Non-target Captures During Small Mammal Trapping with Snap Traps

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Abstract: There is little published information available on non-target captures during small mammal trapping. We used a variety of snap traps baited with a rolled oat-peanut butter mix to capture 2,054 individuals from 9 genera of small mammals in a study of small mammal and avian community structure in riparian areas and adjacent loblolly pine *(Pinus taeda)* plantations. We also captured 170 individuals from 24 non-target species over 122,446 trap-nights. Trapping was conducted from 1990 throught 1995 in 57 riparian areas and adjacent pine plantations in the Ouachita Mountains, Arkansas, during 10-day periods each February. Overall, 7.6% of individuals captured were non-target species. Approximately 78% of non-target captures were birds, 19% were mammals, 2% were amphibians, and 1% were reptiles. Rat traps accounted for 53% of total non-target captures; museum special traps, 29%; and mouse traps, 18%. Within each taxa, more non-target individuals were captured in rat traps than in museum special or mouse traps, excluding reptiles. Most non-target mammals and amphibians were captured in rat traps. Bird captures did not differ among trap types; however, foraging behavior of species such as the hermit thrush *(Catharus guttatus)* and Carolina wren *(Thryothorus ludovicianus)* likely influenced capture susceptibility. Alternative capture methods, timing of trapping periods, bait, trap placement, and type of trap used should all be considered to reduce capture of non-target species during small mammal trapping.

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Snap traps frequently are used to evaluate small mammal community richness, diversity, and abundance in relation to land use practices or habitat disturbance

(Kirkland 1977, Mengak and Guynn 1987, Mengak et al. 1989). The bait used largely determines what species or species groups will be captured (Bateman 1979, Beer 1964, Day et al. 1980, Patice 1970, Rickart et al. 1991). However, baits also attract many non-target species. Furthermore, trap features, bait color, or residual odors of previously captured animals may attract non-target species (Bateman 1979).

The habitat in which a trap is placed also can influence probability of capturing non-target species. Small mammal capture success often can be increased by placing traps in natural runs, along downed logs, in low growing vegetation, or next to stumps (Bateman 1979). However, these trap locations may increase, capture rates of non-target species using similar habitat structures. For example, many bird species forage on or near downed woody debris, stumps, or low growing vegetation (Hamel 1992).

Non-target species can reduce capture success for target species by springing traps or getting captured, thus possibly compromising research objectives by eliminating the opportunity to capture target species. Furthermore, capturing non-target species may be of particular concern if sensitive, threatened, or endangered species are present and vulnerable to capture.

There is a paucity of literature on non-target captures during small mammal trapping. Thus, we report non-target captures by 3 types of snap traps: mouse, museum special, and rat traps. We collected non-target capture data as part of a larger small mammal and avian community structure study during 6 years of winter (February) small mammal trapping in streamside management zones (SMZs) and adjacent pine plantations in the Ouachita Mountains of Arkansas (Tappe et al. 1993). SMZs are strips of mature forest left along perennial and intermittent streams during timber harvest for water quality protection and wildlife habitat enhancement. For this research, non-target species were all non-mammal species and mammals for which snap traps and/or winter trapping was an inappropriate sampling technique due to body size or behavioral traits.

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Methods

We conducted our small mammal trapping in 55 research areas on Weyerhaeuser Company lands and 2 sites on USDA Forest Service land in the Ouachita Mountains within 40 km of Hot Springs. Forty-five of 57 research areas were SMZs consisting of natural, second growth hardwood-pine forest ranging from 6 to 246 m in width and surrounded by loblolly pine *(P. taeda)* plantations varying in age from approximately 2 to 22 years. Nine research areas were in loblolly pine plantations containing ephemeral drains, but no SMZs. An additional 3 research areas were in riparian areas containing mature second growth hardwood-pine forest without adja-

cent pine plantations. Targeted mammal species included southern short-tailed shrew *(Blarina carolinensis),* least shrew *(Cryptotis parva),* fulvous harvest mouse *(Reithrodontomys fulvescens),* pine vole *(Microtis pinetorum),* eastern woodrat *(Neotoma floridana),* golden mouse *(Ochrotomys nuttalli), Peromyscus* spp., marsh rice rat *(Oryzomys plaustris),* and hispid cotton rat *(Sigmodon hispidus)* (Perry et al. 1996, Tappe et al. 1993).

Our 57 research areas were divided into 3 groups of 19 research areas each. We sampled each group of research areas for 2 consecutive years between 1990 and 1995. Research areas were trapped for 10 consecutive days in February. Nine 80-m long transect lines located 20 m apart and perpendicular to the stream channel were used to help position trap stations in each reserve area. Transects were centered on the stream channel, extending 40 m on each side of the stream. When SMZs averaged ≤60 m in width, 2 sets of trapping stations on each side of a stream were used along each transect line. We positioned 1 station next to the stream and the other in the adjacent pine plantation 5 m from the end of the transect line. Research areas with SMZs ≤60 m wide contained 36 trap stations. SMZs >60 m wide and riparian areas with no adjacent pine plantations contained 54 trap stations. On wider (>60 m) SMZs, 1 trapping station was positioned next to the stream, a second 5 m inside the SMZ or from the edge of the transect line, and a third centered between the stream and edge stations. At each trap station, we set 1 Victor® mouse trap, 1 Victor® rat trap, and 1 Woodstream® museum special trap. At each station, we placed traps <2 m apart and by downed wood and other natural runs where possible. Traps were baited with a mixture of rolled oats, smooth peanut butter, and vegetable oil. Enough vegetable oil was added to allow us to squeeze bait mixture out of applicators. All traps were checked and re-baited during the morning hours.

