

Seasonal Occurrence & Habitat Affiliations of Trichoptera at Mammoth Cave National Park

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Introduction

The order Trichoptera (caddisflies) is an ecologically-important, diverse group of insects that are widely distributed across North America (Morse 1993). The aquatic larvae of this order occupy a variety of lentic & lotic habitats, ecological niches, & are frequently used by regulatory agencies as water quality indicators. The ecological & practical importance of the terrestrial, short-lived adults (<1 month lifespan) is less well known, but adult Trichoptera do serve as prey for vertebrates such as bats & birds. (Floyd et al. 2012). These factors underscore the importance of diversity assessments for this group in eastern North America, where fragmentation & human impacts on forest habitats are central concerns to land managers & conservationists (Yahner 2000). Consequently, diversity assessments for this & other conspicuous insect taxa are a valuable tool for stewards in establishing diversity benchmarks for management plans (Summerville et al. 1999, Floyd et al. 2012). Bearing this in mind, we sought to identify seasonal patterns of adult Trichoptera, & to document specific habitat affiliations for the species assemblage at Mammoth Cave National Park (MCNP).

Methods

Our survey efforts took place across an array of upland habitats & along the Green River. Specimens were collected across multiple sites in a given night (≥ 50 m apart) using 10 W blacklight traps. As per recommendations by Yela & Holyoak (1997), survey nights were fair with temperatures ≥ 16 °C at sunset, no precipitation, & low wind. Blacklight traps were suspended 2.5 m prior to dusk & operated throughout the entire night. A dichlorvos-based 'pest strip' was used to subdue specimens. Specimens ≥ 10 mm were enumerated & identified to species level when possible. Specimens were identified using morphological characteristics & by making comparisons to existing data from the region (Floyd et al. 2012). Records were compiled, with forest habitats noted where specimens were collected. Delineation of habitats followed the classification system defined in MCNP's Fire Management Plan (NPS 2012). Surveyed habitats included: mixed coniferous-dominant / deciduous forest, mixed deciduous-dominant / coniferous forest, mesic floodplain deciduous forest, & mesic deciduous upland forest.

Results

We identified Trichoptera, across ≥ 45 species & 11 families (see Table 1 in Proceedings for species checklist). Most specimens were captured at mixed deciduous-dominant / coniferous sites ($n = 1,145$), followed by mixed coniferous-dominant / deciduous sites ($n = 632$). Fewer specimens were captured at mesic deciduous upland sites ($n = 262$) & mesic floodplain deciduous sites ($n = 114$). Mixed deciduous-dominant / coniferous sites had the highest number of unique records ($n = 13$), primarily for leptocerids & hydropsychids (6 & 3 spp., respectively). Mixed coniferous-dominant / deciduous sites and upland deciduous sites also had unique records (4 & 3 spp., respectively). In terms of richness, leptocerids & hydropsychids dominated our surveys (Figure 1). We found three families to be most abundant (Figure 2). Hydropsychidae & Leptoceridae dominated our records (93% of total); Phryganeids were less abundant (4% of total). Two genera were most abundant in our surveys (Figure 3). A low incidence of *Ceraclea* spp. (Leptoceridae) was generally observed, but 252 specimens were captured at a mixed deciduous-dominant / coniferous site on 29 June 2011. *Hydropsyche simulans* was the most commonly captured species during May & June (albeit at low levels) & peaked in abundance during August. In contrast, *Hydropsyche frisoni* was extremely abundant in multiple traps on 6 September 2010.

