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DEMOGRAPHY AND FOOD HABITS OF THE RIVER OTTER (*LUTRA CANADENSIS*) IN WESTERN TENNESSEE

RICHARD E. LIZOTTE, JR., AND MICHAEL L. KENNEDY

Department of Biology, The University of Memphis, Memphis, TN 38152
Present address of REL: Department of Biology, The University of Mississippi, University, MS 38677

ABSTRACT—Demography and food habits of river otters (*Lutra canadensis*) in western Tennessee were examined. Gastro-intestinal tracts of 125 specimens (75 males, 49 females, and 1 of undetermined sex) were examined for contents by season, sex, and age. Demographic information was collected from 179 river otters (104 males, 71 females, and 4 of undetermined sex). Four external measurements (total length, tail length, hind foot length, and ear length), year, season, county, sex, whole weight, and skinned weight were recorded for each animal if available. Analysis of variance was used to determine differences in all measurements across sex, age, year, and season. Embryos and placental scars from nine female river otters were counted to determine average litter size. Results of analysis of digestive tracts indicated that fish and crayfish were the most frequent food types observed with amphibians, mollusks, and insects occurring less frequently while mammals occurred in only trace amounts. Results of demographic information showed an overall sex ratio of 1.5 males:1.0 females; the overall age class ratio was 3.0 adults:1.0 juvenile. Ratios of adult males:adult females and juvenile males:juvenile females approached 1.0:1.0. River otters showed significant differences by sex for all weights and three of four external measurements (total length, tail length, and hind foot length) with males larger than females. Significant differences between age classes within each sex were observed for all weights and two of four external measurements (total length and tail length) with adult males largest and juvenile females the smallest. Average litter size calculated was 2.6 pups/female with a range of one to four.

The river otter, *Lutra canadensis,* has been an important furbearer in Tennessee since the arrival of European settlers near the end of the 18th century. However, human encroachment, habitat destruction, and the harvest of the species for its high quality pelt were factors that led to its near extirpation from Tennessee during the mid-1900s. In 1975, the species was listed as threatened by the State of Tennessee (Tennessee Wildlife Resources Agency, 1992). Reliable sightings and records of accidental trapping accumulated from 1975 to 1989 suggested an increase in number of river otters in the western part of the State. Based on these data, the species was removed from the threatened category in western Tennessee in 1989 (Tennessee Wildlife Resources Agency, 1992). The Tennessee Wildlife Resources Agency then initiated an experimental trapping season for *L. canadensis* to further evaluate the status of the population in the region.

River otter have been the subject of numerous investigations in North America (e.g., Greer, 1955; Hamilton and Eadie, 1964; Lauhachinda, 1978; Polechla, 1987). Many previous studies have focused on food habits and demographic information (Toweill and Tabor, 1982). Griess (1987) reported foods taken by river otters introduced into the Great Smoky Mountains National Park, Tennessee. However, with the exception of Griess (1987) and Miller (1992), there has been no recent report related to the biology of the species in Tennessee. Additional studies are needed to better understand the natural history of *L. canadensis* in this region.

The purposes of the present investigation were to determine food habits and to assess the demography (total length, tail length, hind foot length, ear length, range of weight, age structure, sex ratio, and litter size) of *L. canadensis* in western Tennessee. This study will provide information that will be useful in future decision-making relating to the status of the species in Tennessee.

MATERIALS AND METHODS

The study was conducted in western Tennessee which includes that region of Tennessee east of the Mississippi River and west of the Tennessee River, bounded by the states of Mississippi on the south and Kentucky on the north. The region has extensive wetlands associated with several large river-drainage systems including the Obion, Hatchie, Loosahatchie, Wolf, Forked Deer, and Mississippi rivers that provide excellent habitat for river otters.

From September through March of 1981 to 1993, 179 river otters (104 males, 71 females, and 4 of undetermined sex; Lizotte, 1994; appendix I) were collected; 130 river otters were collected from 1989 to 1993 after the trapping season was initiated. Animals were provided by personnel of the Tennessee Wildlife Resources Agency and commercial trappers. After collection, river otters were transported to the Department of Biology at The University of Memphis, Memphis, Tennessee, where they were stored (frozen) and later examined. Upon examination, digestive tracts (stomach and intestine) were removed, and demographic data were recorded.

