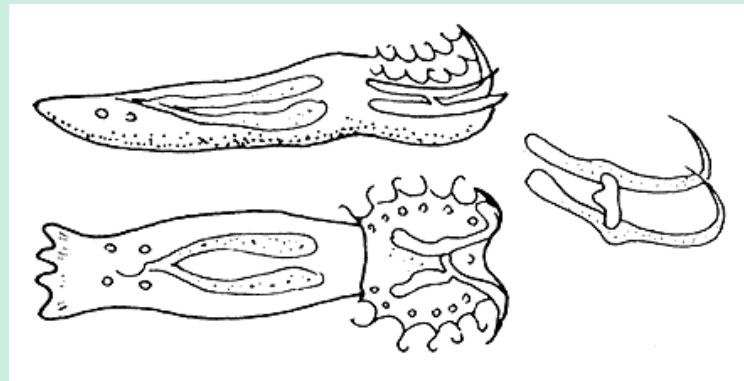


Figure 3: Illustration of *Dactylogyrus* parasite. On the right is a drawing of the main anchor hooks found on the haptor.

Food and Agriculture Organization. Fisheries and Aquaculture Department.
Accessed 06 September, 2011.

Methods

Collection of fish

Samples of *E. duryi* and *E. zonale* were collected from a Flint River site in Madison County, AL. A seine net was used to capture the fish, which were immediately euthanized using MS-222 and then stored in a formalin solution in individual tubes. Samples collected in June were immediately stored in a 10% formalin solution, while samples collected in July were first stored in a 1% solution, then after examination were transferred to a 10% solution for permanent storage. The change in procedure was made to prevent any negative impact on the parasites from the formaldehyde.

Examination of Fish and Parasites

The length, mass, and gender of each fish were recorded following collection. The gill arches of each fish were removed using fine forceps and stained in a 0.5% acetocarmine solution in individual tubes for 24-48 hours.

After the gills were stained, each set of arches was examined under a dissecting microscope at x50 magnification for the presence of Dactylogyrus. The parasites were identified and counted, and the number of parasites found on each fish was recorded.

Preservation of Parasites

Parasites found on the fish were fixed in a 10% solution of alcohol-formalin-acetic acid (AFA) for one hour, then stored in 70% ethanol until ready to be mounted onto slides. The parasites were mounted onto slides using double coverslips and Kleermount solution. The slides were allowed to air dry for at least 24 hours before they were examined under a microscope.

Kara Million and Dr. Bruce Stallsmith

Department of Biological Sciences, University of Alabama in Huntsville.

Results

Based on the samples collected, both the black darters and the banded darters were found to have little to no Dactylogyrus infections, although microscope slides of a few found parasites were prepared.

No correlation was found between the infection rate and the length, mass, or gender of the fish.

Etheostoma duryi (Black Darter) June 2011

# Total Fish collected	27
# Total parasites found	3
Average parasite load per fish	~0.11

Etheostoma duryi (Black Darter) July 2011

# Total Fish collected	36
# Total parasites found	7
Average parasite load per fish	~0.19

Etheostoma zonale (Banded Darter) June 2011

# Total Fish collected	51
# Total parasites found	9
Average parasite load per fish	~0.18

Figure 4: Data obtained from samples of fish examined in June and July. Very few parasites, if any, were found on the gills of the black darters and the banded darters.

The results for these two species of darter differ markedly from those previously obtained for other darter species in the Flint River that are less plentiful, such as *Etheostoma kennicottii* (stripetail darter). Other species of darter have been known to have a significantly greater parasite load than that found for black and banded darters. Further research is required to account for this difference.

It should be noted that data previously gathered for the Tennessee snubnose darter (*Etheostoma simoterum*, a species similar to black and banded darters) indicates a higher parasite infection rate during spring months, at the peak of the darters' breeding season. The data from this project was limited to the post-spawning months, which may partially account for a decline in the infection rate.

UAHuntsville Confocal Microscope

Images of the found parasites were obtained using the UAHuntsville confocal microscope. This powerful microscope is capable of obtaining high-resolution images which are useful for capturing details for species identification and description.

