Comparison of Two Techniques for Assessing Invertebrate Availability for Wild Turkeys in Texas

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Abstract

*Although the importance of invertebrates to young galliforms has been demonstrated by numerous researchers, few comparisons of techniques designed to assess invertebrate availability for these species have been published. Our objective was to compare suction sampling and sweep-netting as methods for evaluating invertebrates available for Rio Grande wild turkey (*Meleagris gallopavo intermedia*) poults on the Edwards Plateau of Texas, USA. We collected invertebrates via sweep-netting (*n = 102*) and suction sampling (*n = 100*) during summers 2002 and 2003 at brood locations. Suction sampling collected the same orders of invertebrates as sweep-netting, but invertebrate dry mass and frequency of occurrence were lower for nearly every order compared to sweep-netting. Suction sampling provided no additional information to that obtained by sweep-netting in the broken grasslands where our study was conducted. For this reason, we believe the additional cost and time required to implement this technique was not warranted for our study areas.* (WILDLIFE SOCIETY BULLETIN 34(3):853–855; 2006)

Key words

invertebrate collection, Meleagris gallopavo, *Rio Grande wild turkey, suction sampling, sweep-net, Texas.*

Studies on the relationship between invertebrate abundance and chick survival in North America include those addressing greater sage-grouse (*Centrocercus urophasianus*; Klebenow and Gray 1965, Johnson 1990), sharp-tailed grouse (*Tympanuchus phasianellus*; Mitchell and Riegert 1994), greater prairie-chickens (*T. cupido*; Svedarsky and Van Amburg 1996), ring-necked pheasants (*Phasianus colchicus*; Hill 1985, Whitmore et al. 1986), and northern bobwhites (*Colinus virginianus*; Palmer et al. 2001). In general, these studies found that invertebrate abundance was important to survival and recruitment of galliform young.

Sweep-netting was the most common invertebrate collection method employed by the above studies, followed by pitfall traps. Because of a perceived inaccuracy of sweep-netting (Harper and Guynn 1998), secondary methods—such as pitfall traps, sticky traps, or suction sampling of invertebrates—generally have been used to determine total invertebrate community within an area (Southwood 1975). The literature suggests that suction sampling typically yields different invertebrate orders than sweep-netting, thus rendering a more accurate estimate of invertebrate community composition when used in conjunction with sweep-netting than do other techniques (Southwood 1975, Hill 1985, Potts 1986, Standen 2000).

Despite considerable literature suggesting the importance of invertebrates to the survival of young galliforms, few comparisons of techniques designed to assess invertebrate availability in brood-rearing habitat of galliforms have been published. We sampled invertebrates as part of a larger study of the ecology of Rio Grande wild turkeys (*Meleagris gallopavo intermedia*) in the Edwards Plateau (EP; Gould 1962) of Texas, USA. We made collections during summers 2002 and 2003 via sweep-netting and suction sampling (Dietrick 1961) in brood-rearing habitat. Our objectives were to determine differences in 1) invertebrate orders collected via sweep-netting and suction sampling, and 2) invertebrate dry mass and frequency of occurrence within samples of invertebrate orders collected via the 2 methods.

Study Area

Four study sites, ranging from 984 to 8,858 ha, were located in the EP of central Texas, USA (Gould 1962): 2 in Bandera County and 1 each in Kerr and Real counties. Soils of the EP generally were shallow, ranging in textures from dark clayey and loamy to moderately alkaline silty–clay to noncalcareous clay and clay loams on a limestone base (Natural Resources Conservation Service 1990*a*,*b*, 1991*a*,*b*). The EP had a precipitation range of 38.1–83.8 cm from west to east (Gould 1962). Typically, rainfall was abundant in May–June as well as September. The EP was characterized as a live-oak (*Quercus fusiformis*) savanna, interspersed with dense stands of Ashe juniper (*Juniperus ashei*; Fowler and Dunlap 1986, Miller et al. 1995). Grasses were typical of mixed-grass prairie with dominate species being various bluestems (*Andropogon* spp., *Bothriochloa* spp., *Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum nutans*), wildrye (*Elymus* spp.), curly mesquite (*Hilaria belangeri*), and buffalograss (*Buchloe dacytloides*; Gould 1962, Correll and Johnson 1970).

Methods

We collected invertebrates during summers 2002 and 2003 using sweep-nets (35-cm aperture; Forestry Suppliers, Jackson, Mississippi) and suction sampling (22.9-cm aperture; John W. Hock Company, Gainesville, Florida). We chose not to use pitfall and sticky traps due to topographic features (shallow soils and limestone outcroppings) and our objectives (collection of invertebrates at brood-feeding sites). Sweep-netting employed 25 sweeps (1 sweep consisted of a forward and backward sweep of the

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Table 1. Standardized mean and standard error (SE) of the dry mass of invertebrate orders collected at Rio Grande wild turkey brood locations on the Edwards Plateau of Texas, USA, 2002–2003, by collection method (sweep-net, $n = 102$; suction sampling, $n = 100$).