Procedures for analysis of food items generally followed

Lagler and Ostenson (1942). Stomach contents were emptied into a 1- by 1-mm sieve, rinsed with water, and placed on an enamel tray to be examined. Intestinal contents were emptied into a 500-ml glass jar. Solvents (best results were with agitation in 100 ml of 100% isopropyl alcohol) were used to break down the heavy mucous-like material found within the intestine. Intestinal contents were then emptied into a 1- by 1-mm sieve, rinsed in water, and placed on an enamel tray to be analyzed. Stomach and intestinal food items were combined in all analyses. After examination, contents were stored in 40% isopropyl alcohol.

Digestive tracts of 125 animals (75 males, 49 females, and 1 of undetermined sex) were examined for contents, and food items were identified. Food items were identified to the lowest taxonomic level possible. Most fish were identified from scales following Sheldon and Toll (1964) and Pflieger (1978). Scales of unknown specimens were compared with known scales using a reference collection housed within the Department of Biology, The University of Memphis. A binocular light microscope at 100× magnification was used to examine scales. In cases where scales were unavailable (e.g., catfish), coloration of incompletely digested skin, spines, and bony parts such as pieces of the premaxilla and maxilla were used following Greer (1955) and Griess (1987). Plants were identified using Fassett (1966). There were several instances when plant material was in such small quantity and poor condition that identification was impossible beyond kingdom. Insects and mollusks were identified using Pennak (1978). Crayfish were identified to genus by geographic location and keys in Hobbs and Marchand (1943), Payne and Riley (1974), and Pennak (1978). Mollusks were identified to order (Pennak, 1978) based on indigestible hard parts (shells) because soft body parts were either masticated beyond recognition or already digested. Amphibians were recognized by coloration of incompletely digested skin to species following Bishop (1947) and Dowling and Duellman (1978). Mammals were identified to species from hairs found in the digestive tracts following Moore et al. (1974).

River otters were grouped by season, sex, and age for statistical analyses. Seasons were as follows: fall (24 September to 23 December), winter (24 December to 23 March), spring (24 March to 23 June), summer (24 June to 23 September). River otters were divided into two age classes, juvenile and adult. Age was determined for both sexes by the amount of suture closure in the skull (Stephenson, 1977) and overall body size; presence of embryos or placental scars and amount of vascularization of the uterus also was used to determine the age of females.

Food items were grouped into six food types (because plants are not usually considered food items for carnivores, this category was omitted from the statistical analysis and treated as a non-food item); fish; crayfish; mammal; amphibian; insect; mollusk (clam and snail). If more than one of the same food item or type was found in a digestive tract, it was considered as only a single occurrence for that food item and type. Percent frequency of each food item and type was calculated. Comparisons among different seasons, ages, and sexes, for each food type were conducted using logistic regressions with lack-of-fit test following Gabor (1992) to determine differences in occurrence. When Chi-square values were small ($P > 0.10$), fiducial limits were calculated using a value of $t = 1.96$, and sequential Bonferroni adjustments at $P < 0.05$ (Rice, 1989) were used when applicable to calculate a correct estimate of significance.

Demographic information was collected from 104 males and 71 females obtained from 16 counties in western Tennessee. Of the animals examined, 98 were adult, 31 were juvenile, and 46 were of undetermined age. Sample sizes for males (listed first) and females by season were as follows: winter, 73 and 50; spring, 5 and 2; summer, 4 and 1; fall, 12 and 16; unknown season, 10 and 2. Four external measurements (total length, tail length, hind foot length, and ear length; Hall, 1981) as well as year, season, county, sex, age, whole weight, and skinned weight (after the pelt was removed) were recorded. The pelt had been removed from most animals prior to examination; therefore, ear and whole-weight measurements were unavailable for many animals. Reproductive data, using embryo and placental-scar counts to determine average litter size and range of litter size, were available for nine animals. Seven specimens were weighed whole and skinned and weighed a second time to calculate average differences in weights (computed in percentage). Adjusted weights were calculated from the difference in percentage of whole weight and skinned weight. Percent difference was multiplied by the skinned weight, and the resulting value was added to the original weight of each skinned animal. Means for all external measurements and litter sizes as well as frequencies of sexes and ages were calculated. Analysis of variance was used to determine differences in external measurements across sex, age, year, and season. All analyses were conducted using the Statistical Analysis System (SAS Institute, Inc., 1990).

RESULTS

Items representing six food types were recorded (Table 1). Seven species of fishes were observed as well as three species of amphibians, two species of mammals, three orders and two families of insects, and four genera of crayfish (Table 1). Mollusks were distinguished to class.