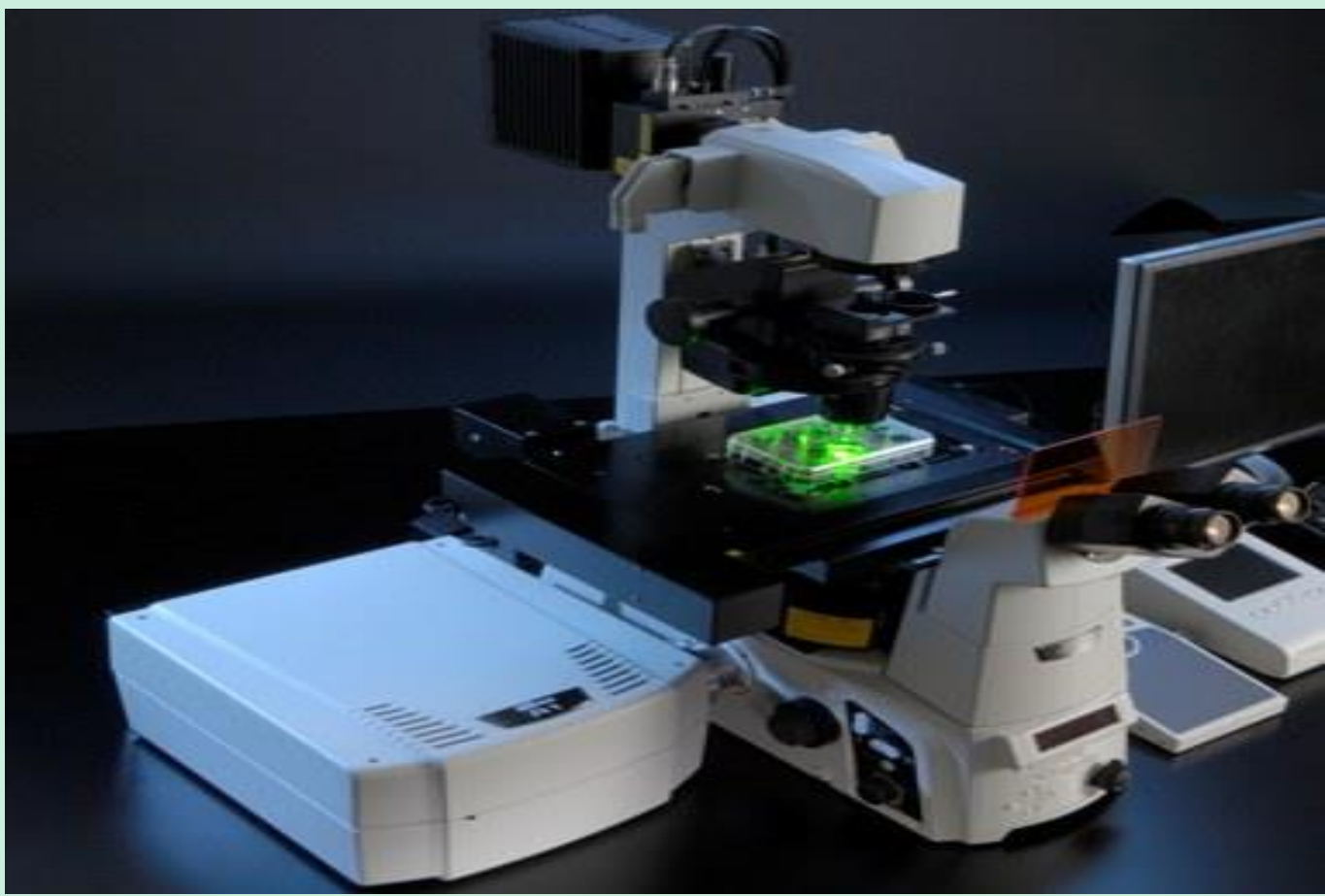


Figure 5: A confocal microscope.

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Dactylogyrus Image

The image below was obtained using the UAHuntsville confocal microscope at 40x magnification. The parasite was removed from one of the banded darter gill samples. The basic body shape is clearly visible, as well as the four eyes and the haptor bearing the hooks. Images such as this one will be useful in the identification of the *Dactylogyrus* species. Ideally, further work with the confocal microscope will provide detailed images of the parasites' hook structures and reproductive organs.



Figure 6: Image of *Dactylogyrus* parasite obtained from a banded darter.

Conclusions and Future Research

Both black and banded darters examined in this project had a very low parasite load in comparison to other darter species. This has consistently been shown to be the case as well with a similar darter species (*E. simoterum*) in other projects by Robert Hanson. Future research would include the collection and examination of black and banded darter gills during other times of the year to determine the effect of the fishes' reproductive seasons on the parasite infection rate. If parasite infection rate is consistently low at all times of the year, further studies can be conducted to determine the possible factors which could be preventing heavy parasite loads from developing on these darter species.

A similar study has been initiated on *Brachyrhaphis episcopi*, a livebearing fish species native to Panama. As no work has previously been done on this fish concerning parasite infection, this project may involve the description of new species of *Dactylogyrus* as well as determining the effects of the environment and the reproductive patterns of the fish on the parasite loads.

References

1. Mettee, M.F. "Perches and Darters". *Fishes of Alabama and the Mobile Basin*. Birmingham, AL: Oxmoor House, 1996. p. 562.
2. Hoffman, G.L. "Monogenea". *Parasites of North American Freshwater Fishes*. 2nd ed. London: Cornell University Press, 1999. p. 95, 124.