	Sweep-net		Suction sampling	
Order	$\bar{x}$	SE	$\bar{x}$	SE
Orthoptera	0.0201	0.0025	0.0024	0.0014
Coleoptera	0.0004	0.0001	0.0017	0.0006
Araneae	0.0005	0.0001	0.0018	0.0004
Hymenoptera	0.0002	0.0001	0.0071	0.0045
Homoptera	0.0004	0.0001	0.0010	0.0007
Hemiptera	0.0007	0.0002	0.0019	0.0008
Diptera	0.0001	0.0000	0.0009	0.0004
Lepidoptera	0.0001	0.0000	0.0004	0.0002
Odonata	0.0000	0.0000	0.0000	0.0000
Neuroptera	0.0001	0.0001	0.0001	0.0000
Total	0.0226	0.0026	0.0172	0.0047

net) at all sites (sampling transects, approx. 10 m). One suction sampling consisted of 4 individual samples and sampled an area of approximately 0.5 m^2. We made sweep-net and suction samplings simultaneously, with one person conducting all sweep-net and another all suction-sampling collections to maintain consistency.

We placed invertebrates collected by each method into individually labeled bags and froze them overnight to facilitate sorting, counting, and massing. Invertebrates then were sorted by order, counted, massed, and frequency of occurrence calculated (percent of samples with order present). After we recorded initial mass, we placed invertebrates in a drier at 170°C and dried to constant mass. We used dry mass for analysis. Dry mass was standardized to represent a 1-m^2 collection area. We conducted statistical analysis (*t*-test) on standardized dry mass at the $P = 0.05$.

Results

Invertebrate dry mass (± SE) of sweep-net collections ($n = 102$ samples) was 0.0226 ± 0.0026 g and 0.0172 ± 0.0047 g for suction-sampling collections ($n = 100$ samples; Table 1). Ninety-four percent of sweep-nettings yielded invertebrates, whereas only 63% of suction sampling yielded invertebrates. Suction sampling collected significantly more invertebrate dry mass per 1 m^2 in all individual orders (Coleoptera, $P = 0.001$; Areanea, $P \leq 0.001$; Homoptera, $P = 0.034$; Hemiptera, $P = 0.002$; Diptera, $P = 0.014$; Lepidoptera, $P = 0.033$) with the exception of Orthoptera and Hymenoptera per 1 m^2. Sweep-net collections collected more invertebrate dry mass of the order Orthoptera ($P < 0.001$) and total invertebrate dry mass ($P < 0.001$) per 1 m^2. We detected no difference in the collection of the orders Hymenoptera and Neuroptera between methods ($P = 0.685$). With the exception of Neuroptera, we found invertebrate orders with greater frequency in sweep-net collections as compared to suction samples (Fig. 1). Suction sampling collected the same taxonomic orders as sweep-netting, with the exception of Odonata.

Discussion

Sweep-netting collected greater total invertebrate dry mass and orders than did suction sampling, with the exception of Neuroptera. Conversely, Standen (2000) caught more Hemiptera, Coleoptera, and Araneae (based both on individuals and species) using suction sampling than by swishing, a method similar to sweep-netting.

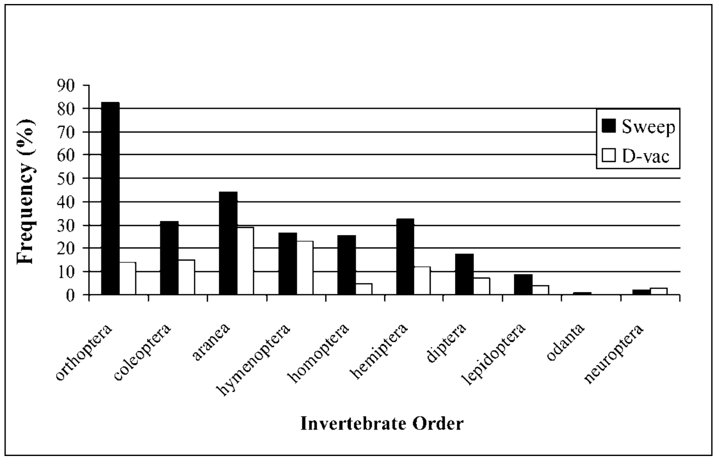

Figure 1. Frequency of occurrence (%) of invertebrate orders collected via sweep-net and suction sampling at Rio Grande wild turkey brood locations on the Edwards Plateau of Texas, USA, 2002–2003.

Suction sampling also was less efficient than sweep-netting. For example, 6 and 37% of collection attempts yielded no invertebrates when we used sweep-netting and suction sampling, respectively. Southwood (1975) maintained that due to patchy distribution of invertebrates, suction sampling might require considerably more effort to collect an adequate sample, which could explain why so many of our suction samples yielded no invertebrates. Sweeping generally took less time than did suction sampling, due in part to the small sample area each suction sampling collected. A sweep-net sample required only the amount of time it took a researcher to walk 10 m. Conversely, suction sampling required 4 discrete samples to be taken, with sampling bags removed and replaced after each discrete sample. Four suction samplings covered an area of 0.5 m^2; to match the area of a sweep-net sample (10 m^2), 80 suction samplings would be required.

Our results were consistent with those of Fenton and Howell (1957), who found that sweeping was superior to other methods for sampling most species of invertebrates. Similarly, Callahan et al. (1966) found sweeping to be superior to suction-sampling collection. Our results, when standardized, found differences between methods when dry mass was used as the comparison. We found suction sampling did not add to our overall evaluation of the invertebrate community, at the order level, in the broken grasslands of the EP. Suction sampling collected higher invertebrate dry mass for all orders with the exception of Orthoptera when collection areas were standardized to 1 m^2. However, sweep-net collection had higher total invertebrate dry mass collected as a result of the more Orthoptera collected via this method. Sweeping collected a more diverse sample with fewer collections yielding no invertebrates than suction sampling. Further research using standardized sampling areas for each collection method would be beneficial.

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