Among the fish identified (Table 1), sunfishes (Centrarchidae) had the highest frequency (33.6%); bluegill sunfish (*Lepomis macrochirus*) occurred most often followed by green sunfish (*Lepomis cyanellis*). The next most common fishes found in the study were catfishes (Ictaluridae; 17.6%); only two specimens of channel catfish (*Ictalurus punctatus*) were identified to species. The third most common fish, bowfin (*Amia calva*), was found to occur in 10.4% of the samples. Other fishes observed with less frequency were: gizzard shad (*Dorosoma cepedianum*), 5.6%; carp (*Cyprinus carpio*), 4.0%; mooneye (*Hiodon* sp.), 2.4%; shiner (*Notropis* sp.), 0.8%; and yellow bass (*Morone mississippiensis*), 0.8%.

Remains of 11 of 16 amphibians were identified and represented three species (Table 1). The marbled salamander (*Ambystoma opacum*) was the most frequently occurring (5.6%) amphibian followed by the southern leopard frog (*Rana utricularia*; 1.6%) and the mudpuppy or waterdog (*Necturus maculosus*; 1.6%).

Although mammals occurred in 4.8% of all digestive tracts examined (Table 1), most occurrences were represented by muskrat (*Ondatra zibethicus*; 4.8%); white-tailed deer (*Odocoileus virginianus*; 1.6%) occurred twice. In several instances, guard hairs of river otter were found. These were not considered as possible food items and were omitted from the analysis because the hairs could have been ingested while the animal was grooming itself.

Several different insect remains were identified to genus (Table 1). Beetles (Order Coleoptera) had the greatest frequency of occurrence (4.8%), while bugs (Order Hemiptera, Family Naucoridae), water scorpions (Order Hemiptera, Family Nepidae),

TABLE 1. Percent occurrence of food items found in 125 digestive tracts of river otter (*Lutra canadensis*) in western Tennessee from 1984 through 1993.

Food item	No. of occurrences	Percent occurrence
Fish	81	64.8
Lepomis macrochirus	29	23.2
Lepomis cyanellus	3	2.4
Lepomis sp.	10	8.0
Amia calva	13	10.4
Ictalurus punctatus	2	1.6
Ictalurus sp.	20	16.0
Cyprinus carpio	5	4.0
Notropis sp.	1	0.8
Dorosoma cepedianum	7	5.6
Hiodon sp.	3	2.4
Morone mississippiensis	1	0.8
Unknown Fish	8	6.4
Amphibians	16	12.8
Ambystoma opacum	7	5.6
Rana utricularia	2	1.6
Necturus maculosus	2	1.6
Unknown Amphibian	5	4.0
Mammals	8	6.4
Ondatra zibethicus	6	4.8
Odocoileus virginianus	2	1.6
Insects	9	7.2
Coleoptera	6	4.8
Hemiptera	2	1.6
Nepidae	1	0.8
Naucoridae	1	0.8
Odonata	1	0.8
Mollusks	18	14.4
Clams	13	10.4
Snails	6	4.8
Crayfish	81	64.8
Cambarus sp.	10	8.0
Fallicambarus sp.	2	1.6
Orconectes sp.	7	5.6
Procambarus sp.	45	36.0
Unknown Crayfish	27	21.6

and dragonflies (Order Odonata) had only one occurrence each (0.8%).

For mollusks, two groups were identified. Clams (Class Bivalvia) occurred most frequently (10.4%) followed by aquatic snails (Class Gastropoda; 4.8%).

Among the remains of crayfish, four genera were identified (Table 1). Of the four, *Procambarus* had the greatest frequency of occurrence (36%). The second most frequently occurring genus was *Cambarus* (8.0%) followed by *Orconectes* (5.6%) and *Fallicambarus* (1.6%).

For non-food items, plants had the highest frequency of occurrence (68.8%) in digestive tracts. Grass (Graminae), milfoil (*Myriophyllum* sp.), unknown root, unknown leaf, and woody plant occurred at a frequency >10%. Except for false loosestrife (*Ludwigia* sp., 5.6%) and willow (*Salix* sp., 8.8%), all other non-food items were found in only trace amounts (Lizotte, 1994).

Greatest frequency of occurrence were for fish and crayfish (64.8% each). Foods taken less frequently included mollusks (14.4%), amphibians (12.8%), and insects (7.2%). Mammals were the least frequent food type found. Overall, comparisons of the major food types showed no statistical difference by sex, season, or age ($P > 0.0083$; Table 2).

