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EFFECTS OF EXPERIMENTAL MANIPULATIONS OF COARSE WOODY DEBRIS ON SORICIDS AND OTHER FAUNA (SRS 33-CA-97-029)

Final Project Report
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PROJECT OVERVIEW

Dr. Joshua Laerm at the Georgia Museum of Natural History initiated this project in 1997 (Laerm et al. 1997a). After preliminary sampling, the temporal scope of this effort was extended for three years (Laerm et al. 1997b). Following the death of Joshua Laerm, the project was directed by Elizabeth Reitz and, later, Timothy McCay. This work recently has been extended with a separate cooperative agreement (SRS 33-CA-11330138-197) through summer 2001 (McCay et al. 2000). A comprehensive final report will be submitted upon completion of the more recent agreement. The primary project objective has been to test whether removal of coarse woody debris affects abundance or species richness of shrews and herptiles. Data were further brought to bear on the topic of dispersal of moisture-dependent organisms through xeric environments.

SUMMARY OF METHODS

Forest-floor vertebrates have been sampled at 4 plots within each of three timber compartments (12 plots total). Plots within a compartment were randomly assigned to one of four experimental treatments: (1) removal of fallen CWD (dead stems ≥ 10 cm diameter), (2) removal of fallen and standing CWD, (3) addition of CWD by simulated catastrophic wind storm, and (4) control. The addition treatment had not been implemented during the study period and was considered another control. Also, because forest-floor animals are not likely to be affected by the removal of standing wood, all removal and down removal plots were combined in a single removal treatment in the present analyses.

Deceased

Animals were sampled using 52 pitfall traps (19-l plastic buckets) and 300 m drift fencing at each plot. Sampling was conducted during winter, fall, and summer for 14 days and during spring for 28 days. Captured animals were identified, marked, and released. Animals that died during capture have been inspected in the lab and accessioned into the collections of the Georgia Museum of Natural History. Population data were analyzed using repeated-measures analysis-of-variance with compartment and season used as blocking factors (von Ende 2001). Further details regarding methods can be found in McCay et al. (*in press*).

PROJECT FINDINGS

Insectivores. —Sampling through spring 2001 resulted in the capture of 396 individual shrews within three species: the southern short-tailed shrew (*Blarina carolinensis*), the least shrew (*Cryptotis parva)*, and the southeastern shrew (*Sorex longirostris*). We also caught star-nosed moles (*Condylura cristata*).

Blarina carolinensis was the most common shrew sampled, with 195 individuals captured (Figure 1). There was a strong seasonal trend in captures of this species, with more animals captured during winter and spring than summer and fall. During winter and spring there was a trend toward greater capture rates at control plots than removal plots. However, a relatively weak treatment effect ($P = 0.08$) precluded us from making any confident assertions about the effect of CWD removal on this species. *Sorex longirostris* was the second most common species at our plots, with 142 unique captures. There were seasonal and multi-year trends in capture rates of *Sorex*. Again, capture rates were greatest during winter and spring. Captures of *Sorex longirostris* also declined throughout the study period, perhaps due to the extended drought in the region. We found no evidence of an effect of CWD removal on this species ($P = 0.26$). *Cryptotis parva* was the least common shrew at the study area, with 59 unique captures. *Cryptotis* demonstrated a strong treatment effect ($P = 0.004$) with fewer captures at removal than control plots. So, of these three species, the least shrew appears to be the most sensitive to dead wood removal. These three shrews are thought to use dead wood for foraging, nesting, and cover (Loeb 1994). These data were the subject of an oral presentation given at the 81st Annual Meeting of the American Society of Mammalogists (McCay and Komoroski 2001; attached), and a manuscript based on these results is currently being prepared for submission to the Journal of Mammalogy.

During sampling, we captured two star-nosed moles. These semi-aquatic animals were apparently using rain events to allow dispersal through our relatively xeric plots (McCay et al. 1999; attached).

Herptiles. —Sampling through spring 2000 has yielded 37 species of amphibians and reptiles. Only two species demonstrated convincing differences between control and reference plots. The Carolina anole (*Anolis carolinensis*) was captured more frequently in removal ($\bar{X} = 0.25$ captures / day) than control plots ($\bar{X} = 0.17$ captures / day; $P = 0.025$). The red salamander (*Psuedotriton rubber*) also was captured more frequently at removal ($\bar{X} = 0.03$ captures / day) than control plots ($\bar{X} = 0.00$ captures / day; $P = 0.001$).

Both species exhibited differences contrary to our initial expectations. We expected that populations of salamanders and lizards might decrease at plots from which dead wood was removed, because many herptiles use dead wood for reproduction, thermoregulation, foraging, and protection from desiccation (Whiles and Grubaugh 1994). The increase in anoles may reflect a partial release from predation by shrews on eggs or adults. Anoles lay eggs in shallow depressions under litter (Smith 1946), where epigeal shrews, such as *Cryptotis parva*, forage. Shrew predation is not likely to affect populations of red salamanders, which lay eggs in seeps and other mesic areas (Petranka 1998). The location of suitable breeding locations near our study plots may affect the abundance of this species within the landscape. We found no difference in species richness of amphibians or reptiles ($P > 0.05$) between removal and control plots. These data are the subject of a manuscript currently being prepared for submission to Conservation Biology.

SUMMARY

Results to date suggest a subtle, but complex, response by the forest floor fauna to the removal of coarse woody debris. Shrews generally have responded negatively to wood removal; however, a convincing response has been detected only for the least shrew. Two of 37 herptiles have demonstrated convincing positive responses to dead wood removal, which may reflect a release from predation by other species. Slight responses suggest that other habitat components, such as small pieces of dead wood and low vegetation, might be more important than CWD to the forest-floor fauna. We look forward to a more comprehensive analysis of this topic upon completion of the agreement that extends this work (McCay et al. 2000).