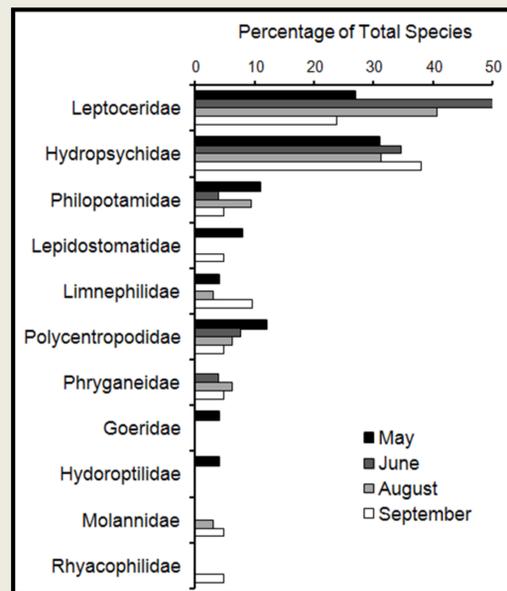
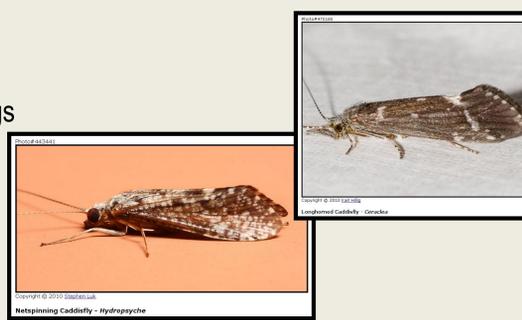


Figure 1. Percent composition of trichopteran families captured in blacklight traps from Mammoth Cave National Park, 2010-2011.

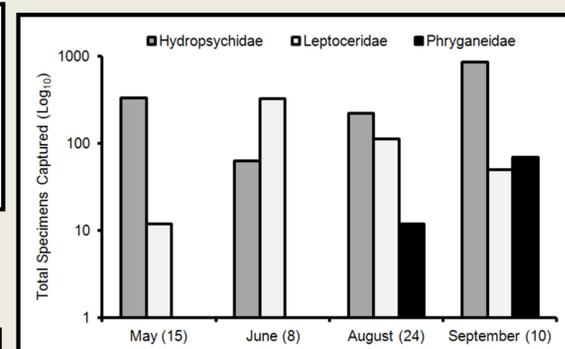


Figure 2. Abundance trends across months for major families of Trichoptera captured in blacklight traps at Mammoth Cave National Park, 2010-2011. Numbers of trap-nights are in parentheses.

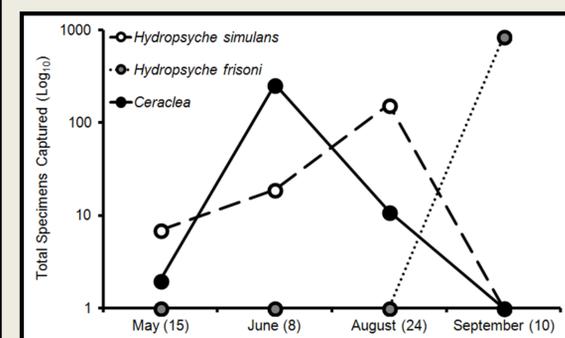


Figure 3. Abundance trends across months for major taxa of Trichoptera captured in blacklight traps at Mammoth Cave National Park, 2010-2011. Numbers of trap-nights are in parentheses.

Discussion

This study increases our understanding of what invertebrate fauna are specific to MCNP over the growing season & also demonstrates that adult Trichoptera may occupy terrestrial habitats located away from aquatic environments. The relative richness of Leptoceridae peaked during the middle of the growing season while richness of Hydropsychidae remained more constant across our surveys. Less common families were either limited in their capture period or, as in the case of Phryganeidae, were dramatically more abundant during certain

months (late summer to fall). Collectively, these data demonstrate shifts in the richness & abundance of taxa within the assemblage across a forest landscape. While adult Trichoptera are typically most abundant near aquatic habitats (Petersen et al. 2004), broad terrestrial movement of these & other semi-aquatic insects is an integral component of their ecology that merits further study (Briars & Gee 2004, Didham et al. 2012). In most cases our surveys were conducted away from permanent water sources & riparian habitats, where larvae are found & where sampling for terrestrial adults typically takes place (Floyd et al. 2012). In this way, our study has also provided a unique survey of terrestrial habitats at MCNP.