We sorted data for non-target captures by taxa (birds, mammals, amphibians, and reptiles) and trap type (mouse, museum special, and rat trap) for analysis. We compared total numbers of individual birds captured among trap types using a Kruskal-Wallis test *(H).* However, non-target amphibian and reptile captures were not compared among trap types due to insufficient sample size. We did not compare non-target mammal captures among trap types because all but 1 were captured in rat traps. Bird abundance data collected concurrently was restricted in this study to those birds captured as non-target species. Abundance was ranked from 1 to 14, with 1 depicting the species with the most individuals recorded during winter bird surveys and 14 depicting the least number (R. E. Thill, U.S. Dep, Agric. For. Serv., unpubl. data). Numbers of non-target birds caught by species were ranked in similar manner.

Results and Discussion

Of 2,224 target and non-target individuals captured during 122,446 nights of small mammal trapping, 170 individuals represented 24 non-target species or 7.6% of the captures (Table 1). Due to differences in numbers of sprung traps without captures, mouse traps accounted for 40,639 trap nights; museum specials, 40,408; and rat 41,399. Approximately 78% of non-target captures were birds; 19% were mam-

Table 1. Numbers of non-target species captured by mouse, museum special, and rat traps during winter small mammal trapping in riparian areas and adjacent pine plantations in the Ouachita Mountains, Arkansas, 1990–1995. Total number of trap nights: mouse, 40,639; museum specials, 40,408; and rat, 41,399.

Species	Mouse	Museum special	Rat	Total
Birds				
Northern cardinal *(Cardinalis cardinalis)*	3	5	7	15
Hermit thrush *(Catharus guttatus)*	11	21	21	53
Common flicker *(Colaptes auratus)*	0	0	1	1
Yellow-rumped warbler *(Dendroica coronata)*	0	0	1	1
Pine warbler *(Dendroica pinus)*	0	1	1	2
Dark-eyed junco *(Junco hyemalis)*	1	0	0	1
Eastern screech-owl *(Otus asio)*	0	0	1	1
Tufted titmouse *(Parus bicolor)*	1	1	1	3
Carolina chickadee *(Parus carolinensis)*	0	1	0	1
Hairy woodpecker *(Picoides villosus)*	0	0	1	1
Carolina wren *(Thryothorus ludovicianus)*	7	16	14	37
Brown thrasher *(Toxostoma rufum)*	0	1	0	1
Winter wren *(Troglodytes troglodytes)*	2	4	3	9
American robin *(Turdus migratorius)*	0	0	5	5
White-throated sparrow *(Zonotrichia albicollis)*	1	0	0	1
Total	26	50	56	132
Mammals				
Southern flying squirrel *(Glaucomys volans)*	0	0	16	16
Raccoon *(Procyon lotor)*	0	0	1	1
Eastern spotted skunk *(Spilogale putorius)*	0	0	1	1
Eastern cottontail *(Sylvilagus floridanus)*	1	0	11	12
Eastern chipmunk *(Tamias striatus)*	0	0	3	3
Total	1	0	32	33
Amphibians				
American toad *(Bufo americanus)*	0	0	1	1
Slimy salimander *(Plethodon glutinosus)*	1	0	0	1
Southern leopard frog *(Rana utricularia)*	0	0	1	1
Total	1	0	2	3
Reptiles				
Fence lizard *(Sceloporus undulatus)*	2	0	0	2
Total	2	0	0	2
Total individuals	30	50	90	170

mals, 2% amphibians; and 1% reptiles. By taxa, 63% (15 species) were birds, 21% (5 species) were mammals, 12% (3 species) were amphibians, and 4% (1 species) were reptiles. Five species, including hermit thrush *(Catharus guttatus),* Carolina wren *(Thyothorus ludovicianus),* southern flying squirrel *(Glaucomys volans),* northern cardinal *(Cardinalis cardinalis),* and eastern cottontail *(Sylvilagus floridanus)* comprised 78% of non-target captures.

Rat traps accounted for 53% of non-target captures; museum special traps, 29%; and mouse traps, 18%. Rat traps had the most non-target captures in each taxa group except reptiles. Although about half as many individual birds per species were captured in mouse traps(x=1.73, SE=0.82, N=15) than either museum special (x=3.33, SE=1.66, N=15) or rat traps (x=3.73, SE=1.57, N=15), these differences were not significant (H=1.726; 2,14 df; P=0.422). Birds were the only non-target species caught in museum special traps.