Demographic data are summarized in Table 3. Of the animals examined, 58.1% were males ($n = 104$), and 39.7% were females ($n = 71$). The overall sex ratio was 1.5 males: 1.0 female, and the overall age structure was 76.2% adults ($n = 98$) and 23.8% juveniles ($n = 31$). The age ratio (overall) was three adults:one juvenile. For ratios of adult males ($n = 51$):adult females ($n = 47$), data approached 1:1 with the adult population comprised of 53.3% males and 46.7% females. Juvenile males ($n = 16$) and females ($n = 15$) also approached a 1:1 ratio with the juvenile population comprised of 52.4% males and 47.4% females.

Skinned animals ranged from 71.4% to as much as 85.9% of the whole animal weight and averaged 77.3% for the specimens examined. Comparisons of means for whole weight, skinned weight, and adjusted weight of river otters showed significant differences among sexes and age groups. For all weights, adult males were largest while juvenile females were the smallest (Table 3).

Adult males were largest for external measurements (Table 3). Because measurements among seasons or years were not significantly different, data were combined for other analyses. Males were significantly larger than females for all measurements except ear length (Table 3). Adults were significantly larger than juveniles for all characters examined except hind foot length and ear length.

Eight of nine river otters examined for reproductive data had embryos, and one had placental scars. Average litter size was 2.6 pups/female with a range of one to four.

DISCUSSION

Food items found in the present study correspond to those reported in previous investigations (Toweill and Tabor, 1982). Many studies of river otter have found fish to be the primary food eaten (Toweill and Tabor, 1982), and other investigations (Grenfell, 1974; Pierce, 1979; Griess, 1987; Tumlison and Karnes, 1987; Miller, 1992) have reported crayfish as a primary food source. As in the present study, secondary food types reported in previous investigations have included amphibians and insects (Toweill and Tabor, 1982); however, foods such as mollusks, birds, and reptiles have varied greatly in their frequency of occurrence (Chabrek et al., 1982; Toweill and Tabor, 1982; Griess, 1987). In most studies, remains of mammals were found in either trace amounts or not at all (Toweill and Tabor, 1982) and are not usually considered important to the river otter. However, in California (Grenfell, 1974) and Louisiana (Chabrek et al., 1982), remains of mammals were reported in 7.0% of the scats of river otters examined.

Several studies in the southeastern United States have reported sunfish and catfish to be an important part of the diet of river otters (e.g., Wilson, 1954; Lauhachinda, 1978; Pierce, 1979; Tumlison and Karnes, 1987). The most common species of fish

TABLE 2. Percent occurrence of food types by sex, season, and age class in the river otter (*Lutra canadensis*) in western Tennessee from 1984 through 1993.

	Percent occurrence					
	Sex		Season		Age class	
Food type	Male (n = 75)	Female (n = 49)	Fall (n = 18)	Winter (n = 106)	Juvenile (n = 17)	Adult (n = 65)
Fish	69.9	57.1	44.4	67.9	58.8	66.2
Amphibian	16.0	8.1	22.2	11.4	11.7	12.3
Mammal	5.6	4.1	5.5	4.7	0.0	6.2
Crayfish	61.8	69.4	38.9	68.9	35.3	70.8
Insect	5.3	10.2	0.0	7.5	5.8	9.2
Mollusk	12.0	18.4	16.7	14.2	23.5	15.4

eaten by the river otter in western Tennessee was the bluegill sunfish. Pflieger (1978) found that bluegill sunfish was the most abundant sunfish in man-made impoundments, overflow ponds, and oxbow lakes and also common in the deeper pools and backwater streams in Missouri. These habitats are abundant in western Tennessee and support high densities of sunfish that constitute a major portion of the diet of river otters within the region (Strom, 1992).

Although previous studies of the food habits of *L. canadensis* have tried to identify crayfish to genus or even species (Ryder, 1955; Grenfell, 1974; Toweill, 1974; Lauhachinda, 1978; Chabrek et al., 1982), none have tried to determine if river otters have a preference for certain groups of crayfish. Ryder (1955) and Lauhachinda (1978) found river otter to eat more than one species of crayfish, but neither tried to determine any preference. Chabrek et al. (1982) observed that river otters in Louisiana ate crayfish of only one genus (*Procambarus*) even though the relative abundance of this genus was low. All four genera of crayfish ingested by river otters in western Tennessee occur either moderately or abundantly in several river drainages (Payne and Riley, 1974) and Reelfoot Lake in western Tennessee (Hobbs and Marchand, 1943). However, river otters appear to take more *Procambarus* than other crayfish during the fall and winter in western Tennessee. The results of the present study could be taken to support the conclusion of Chabrek et al. (1982) that river otters have a preference for certain groups of crayfish; reasons for the apparent preference for *Procambarus* in western Tennessee are unclear at this time.

