Decreased Distribution of Blackside Dace (*Phoxinus cumberlandensis*) in the Middle Fork Beaver Creek Drainage, Daniel Boone National Forest, Kentucky

United States Department of Agriculture Forest Service
Center for Aquatic Technology Transfer
Virginia Polytechnic Institute and State University
1650 Ramble Road
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Craig N. Roghair
Fisheries Biologist

J. Keith Whalen
Daniel R. Nuckols
Fisheries Technicians

and

C. Andrew Dolloff
Project Leader
Coldwater Fisheries Research Unit
Southern Research Station

Prepared By:
Craig N. Roghair, J. Keith Whalen, and Daniel R. Nuckols

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Introduction

In July 1995, at the request of the Daniel Boone National Forest, the U. S. Forest Service Center for Aquatic Technology Transfer (CATT) performed a stream habitat and fish survey on Middle Fork Beaver Creek (Leftwich et al. 1995). Middle Fork Beaver Creek was known to contain a population of the federally threatened blackside dace (*Phoxinus cumberlandensis*). The purpose of the survey was to 1) determine the distribution and abundance of blackside dace and rainbow trout (*Oncorhynchus mykiss*) in Middle Fork Beaver Creek, 2) search for evidence of trout predation on blackside dace, and 3) provide data that could be used with an existing U. S. Forest Service habitat database. We used basinwide visual estimation technique (BVET) (Hankin and Reeves 1985, Dolloff et al. 1993) habitat and fish surveys to address the study questions. The surveys demonstrated that blackside dace were fairly abundant and widely distributed within the study area and that rainbow trout were not a threat to the blackside dace population. The BVET fish survey showed promise for sampling threatened or endangered fish, producing statistically reliable results with minimum risk of fish mortality.

In August 2001, the CATT returned to Middle Fork Beaver Creek to repeat the 1995 BVET fish survey. The purpose of the survey was to 1) determine the distribution and abundance of blackside dace and compare to 1995 results, and 2) further investigate the utility of the BVET fish survey for inventorying threatened and endangered species.

Study Site

Middle Fork Beaver Creek (Figure 1) is a fourth order, clear, low gradient (<0.3%), warm water tributary of the Cumberland River characterized by alternating pool-riffle morphology and sand-rubble substrate (U. S. Forest Service, unpublished data). The majority of the Beaver Creek drainage is within the boundaries of the Beaver Creek Wilderness Area. In August 2001, we surveyed approximately 10.5 km of Middle Fork Beaver Creek on the Daniel Boone National Forest, McCreary County, Kentucky for blackside dace.

Methods

Fish species in Middle Fork Beaver Creek were classified and inventoried using two-stage visual estimation techniques. During the first stage, a diver counted the number of blackside dace and noted occurrence of other species in approximately every 5th pool and every 10th riffle in the stream. During the second stage, we attempted to calibrate the blackside dace counts by performing three-pass electrofishing depletions on approximately every 2nd pool and riffle visited by divers. We recorded the number of all species captured during each electrofishing pass. Calibrated diver counts may be used to estimate fish population size when there is a consistent relationship between dive counts and electrofishing estimates (Dolloff et al. 1993).

Results

During the first two days of the survey we performed diver counts on over 30 pools and 10 riffles, and electrofished 7 pools and 4 riffles on more than four kilometers of stream, but had no confirmed sightings of blackside dace. At that point we realized that we would not have enough paired diver/electrofishing samples to perform BVET population abundance estimates and abandoned further electrofishing efforts. We continued with the diver counts on Middle Fork Beaver Creek, and added Little Hurricaine Fork and Freeman Fork (Figure 1) to the diver survey to further investigate the distribution of blackside dace within the drainage.