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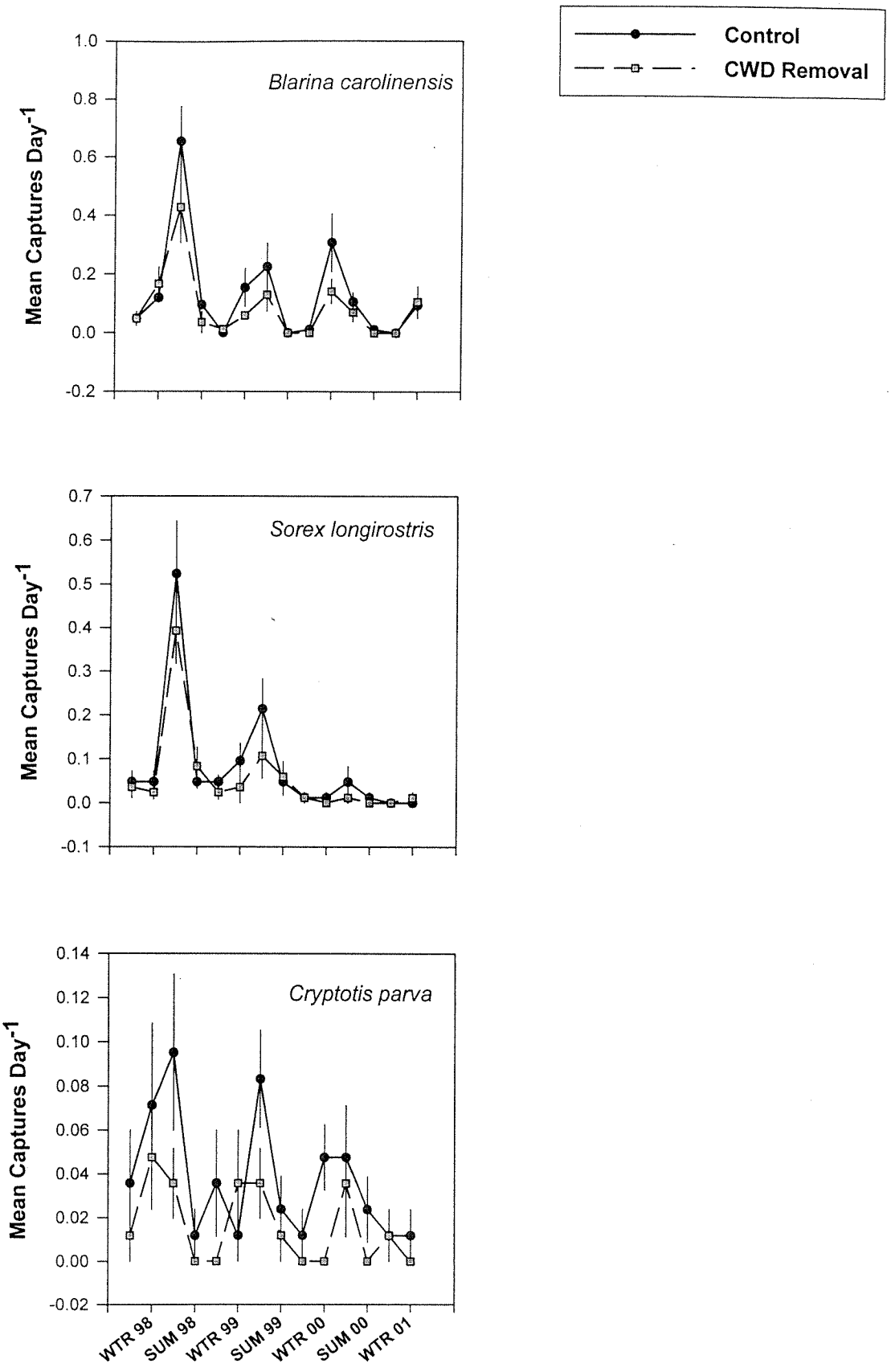

Figure 1. Capture rates of three shrews at plots from which all logs > 10 cm were removed and control plots. Error bars represent standard errors of seasonal means.

RESPONSE OF SHREWS TO EXPERIMENTAL REMOVAL OF DEAD WOOD IN A SOUTHEASTERN PINE FOREST.

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Dead wood is an important habitat component for many forest animals, including small epigeal mammals. Nevertheless, few studies have experimentally examined the effect of manipulation of dead wood on populations of mammals. We sampled shrews at twelve 9.3-ha plots in a southeastern pine forest from autumn 1997 to winter 2001. Logs (>10cm) were removed from six of the plots summer 1997 and annually thereafter; remaining plots were not manipulated. Our aim was to better understand the role of dead wood in the population dynamics of southeastern shrew species. *Blarina carolinensis* exhibited strong seasonal fluctuations, most frequently captured in winter. *Blarina* was marginally less common at removal than control plots ($P = 0.065$). *Sorex longirostris* also demonstrated seasonal fluctuations, but peaked during spring. There was no difference in capture rates of *Sorex* between removal and control plots ($P=0.474$). *Cryptotis parva* showed no obvious seasonal changes but was much more common at control than removal plots ($P=0.0001$). *Sorex* demonstrated a decline in capture rate at all plots through the study period, perhaps due to an extended drought in the region. Capture rates of all species were correlated with rainfall on the day of capture ($P<0.05$). Results suggest that southeastern shrews may vary in their response to changes in the abundance of dead wood.