Methods for Evaluating Abundance and Distribution of River Otters in Georgia

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Abstract: Data for assessing trends in river otter (*Lutra canadensis*) distribution and abundance are difficult to collect because monitoring techniques are currently unavailable, prohibitively expensive, or are applicable only to small areas. Scent-station and field-sign techniques for gathering such information were evaluated in 52 counties and 6 physiographic regions of Georgia from 1983 through 1986. Indices derived from scent-station and field-sign surveys were correlated ($P < 0.01$). Scent-station surveys were discontinued in 1985 and 1986, and field-sign surveys were used exclusively in all but 1 region because field-sign surveys were less costly. Field-sign surveys are a rapid, economical means of determining river otter distribution, but high variability in field-sign or scent-station indices precludes their use as detectors of annual fluctuations in otter abundance.

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River otters are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (U.S. Fish and Wildl. Serv. 1982). In accordance with CITES, export permits cannot be issued until state wildlife agencies present the U.S. Fish and Wildlife Service (USFWS) with objective information that indicates exports will not be detrimental to survival of the species. Accurate data for assessing population size of otters, however, are difficult to collect. Numbers of otters harvested may not reflect population fluctuations be-

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cause they are often influenced by pelt prices (Erickson 1981, Clark et al. 1985). Population estimates for river otters derived from radio telemetry or mark-recapture techniques are more reliable but are expensive and generally applicable only to small areas (Knaus et al. 1983, Melquist and Hornocker 1983). At present, managers may be unable to detect large changes in statewide otter populations and are in need of cost-efficient monitoring techniques that are extensive in scope.

Survey methodologies using observations of field sign or tracks left by animals attracted to scent baits hold promise for monitoring population changes of secretive carnivores. Scent-station surveys have been used to measure relative abundance of furbearers in the southeastern United States (Johnson and Pelton 1981) and in western states (Linhart and Knowlton 1975, Roughton and Sweeny 1982). Humphrey and Zinn (1982) used scent stations to monitor habitat use by river otters. Robson and Humphrey (1985) experimented with attractants and compared scent stations constructed of chalk-covered masonite boards with field sign as indices of relative abundance for otters. Jenkins and Burrows (1980) and Kruuk et al. (1986) found field sign to be a rough index of relative abundance of European otters (*Lutra lutra*).

A study was initiated in 1980 to: (1) determine whether otters would visit scent stations in Georgia, (2) evaluate effectiveness of several scent station designs, and (3) determine whether 1, 2, or 3 nights of sampling would be most efficient. Clark (1982) determined that scent stations constructed of sifted sand were most effective; otters visited scent stations at rates sufficient for a statewide survey; and 1-night sampling periods were optimal. Objectives of the present study were to develop statewide scent-station and field-sign survey methods and to determine the feasibility of each for monitoring trends in distribution and abundance of river otters in Georgia.

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Methods

The sampling design consisted of observations of tracks left at scent stations or of otter field sign along the banks of perennial streams (rivers and creeks) adjacent to bridge crossings in 52 counties in 6 physiographic regions (southern Piedmont, mountain, upper coastal plain, lower coastal plain, ridge and valley, and fall line hills) in Georgia. Numbers of counties in each region were selected according to a stratified sampling design based on relative land area within that region. To select bridge crossings for sampling, all crossings over perennial streams were first numbered on county maps. Crossings at divided highways or over intermittent

streams and within city limits were excluded. Next, a subset of 20 crossings was randomly selected from the numbered crossings for each county. Crossings within 1.6 km of those numbered crossings selected were omitted and others were chosen to replace them to reduce the possibility of 1 otter visiting multiple stations.

Two scent stations were established approximately 100 m upstream and 100 m downstream at each bridge crossing within each county. Scent stations were 1 m-diameter circular areas of sifted agricultural lime with a small tuft of grass placed in the center. Agricultural lime was used rather than sifted sand as in the pilot study because lime provided a better tracking medium. Approximately 0.5 ml of an otter lure, composed chiefly of anal scent gland secretions (Hawbaker's Otter Lure, S. S. Hawbaker and Sons, Fort Loudon, PA 17224), was applied to the grass with a hypodermic syringe. Stations were checked for otter tracks the day after stations were established.