In Middle Fork Beaver Creek we began to consistently encounter blackside dace approximately 0.5 km downstream of Cane Branch, although we also observed several blackside dace a single pool approximately 1.0 km upstream from Freeman Fork (Figure 1). In both Freeman Fork and Little Hurricane Fork divers observed blackside dace within 0.5 km of their respective confluences with Middle Fork Beaver Creek (Figure 1). Surveys on the tributaries were limited in length due to time constraints. Blackside dace were most frequently encountered in pools in all three streams. We encountered a total of 18 species in Middle Fork Beaver Creek (Table 1).

Discussion and Recommendations

In August 2001, we found blackside dace in about one-third of the total stream area that had been occupied in July 1995. This dramatic decrease in population distribution prevented us from using BVET techniques to estimate population abundance. We can only speculate on the cause of the population decrease. Leftwich et al. (1995) suggested that although blackside dace were relatively abundant in 1995, that a single catastrophic event could decimate the population. The Middle Fork Beaver Creek drainage is contained almost entirely within the Beaver Creek Wilderness Area, limiting the possibility of direct anthropogenic disturbance, however it is still susceptible to natural disturbances. Furthermore, fluctuations in blackside dace population abundance and distribution are not uncommon (Rakes et al. 1999, Vicki Bishop, pers. comm.)

It is possible that low flow conditions and associated rises in water temperature, related to a several year long drought in the southeastern U. S., may have contributed to the decrease in blackside dace abundance and distribution. Several warm water species that were not observed in Middle Fork Beaver Creek in 1995 were observed in 2001, and species that prefer cooler water temperatures, such as rainbow trout and blackside dace were either absent or their range was much reduced (Table 1). Divers noted that water in the tributaries, particularly in Freeman Fork, was much cooler than in Middle Fork Beaver Creek. These areas may be serving as important refuges for blackside dace until more favorable conditions return to Middle Fork Beaver Creek. It seems likely that the upstream reaches may be serving in a similar capacity.

Given the threatened status of the blackside dace, intensive monitoring of this situation is recommended. We suggest using protocols similar to the 1995 and 2001 BVET surveys. The results of annual monitoring of the Beaver Creek population can provide a reference for comparison with other blackside dace populations. Such monitoring could help distinguish between changes caused by management activities on National Forest lands and changes related to causes outside the direct control of the Forest Service.

Literature Cited

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Table 1. Species observed by divers or captured by snorkeling in Middle Fork Beaver Creek, DBNF, in July 1995 and August 2001.

Species	1995	2001
Blackside Dace (*Phoxinus cumberlandensis*)	x	x
Rainbow Trout (*Oncorhynchus mykiss*)	x	
Creek Chub (*Semotilus atromaculatus*)	x	x
Striped Darter (*Etheostoma virgatum*)	x	x
Rainbow Darter (*Etheostoma caeruleum*)	x	x
Arrow Darter (*Etheostoma sagitta*)	x	x
Least Brook Lamprey (*Lampetra aepyptra*)	x	x
Northern Hog Sucker (*Hypentelium nigricans*)	x	x
Rosefin Shiner (*Lythrurus ardens*)	x	x
Stonecat (*Noturus flavus*)	x	x
White Sucker (*Catostomus commersoni*)	x	x
Lepomis spp. (not identified)		x
Largemouth Bass (*Micropterus salmoides*)		x
Smallmouth Bass (*Micropterus dolomieui*)		x
Logperch (*Percina caprodes*)		x
Rockbass (*Ambloplites rupestris*)		x
Bluntnose Minnow (*Pimephales notatus*)		x
Stoneroller (*Campostoma anomalum*)		x
Notropis spp. (not identified)		x