Among the secondary food items found in the diet of river otters in western Tennessee, a variety of aquatic insects, mollusks, and amphibians were identified. Most of the insects identified occurred in trace amounts while only the Coleoptera occurred in ca. 5.0% of the river otters examined. Because bluegill sunfish, green sunfish, catfish, and bowfin have been known to include aquatic insects in their diet (Pflieger, 1978), it has been suggested that some insects occurring in trace amounts could have been ingested secondarily by river otters and were not necessarily taken as actual food items (Griess, 1987). Among the mollusks, freshwater clams appear to comprise an integral part of the diet of river otters whereas aquatic snails occurred in only trace amounts. Bluegill sunfish and catfish are known predators of aquatic snails (Pflieger, 1978); therefore, aquatic snails also may have been secondarily ingested by river otters. Morejohn (1969), the only other study showing extensive feeding on freshwater mussels, observed river otters eating large numbers of *Anodonta californicus* along a creek in California.

Although only three species of amphibians occurred in more than trace amounts, the frequent occurrence of this food type as

TABLE 3. Means for the four standard external measurements (in millimeters) and weights (in kilograms) for males and females of both age classes of river otter (*Lutra canadensis*) in western Tennessee from 1981 through 1993.

	Male		Female	
Measurement	Adult (n)	Juvenile (n)	Adult (n)	Juvenile (n)
Total length	1176.8 (49)**	1074.8 (15)**	1101.0 (44)**	1032.6 (13)**
Tail length	417.6 (49)**	384.7 (15)**	389.5 (45)**	386.6 (13)**
Hindfoot length	124.3 (43)*	121.5 (15)*	115.3 (42)*	118.3 (11)*
Ear length	22.9 (22)	22.4 (10)	21.2 (18)	20.0 (3)
Whole weight	8.9 (16)**	6.7 (5)**	7.5 (14)*	5.9 (1)
Skinned weight	7.0 (29)**	4.5 (6)**	5.3 (30)**	4.1 (11)**
Adjusted weight	8.3 (29)**	5.5 (6)**	6.5 (30)**	5.0 (11)**

* Significantly different between sexes at $P < 0.05$.

** Significantly different between sexes and between age classes within each sex at $P < 0.05$.

a group suggests that it was an important part of the diet. Several other studies have suggested that amphibians are an important supplement to the diet (Toweill and Tabor, 1982; Griess, 1987). Erlinge (1968) in a study on the feeding of captive European river otters (*Lutra lutra*) observed that frogs were preferred over certain fishes and even crayfish. Liers (1951) showed that river otters did poorly on a diet of fish alone and that other food items such as frogs and crayfish could add nutrients that were otherwise lacking. The low frequency of amphibians and lack of reptilian remains was because most of the river otters were collected during fall and winter. Griess (1987) observed a greater occurrence of amphibians and reptiles during spring and summer and suggest seasonal variation in food habits.

As in the present investigation, previous studies have found that river otters eat mammals (Greer, 1955; Hamilton, 1961; Toweill, 1974; Chabrek et al., 1982). However, few investigations have found remains of mammals at more than trace frequencies (Grenfell, 1974; Chabrek et al., 1982). Several investigations have reported muskrat in the diet of river otter (e.g., Wilson, 1954; Greer, 1955; Hamilton, 1961; Grenfell, 1974; Lauhachinda, 1978; Melquist and Hornocker, 1983); yet, only Greer (1955) observed muskrat to occur at a frequency >4.0% during spring and summer. Greer (1955) and Melquist and Hornocker (1983) found muskrats to occur less frequently during fall and winter than during spring and summer. The comparatively high occurrence of muskrats in the diet of river otters in western Tennessee during fall and winter may be because it is locally abundant in many aquatic habitats (Kennedy, 1991) and is frequently available in traps of commercial trappers in the region based on records of fur harvest (Tennessee Wildlife Resources Agency, 1992). Studies that have reported the occurrence of white-tailed deer (Melquist and Hornocker, 1983) in the diet of river otters are few in number. Because many river otters were taken from counties with a high harvest of white-tailed deer (Tennessee Wildlife Resources Agency, 1993), findings of the present study probably represent largely deer that were shot by hunters and then scavenged by river otters.

