Effects of an Invasive Species Complex on a Native Fish in a South Eastern Idaho Stream

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Background

- Invasive species often lead to the loss of biodiversity, and combinations of invasive species may have synergistic effects on food webs.
- In stream-riparian ecosystems, such interactions may involve both aquatic and terrestrial species.
- Deep Creek, Idaho (Fig. 1) has been studied since the 1970s and has experienced an increase in invasive species, such as Russian Olive (Figs. 6, 7), and a subsequent loss of native species.
- Previous work indicates that invasive Russian Olive (and possibly New Zealand mud snails) are subsidizing invasive common carp, which may contribute to increases in nonnative perch and largemouth bass.
- Interactions among invasive species, and especially those with largemouth bass (Fig. 3), may be causing a reduction in the remnant speckled dace (Fig. 4).

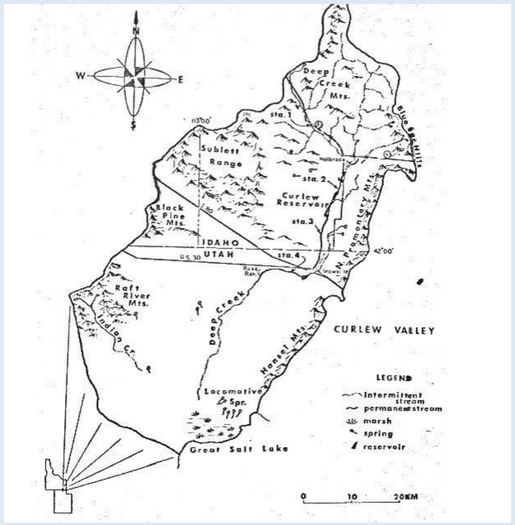

Figure 1. Deep Creek , Idaho, Courtesy of G. Wayne Minshall

Objectives

- The aim of this study was to determine the extent bass may be subsidized by other nonnative species and if that mediates their consumption of native speckled dace.

Figure 2. Diet contents of a largemouth bass

Figure 3. Largemouth Bass (*Micropterus salmoides*) collected from Deep Creek April 2017

Figure 4. Speckled dace (*Rhinichthys osculus)* collected from Deep Creek April 2017

Results

	No. of Bass Analyzed	Invasives in Gut Contents	Incidence of Piscivory
April	12	None	0
August	12	Bass/Perch	3 (1 Dace)
October	50	Bass/Perch	2 (1 Dace)
June	8	Carp	2 (0 Dace)

- There were no New Zealand mud snails or Russian olives identified in the diets of the 82 bass observed.
- We found that of the 82 bass gut contents analyzed, 7 contained fish.
- Of those 7, 3 were identified as either invasive bass or perch, 2 were identified as carp, and 2 were identified as native speckled dace.
- The catch data from October (the most extensive survey) indicated that for every 19 bass and perch observed, 1 dace was observed. Above a concrete irrigation diversion within the study reach, there is a source population composed of 100% dace.
- Dace composed less than 5% of the fish observed below the diversion while electrofishing, and composed 29% of the fish observed in the diets of largemouth bass.

Methods

- We collected fish via electrofishing (Fig. 5). The fish were euthanized and preserved in ethanol.
- The total length, fork length, and mass were recorded for each sample.
- The bass were dissected, and gut contents were analyzed (Fig. 2). The presence or absence of invasive species and the incidence of piscivory was recorded.

Figure 5. Electrofishing below the diversion, Deep Creek, April 2017

- In addition, we dissected bass previously collected by graduate students in the stream ecology lab from August 2013, and from October 2015.
- Fish collected from the stomach contents were identified as either bass/perch, carp, or dace.

Discussion

- The lack of New Zealand mud snails and Russian olive, may indicate that the largemouth bass in Deep Creek are not being subsidized by either of these invasives, though they may be eating nonnative perch.
- During time periods in which juvenile carp are present, they may be subsidizing nonnative bass.
- Currently, the concrete diversion may be serving as a barrier to predatory bass, maintaining a refuge, source population of dace above the diversion.
- Overall, these findings point to the possibility that interactions among multiple invasive species may be driving a loss of native fish biodiversity in intermountain streams like Deep Creek.

Figure 6. Deep Creek, Idaho circa 1970, Courtesy of G. Wayne Minshall
Figure 7. Deep Creek, Idaho circa 2008, showing colonization by invasive Russian Olive. Courtesy of Colden Baxter

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