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Burying Beetle (Coleoptera: Silphidae, *Nicrophorus*) Surveys on Poteau Ranger District, Ouachita National Forest

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Abstract

Surveys for American burying beetles (*Nicrophorus americanus* Oliver) were conducted in west-central Arkansas on Poteau Ranger District of the Ouachita National Forest in 1992 and 1993. A total of 2450 *Nicrophorus* specimens were captured in 1098 trap nights. The most frequently captured specimens were *N. orbicollis*, *N. tomentosus*, and *N. pustulatus*. One specimen of *N. americanus* was also captured. Other species of beetles were also trapped and identified in this survey. Habitats sampled were primarily well-drained uplands with proposed or recent harvests of shortleaf pine (*Pinus echinata*). It appears that these habitats may not harbor extensive populations of *N. americanus* on Poteau RD.

Introduction

The American burying beetle (*Nicrophorus americanus* Oliver) was added to the Federal list of endangered species in July 1989 (USF&WS, 1991). Beginning in September 1992, Ouachita National Forest (Ouachita NF) districts with historical records of *N. americanus* were directed to perform surveys prior to ground-disturbing activities (e.g., road construction, preparation of sites for tree planting) that might affect this species (J.M. Curran letter of Sept. 18, 1992). Surveys were initiated in fall 1992 on the Poteau Ranger District (Poteau RD) in west-central Arkansas.

Study Area

Poteau RD encompasses 69,659 ha of mixed forest consisting primarily of shortleaf pine (*Pinus echinata*) and various hardwood species in Scott, Polk, and Sebastian counties of west-central Arkansas. Most of these public lands are located on rugged uplands of east-west trending ridges typical of the Ouachitas. In general the cool north slopes favor hardwoods, while the warmer south slopes and ridge tops favor shortleaf pine. Privately-owned farmland occupies most extensive bottomlands within the boundaries of Poteau RD.

Trap lines were established on Poteau RD where projects were proposed that would involve various ground-disturbing activities including: 1) harvest of shortleaf pine timber, 2) construction of temporary roads to provide access to the harvest areas, 3) revegetation of eroded cut-over lands recently acquired by the Forest Service, and 4)

various wildlife-related projects, including pond construction. Most of these activities occurred in well-drained areas with tree stands currently dominated by shortleaf pine or that were dominated by pine prior to recent harvest. No beetle trapping occurred on north-facing hardwood dominated stands, in bottomland pastures, or in open grasslands.

Methods

Surveys for American burying beetles were conducted on Poteau RD in Scott County from 7-13 October 1992, and from 22 June - 10 September 1993. In 1992 surveys totalled 351 trap nights; in 1993, 747 trap nights (one trap night = one baited pitfall trap in place for beetle trapping for one night).

Methods used were similar to nonlethal baited pitfall traps described in the recovery plan for *N. americanus* (USF&WS, 1991). A pit was formed by a single 16 ounce plastic cup set in the ground with the lip of the cup at ground level; a second cup was inserted into the first cup to facilitate removing trapped beetles. In 1992 and at the beginning of 1993, chicken gizzard bait was placed in the bottom of the second cup and the trap was covered with a rock or bark. This method was modified in 1993 with bait placed in a 1-2 ounce sauce cup suspended with flexible wire over the 16 ounce cup. The baited trap was covered by lids cut from plastic one gallon bleach jugs that were approximately 10 cm in height by approximately 15 cm in diameter. The lids were weighted with small stones or limbs. A severe thunderstorm blew the lid off one trap, causing the trap to fill with water; thereafter, small

drainage holes (diameter = 2 mm) were made in the bottom of all cups. Traps were checked for three consecutive mornings following the set-up day (for an equivalent of three trap nights).

In 1992 and at the beginning of 1993, frozen baits were thawed, then placed in an outdoor container and allowed to spoil for 2-4 days. Later in 1993 thawed baits (or unfrozen, fresh baits) were held in a cooler with ice to prevent rapid deterioration during intense summer heat.

Configuration of trap lines varied according to topography and proposed resource management project that prompted the survey. Pitfalls were often set 74 - 122 m apart on proposed road construction rights-of-way, allowing survey of the entire corridor. Shorter trap lines, with pitfalls 46 - 61 m apart, were set in other areas, such as those planned for control of soil erosion. Survey lines were within approximately 800 m of the project area.

Specimens of *Nicrophorus* and other beetles were identified in the field. Field identification was based upon preserved specimens that had been sent out for examination (see Acknowledgements). Many relatively small beetles were not identified in the field; these were entered on data sheets as "beetle species."

Results

In 1992 and 1993, 2450 specimens of *Nicrophorus* were captured in 1098 trap nights. *N. orbicollis* and *N. tomentosus* accounted for >90 percent of the total (Table 1). *N. pustulatus*, *N. marginatus*, and *N. americanus* were also captured in small numbers. A male *N. americanus* was trapped in compartment 1281, approximately 16 km southwest of Waldron, in Scott County, Arkansas, on 5 August 1993. Habitat at the capture site was a mixed stand of mature trees dominated by shortleaf pine adjacent a recently harvested stand in early regeneration (grasses, forbs, and seedling trees). In the same cup with *N. americanus* were four *N. orbicollis* and two *Canthon* sp.

Table 1. Captures per trap night of *Nicrophorus* sp. beetles on Poteau RD, Ouachita NF, 1992-1993.