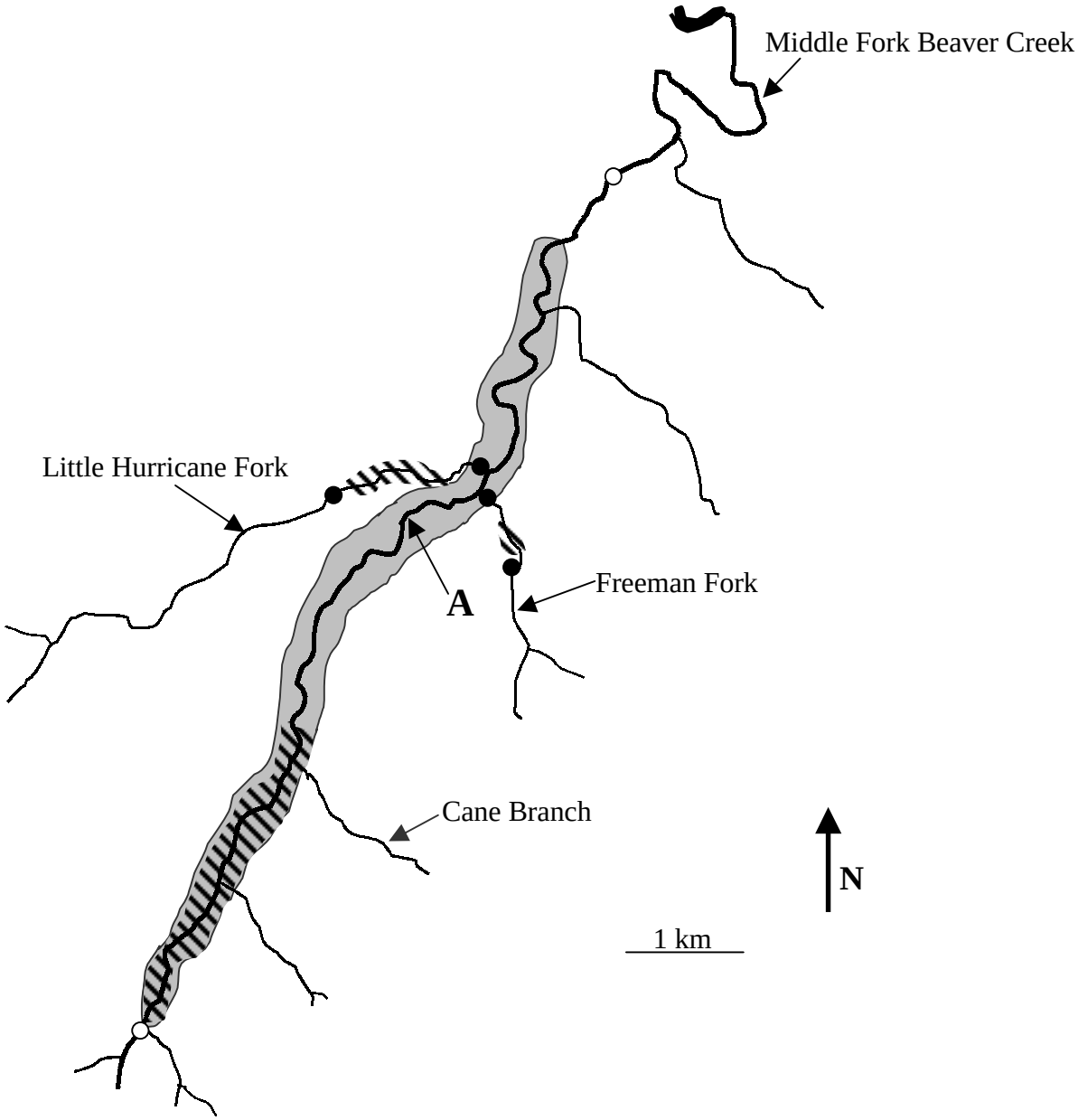

Figure 1. Location of blackside dace in the Middle Fork Beaver Creek drainage as observed by the CATT using diving and electrofishing techniques in 1995 (gray) and 2001 (patterned). Blackside dace were also observed in a single pool at point 'A' during the 2001 survey. Start and end points for Middle Fork Beaver Creek surveys in both 1995 and 2001 are indicated by open circles. Start and end points for tributary surveys performed in 2001 indicated by closed circles.