Foraging patterns in terrestrial insectivores among terrestrial and aquatic food webs

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Introduction

Freshwater, and terrestrial ecosystems are a great model for understanding the effects of cross-ecosystem interactions because they are reciprocally linked (Wesner 2016). Water, vegetation, and emergent insects can attract terrestrial insectivores to streams. However, along the northern Wasatch Front in Utah, streams commonly support nonnative, insectivorous rainbow trout *Oncorhynchus mykiss*. Where nonnative trout are present, food to attract terrestrial insectivores (i.e., birds and spiders) may be reduced. Shown in Baxter et al. (2004) when non-native trout were introduced into streams, the emergent insects significantly decreased.

Aquatic insects are an essential part of an aquatic ecosystem including providing a large energy source to insectivores. However, the relationship between aquatic insects and terrestrial insectivores is often overlooked. Emerging insects from streams are important for survivorship and feeding patterns of insectivorous birds (Gray 1993). With there being less insect emergence, we assume there is less incentive for terrestrial insectivores to occupy these areas. Our objective was to look at foraging patterns in terrestrial insectivores among terrestrial and aquatic food webs with and without non-native species. We believed that the non-native species would cause a disruption in the food web and alter how terrestrial and aquatic ecosystems interact.

Methods

We compared two creeks, Beus which is troutless (Figure 3.) and Burch which has trout (Figure 4.) along the northern Wasatch Front, Utah. We sampled the same 20 m section each creek 15 times (29 June - 27 November 2021). The width and maximum depth on three standard cross sections were measured each time. We averaged width and depth for each visit over time.

During each visit, spider webs along the 20 m section were counted. Songbirds, specifically the black-capped chickadee *Poecile atricapillus, (*these were the only common insectivorous bird) were also observed and counted for 30 minutes during each visit. We calculated mean and standard deviation for these observations.

Results

As expected, mean abundance of songbirds was higher at Beus Creek which was troutless (Table 1). Spider web counts among both creeks were similar. Average depth among both creeks remained constant over the course of the study (Figure 1 & 2). Average width also showed a similar trend between both creeks. Seen in the graphs, Burch Creek is slightly bigger than Beus Creek.

Table 1. Birds & Spider Webs Observed

Beus Creek (troutless)		Burch Creek (with trout)	
Spider Webs	22 ± 21 SD	Spider Webs	24 ± 29 SD
Birds	3.0 ± 1.6 SD	Birds	1.0 ± 0.6 SD

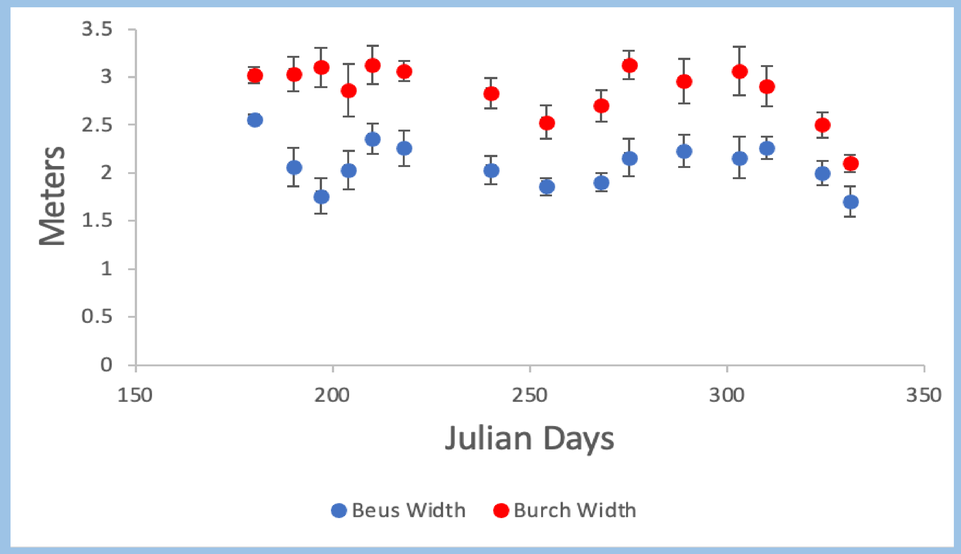

Figure 1. Mean (± SD) of Beus Creek and Burch Creek width versus time. The data points represent each visit (n = 15).

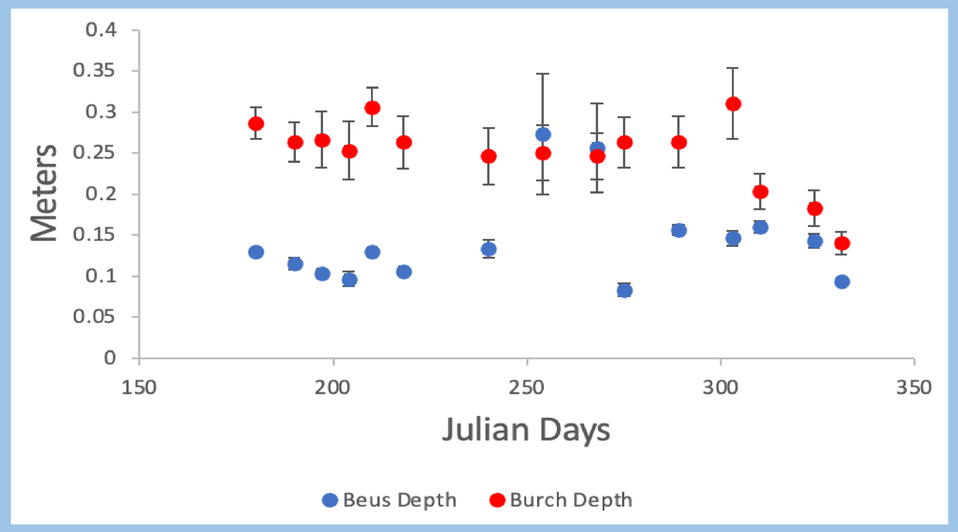

Figure 2. Mean (± SD) of Beus Creek and Burch Creek depth versus time. The data points represent each visit (n = 15).

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Discussion

Differing abundance of chickadees between creeks is consistent with the hypothesis that trout in Burch Creek reduced emergent insect food to attract birds. If so, this did not seem to affect spiders, which hypothetically might also reduce emergent insects available to chickadees. The consistency of the spider webs across both creeks was unexpected. Previous experiments like Baxter et al. (2004) show that when non-native trout are introduced, the spider population decreases. Further research focusing on interactions between emerging insects and spiders in these creeks could be conducted. This would provide a better understanding of the spider interaction with aquatic invertebrates along the Wasatch Front. More research to determine why chickadees prefer Beus Creek compared to Burch. In addition, with our hypothesis, maybe the smaller size of Beus Creek is impacting where chickadees reside.

Figure 3. Beus Creek

Figure 4. Burch Creek

References

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