Bridge crossings were regarded as the basic sampling unit. A scent-station visit was recorded if either station at a bridge crossing had been visited by otters. If 1 of the 2 stations at a bridge crossing was deemed inoperable, due to weather or other disturbance, the other station of that pair was also defined as inoperable unless it was visited by otters. This was done to give each bridge crossing an equal probability of recording visits if disturbance occurred, yet not disregarding those bridge crossings at which 1 station was visited and the other was deemed inoperable. County scent-station indices were defined as the percentage ($+/-$ standard error) of operable crossings (scent station pairs) visited by otters in each county. Regional and statewide indices were calculated by averaging county indices.

Presence of field sign (otter tracks or scats) were recorded while constructing scent stations during 1983 and 1984. During 1985 and 1986, scent-station surveys were discontinued in all regions except the Lower Coastal Plain, and only field sign data were collected. Observers did not attempt to determine number of tracks or scats present, only whether or not field sign was present within 100 m upstream or downstream from each bridge crossing. A field-sign observation was recorded for that bridge crossing if otter tracks or scats were observed. Field-sign indices were calculated by the same procedure as the scent-station indices. During 1985 and 1986, field-sign data were collected according to the same sampling scheme developed for the scent-station survey, except that scent stations were not constructed. Consequently, the survey could be completed in 1 day because scent stations did not have to be checked.

Surveys were initiated during mid-February each year to coincide with the otter breeding season when visitation rates to scent stations are highest (Lauhachinda 1978, Robson 1982, Humphrey and Zinn 1982). Personnel were required to attend a 1-day training program in which they were shown otter field sign under natural conditions. Surveys were conducted no earlier than 3 days following a rainfall, and only when water levels were considered medium or low. Most surveys were completed by early April but, due to high water levels and inclement weather during 1983 and 1984, some were not completed until July.

Correlation analysis was used to determine the relationship between field-sign and scent-station indices. Coefficients of variation were calculated for each sample mean to allow a direct comparison of the relative precision of each technique. Analysis of variance was used to determine whether differences ($P \leq 0.05$) in field-sign or scent-station indices existed between years.

Results

Otter tracks were observed in scent stations at 112 of 969 bridge crossings during 1983 and at 78 of 959 crossing during 1984 (Table 1). From 1983 through 1986, field sign was observed at 103 of 1,040, 103 of 1,005, 152 of 1,029, and 165 of 1,088 crossings (Table 2).

Field-sign and scent-station indices by county in 1983 and 1984 were correlated ($r = 0.26$, $P < 0.01$). Coefficients of variation of indices derived from statewide totals, and within each physiographic region, were similar for both techniques (Table 3). Analysis of variance of scent-station and field-sign data did not indicate that statewide indices for either data set were different between years ($P > 0.05$); however, variability was high.

Discussion

Field-sign and scent-station techniques provided indices of otter presence during 1983 and 1984 that were weakly correlated and approximately equal in precision. The field-sign technique required about 50% of the manpower of the scent-station technique because a field-sign survey could be conducted in 1 day instead of

Table 1. Scent-station indices at bridge crossings for river otters during 1983 and 1984 in 6 physiographic regions in Georgia.

	Physiographic region[a]						
	RV	M	P	FLH	UCP	LCP	Total
			1983				
Observed bridge crossings	18	40	310	97	266	238	969
Visits	0	0	40	25	30	16	112
Index	0.0	0.0	13.1	25.9	11.3	6.7	11.5
SE	0.0	0.0	4.3	10.4	2.4	4.6	2.2
			1984				
Observed bridge crossings	20	36	330	92	224	237	959
Visits	0	0	25	17	20	16	78
Index	0.0	0.0	7.7	19.1	8.1	6.9	8.2
SE	0.0	0.0	2.1	8.4	2.4	2.6	1.5

[a]RV–Ridge and Valley, M–Mountain, P–Piedmont, FLH–Fall Line Hills, UCP–Upper Coastal Plain, LCP–Lower Coastal Plain.