Our data suggest non-target captures may have been influenced by habitat and foraging behavior of individual species. Eleven of 15 bird species captured in this study forage in low-growing bushes and/or on the ground (Hamel 1992). Thus, their exposure to traps would be greater than species foraging elsewhere. Bird abundance data suggested that foraging behavior influenced capture rates of certain non-target bird species (Table 2). For example, the hermit thrush, a ground or bush-gleaning omnivore, had an abundance rank of 8 but was the most commonly captured bird species. In contrast, the Carolina chickadee *(Parus corolinensis),* a canopy forager, had the highest abundance rank in our research areas, yet only 1 individual was captured in the 6 years of our study. The Carolina wren, a bush and ground forager, was the second most abundant non-targeted bird species and the second most captured bird species.

Together, southern flying squirrels (48.5%) and eastern cottontails (36.4%) comprised 84.8% of non-target mammal captures. Capture of these 2 species may

Table 2. Winter foraging guilds[a], ranked abundance[b], and rank by numbers of individuals captured as non-target bird species during winter small mammal trapping in riparian areas and adjacent pine plantations in the Ouachita Mountains, Arkansas, 1990–1995.

		Ranked	
Species	Winter foraging guild	Abundance	*N* caught
Carolina chickadee	Arboreal gleaning insectivore-omnivore.	1	8
Carolina wren	Terrestrial or bush gleaning insectivore.	2	2
Northern cardinal	Terrestrial or bush foliage gleaning omnivore-granivore.	3	3
American robin	Tree or bush gleaning frugivore.	4	5
Dark-eyed junco	Terrestrial gleaning omnivore-granivore.	5	8
White-throated sparrow	Terrestrial gleaning granivore.	6	8
Tufted titmouse	Arboreal gleaning insectivore-omnivore.	7	6
Hermit thrush	Terrestrial or blush gleaning omnivore.	8	1
Yellow-rumped warbler	Bush or tree foriage gleaning omnivore.	9	8
Pine warbler	Tree foriage gleaning insectivore-omnivore.	10	7
Hairy woodpecker	Tree trunk probing insectivore.	10	8
Winter wren	Terrestrial gleaning insectivore.	11	4
Common flicker	Tree trunk or terrestrial probing insectivore-omnivore.	12	8
Brown thrasher	Terrestrial or bush gleaning insectivore-omnivore.	13	8
Eastern screech-owl	Nocturnal terrestrial pouncing carnivore.	14	8

a. From Hamel (1992).

b. Ranked bird abundances were obtained from bird census data collected as part of a larger study on small mammal and avian comminity structure. Bird species censussed as part of the larger study but not captured in snap traps: mouse, museum special, or rat trap, were not included in the ranking of birds on this table (Tappe et al. 1993; Thill, U.S. Dep. Agric. For. Serv., unpubl. data).

have resulted from traps being placed in natural runs or beside trees. Flying squirrels were captured primarily in traps placed at the base of trees, whereas cottontails were captured under brush and downed woody debris.

Mouse and museum special traps generally were not large enough to capture our 2 largest non-target species, the flying squirrel and cottontail. Perry et al. (1996) indicated that rat traps were most efficient for capturing the largest small mammals encountered in this study. In our study, body weight of the smallest non-target mammal captured (southern flying squirrel; 40–98 g) was below the weight of the largest target species (eastern woodrat; 147–428 g, Sealander and Heidt 1990).

Perry et al. (1996) suggested a combination of mouse and rat traps as providing an inexpensive yet accurate way to sample small mammal community richness and diversity. However, if a study area contains trap-susceptible non-target species of special concern or sensitive, threatened, or endangered species, use of snap traps may not be advisable. Overall, rat traps accounted for 53% of our non-target captures. Had we not used rat traps, only 1 non-target mammal would have been captured. However, excluding rat traps would have resulted in fewer target species being captured and some not being detected at all, especially those of larger body size. Also, excluding rat traps would not have protected smaller non-target species such as the hermit thrush or Carolina wren from accidental capture in mouse or museum special traps.

Weather conditions also influence non-target species captures. Due to cold temperatures, amphibians and reptiles are generally inactive in early February in the Ouachita Mountains, Arkansas. Thus, the chance of capturing individuals from these 2 taxa was low. All non-target amphibian and reptile captures occurred during the unseasonably warm February 1990. Had we experienced several unseasonably warm winters during our study, or had we trapped during warmer months, we may have captured more amphibians and reptiles.

In conclusion, the foraging behavior of individual species, trap placement, trap type, trapping season, and perhaps bait influence numbers and species of non-target captures. Because of the relatively high rate of non-target captures in this study, the use of alternative trap types may be advisable. We have since used live traps in subsequent small mammal studies in the Ouachita Mountains despite the substantial difference in trap cost (Tappe et al. 1994). The use of a winter trapping period may help keep numbers of non-target amphibians and reptiles low. If snap traps are required to meet research objectives, we suggest setting traps near sunset and closing them shortly after sunrise to reduce capture of diurnal species, especially birds.

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