Species	351 Trap Nights 1992	747 Trap Nights 1993
<i>N. orbicollis</i>	1.66	2.04
<i>N. tomentosus</i>	1.29	0.05
<i>N. pustulatus</i>	0.50	0.02
<i>N. marginatus</i>	<0.01	<0.01
<i>N. americanus</i>	<0.01	<0.01

Table 2. Sample of beetles attracted to ripened gizzard bait, Poteau RD, Ouachita NF, 1992-1993. Results are presented as captures per trap night.

Species	186 Trap Nights 1992	159 Trap Nights 1993
<i>Deltochilum gibbosum</i>	0.53	0.85
<i>Canthon</i> sp.	0.27	0.48
<i>Necrodes surinamensis</i>	0.02	0.38
<i>Trox</i> sp.	0.09	0.14
<i>Necrophila americana</i>	0.06	0.07
<i>Geotrupes</i> sp.	0.01	0.06

Other species of beetles were frequently trapped. A sample of these captures is present in Table 2. Specimens of the Scarabaeidae (especially *Deltochilum gibbosum* and *Canthon* sp.) were often identified in these samples. Other specimens regularly captured included *Trox* sp., *Geotrupes* sp. (Scarabaeidae) and other carrion beetles (e.g. *Necrophila americana*, *Necrodes surinamensis*). Rove beetles (Family Staphylinidae: e.g. *Creophilus maxillosus*) and his-ter beetles (Histeridae: e.g. *Ateuchus histeroides*) were occasionally common.

Discussion

Beetle surveys on Poteau RD varied seasonally and numerically between the two years (Table 1). While captures per trap night of *N. orbicollis* were similar between the two years, the capture rates for *N. tomentosus* and *N. pustulatus* were numerically dissimilar. *Nicrophorus tomentosus* is reproductively active in the fall (Wilson and Fudge, 1984), which likely explains why the trapping in October 1992 resulted in a higher rate of capture as compared to the summer trapping in 1993. *Nicrophorus pustulatus* is a woodland species active throughout the summer, but it seems very sensitive to a lack of moisture (K. Stephan, pers. comm.) Unlike October 1992 the 1993 trapping season was droughts from 27 June - 1 August, with 0.4 cm of rainfall and temperatures ranging from 33 to 39 degrees C (Poteau RD weather data). Five surveys during this period resulted in the capture of 161 *Nicrophorus* sp. in 258 trap nights, or 0.6 beetles per trap night, a rate lower than overall results for the two years (Table 1).

Pitfall traps baited with ripened carrion serve as a powerful attractant to carrion beetles, including *Nicrophorus* sp. (USF&WS, 1991), but ripening bait more than two days under very warm conditions during sum-

mer in western Arkansas may reduce the value of the bait as an attractant. On Poteau RD the fresh chicken gizzard bait changed from pink (relatively fresh, slight odor, few or no maggots), to gray (rotting, strong odor, small maggots), to black (putrid, overwhelming odor, numerous large maggots). These changes occurred slowly during the cool, fall weather of 1992, and quickly during the hot weather of 1993.

Bait in the pink to gray condition was effective in attracting *Nicrophorus* sp., but as the bait advanced toward the black, putrid condition, fewer *Nicrophorus* sp. were attracted, and there was an increase in *Necrodes surinamensis*, *Trox* sp. and other species. *Deltochilum gibbosum* was attracted at all stages of bait ripening, but numbers increased as the bait approached the gray and black stages. In 1993 *Geotrupes* sp. appeared most frequently with highest numbers of *Nicrophorus*. *Necrophila americana* did not seem to appear until the bait reached the gray stage. The apparent preference of *Nicrophorus* sp. for bait in the pink to gray condition may confer an adaptive advantage to the insects by allowing early colonization and thereby maximizing the nutritional resources available to larvae (May, 1993; C. Carlton, pers. comm.).

A relatively large population of these beetles has been documented at Ft. Chaffee, Arkansas, in habitats characterized as grasslands and open oak and oak-hickory woodlands or "oak savannas" (U. S. Army, 1993). Since September 1992, *N. americanus* has been captured on four ranger districts of the Ouachita NF in western Arkansas and eastern Oklahoma (Frazier, 1993; file data, Ouachita NF). Most captures occurred on the Tiak RD in McCurtain County, Oklahoma, and on the Cold Springs RD in Logan and Scott counties, Arkansas. Therefore, despite declining elsewhere in North America (USF&WS, 1991), a population persists along the eastern deciduous-western prairie ecotone in western Arkansas and eastern Oklahoma.

The capture of *N. americanus* in compartment 1281 of Poteau RD in Scott County, Arkansas, was the only capture during surveys involving 25 of 127 district compartments. The closest other captures were more than 30 km northeast and west (file data, Ouachita NF). The capture on Poteau RD provided an additional link in the current range of this species in the western Arkansas-eastern Oklahoma prairie-forest ecotone.

Very little open, park-like oak-hickory forest and open grassland occurs within Forest Service boundaries on Poteau RD. It appears that typical well-drained upland sites most suitable for growth of shortleaf pine may have limited potential for populations of *N. americanus*.

Finally, no action taken by the US Forest Service may jeopardize critical habitat of federally listed species (Ouachita NF, 1990). These surveys satisfied that legal requirement. In addition, the surveys provided an oppor-

tunity to collect data on carrion beetles, an otherwise little-studied component of the Ouachita ecosystem.

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