Several plant items were observed in the digestive tracts. Although plants overall had a high frequency of occurrence (68.8%), most of the vegetative material found was in such small quantity that it could not be construed as an intentional food item. Many of the plants identified occurred in only trace amounts; those that occurred with greater frequency could have been ingested while foraging for prey. Bluegill sunfish and bowfin can be found along the shore in vegetative cover of lentic habitats (Pflieger, 1978), and crayfish, *P. clarkii* and *P. blandigii,* are known to inhabit regions where vegetation is extremely thick (Hobbs and Marchand, 1943). Invertebrates such as aquatic snails occur on plant material on which they feed (Pennak, 1978). Because all of these prey items frequently occur in the river otter's diet, it is very likely that ingestion of plant items such as milfoil, false loosestrife, and roots occurred accidentally. Liers (1951) noted that river otters would root through mud and debris to find frogs and get mouthfuls of mud and debris along with the frogs. This could explain the high occurrence of grass and woody plants in the present study. Therefore, the occurrence of plant items in the digestive tracts of river otters was considered unimportant and categorized as a non-food item.

Results of comparisons of food types by sex, season (fall and winter), and age that showed no significant statistical difference in the present study were similar to findings reviewed by Toweill and Tabor (1982). Such results, which indicate a relatively small variance between frequencies of food types eaten and a high level of similarity in food types taken, suggest a high dietary overlap within populations of river otters.

As seen in the present study, the number of males in most samples (those generally derived from trapper-caught river otter) is generally greater than the number of females. Such results have been reported by Wilson (1959), McDaniel (1963), Hamilton and Eadie (1964), Tabor (1974), and Mowbray et al. (1979). The greater number of males in samples is usually attributed to the fact that males are more accessible for harvest because they range more widely than females (Lauhachinda, 1978). However, in the present study, the ratios of males to females when assessed by age classes suggest a near 1:1 ratio. Sex ratios of northern river otter (Michigan, Idaho, and Oregon) usually do not differ significantly from 1:1 (Toweill and Tabor, 1982).

Age structure for river otters in western Tennessee showed a greater number of adults than juveniles. Little is known about the dynamics of age structure in populations of river otters. Growing populations are usually characterized by a larger number of young while declining populations are characterized by a higher proportion of the individuals moving into the older age classes (Smith, 1992). Juveniles have been reported to compose the greatest part of populations of river otters in Arkansas, Idaho, and Oregon (Tabor and Wright, 1977; Melquist and Hornocker, 1983; Polechla, 1987). Because the river otter was protected from harvest in western Tennessee for a period of ca. 45 years (Tennessee Wildlife Resources Agency, 1992), the population may have reached a stage where it was beginning to show signs of decline rather than growth and would benefit from controlled harvest. Because the present study only examined two age groups (juvenile and adult), the age structure for the population in western Tennessee remains unclear and further study is needed to better understand such patterns.

Weights reported in the present study are within the range reported for the species (Hall, 1981). Means for whole weight of adult river otters from western Tennessee were greater than those of adults from Alabama and Georgia (Lauhachinda, 1978) and smaller than those of adults from Arkansas (Polechla, 1987). Whole weights of animals from western Tennessee were only slightly less than those reported for river otter from Idaho (Melquist and Hornocker, 1983). Weights of animals with the skin removed were larger than those reported for river otter in the same condition from Ontario (Stephenson, 1977) and Alabama and Georgia (Lauhachinda, 1978). In general, larger size is observed in more southern populations (van Zyll de Jong, 1972).

The external measurements recorded in the present study also are within the range reported for the species (Hall, 1981). Adult river otters from western Tennessee are bigger than adults from Alabama, Georgia, and Ontario (Stephenson, 1977; Lauhachinda, 1978) but slightly smaller than those from Idaho (Melquist and Hornocker, 1983). Van Zyll de Jong (1972) observed a size gradient of larger animals in the south in the more eastern portion of the species range while the opposite was observed along the western coast of North America.

Average litter size of river otters in western Tennessee was similar to that of other investigations (Toweill and Tabor, 1982). Litter size for the species usually ranges from 1.0 to 6.0 (Hamilton and Eadie, 1964) with 2.0 to 4.0 pups most common (Toweill and Tabor, 1982). Within a given region, production of young may reflect a number of biological and physical factors (e.g., abundance of food, population density, effective breeding size; Smith, 1992) but usually gives a good estimate of the rate of

recruitment in the population. Factors involved in the reproductive success of river otter are in need of additional study.

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