Table 2. Field sign surveys at bridge crossings for river otters from 1983 to 1986 in 6 physiographic regions in Georgia.

	Physiographic region[a]						
	RV	M	P	FLH	UCP	LCP	Total
			1983				
Observed bridge crossings	20	40	340	100	280	260	1040
Visits	0	1	38	17	40	6	103
Index	0.0	2.5	11.2	17.0	14.3	2.3	9.8
SE	0.0	2.5	2.2	5.6	4.3	1.2	1.6
			1984				
Observed bridge crossings	20	40	339	100	246	260	1005
Visits	0	0	49	15	30	9	103
Index	0.0	0.0	14.5	15.0	11.2	3.5	10.1
SE	0.0	0.0	3.8	4.5	4.3	2.0	1.9
			1985				
Observed bridge crossings	20	40	340	100	276	253	1029
Visits	0	1	63	24	49	4	152
Index	0.0	2.5	18.5	21.7	18.5	8.1	15.3
SE	0.0	2.5	3.5	5.6	4.9	3.0	2.1
			1986				
Observed bridge crossings	60	80	333	100	261	254	1088
Visits	0	1	53	20	62	27	165
Index	0.0	1.3	16.1	17.5	25.3	10.8	15.2
SE	0.0	1.3	3.1	4.0	6.0	2.6	2.0

[a]RV–Ridge and Valley, M–Mountain, P–Piedmont, FLH–Fall Line Hills, UCP–Upper Coastal Plain, LCP–Lower Coastal Plain.

Table 3. Coefficients of variation for scent-station and field-sign survey indices for river otters during 1983 and 1984 in 6 physiographic regions in Georgia.

	Scent-station technique		Field-sign technique	
Physiographic region	1983	1984	1983	1984
Ridge and valley	—[a]	—	—	—
Mountain	—	—	100	—
Piedmont	33	27	20	26
Fall line hills	40	44	33	30
Upper coastal plain	21	30	30	38
Lower coastal plain	69	38	52	57
Statewide	19	18	16	19

[a]Coefficients of variation are 0/0, hence indeterminate.

2 days. Coefficients of variation were relatively high for both techniques in the lower coastal plain, probably because field sign was difficult to observe and scent stations had to be constructed in unlikely locations in those inundated habitats.

Otters responded to olfactory attractants producing visitation rates over 10 times higher than those found by Robson and Humphrey (1985) who evaluated the efficacy of scent stations as a measure of relative abundance of river otters in Florida. They recorded only 1 otter visit at 15 test sites over an 8-day period, and also found no difference in response rates of captive otters to 2 types of olfactory attractants and a blank control. Because of these low visitation rates and because otters under controlled conditions did not appear to be interested in olfactory attractants, they concluded that scent stations were inefficacious as an otter population trend indicator. The difference in visitation rate between the Florida study and our study may be due, in part, to different habitat types, otter population levels, scent attractant, or scent-station construction. Clark (1982) conducted surveys with trackboards similar in design to those used by Robson and Humphrey (1985) in Florida and also recorded low visitation rates. Visitation rates increased markedly, however, when the trackboard scent stations were replaced with stations constructed of sifted sand. Trackboards may be avoided by otters.

Scent-station and field-sign indices generally reflected knowledge about otter distribution in Georgia. Both surveys serve as rapid, effective methods for determining changes in otter distribution, but the field-sign survey is more cost efficient. The sampling design using bridge crossings over perennial streams was effective in Georgia where otter habitats are primarily riverine. This design could lead to bias in other areas, however, where marshes, swamps, lakes, and other such inaccessible wetlands predominate.

Neither of the 2 techniques is a good indicator of changes in otter population densities. Analysis of variance did not detect differences between field-sign indices between years even though indices ranged from 9.8 to 15.3. The high variability of these techniques precludes their use as detectors of annual fluctuations in population size.

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