Notes

Implantation and Parturition Dates of North American River Otters, *Lontra canadensis,* in Southern Missouri

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Despite numerous studies of reproductive dynamics of the North American River Otter (*Lontra canadensis*), relatively little information exists on the implantation or parturition dates of North American River Otters in the wild. We collected carcasses of North American River Otters that had been legally harvested in southern Missouri, USA, between 1997 and 1999 as part of a larger population dynamics study. Embryos (n = 28) were removed from a subset of North American River Otters (n = 9) during necropsy. Using harvest dates and crown–rump length measurements of embryos, we estimated implantation dates, which ranged from 7 December to 12 January, and parturition dates, which ranged from 8 February to 15 March (assuming an implantation time of 63 days). Our results are similar to other studies that have reported parturition dates ranging from mid-January to early May in more extreme latitudes. Our results suggest that variation in implantation and parturition dates among populations are likely related to factors affected by latitude such as photoperiod and winter weather severity.

Key Words: North American River Otter, *Lontra canadensis*, implantation, parturition, reproduction, Missouri.

North American River Otters (*Lontra canadensis*) are one of the most widespread and commercially valuable furbearers in North America (Melquist et al. 2003). Although unregulated trapping and habitat destruction reduced North American River Otter populations throughout much of their historical range (Anderson 1977), reintroduction programs throughout North America have restored North American River Otter populations in many areas (Raesly 2001). North American River Otter populations in many areas have recovered and in some cases have increased beyond post-settlement levels (Hamilton 1998*).

Because of the variety of habitats in which North American River Otters occur and the abundance of translocated populations throughout North America (>20), there is extreme variability in reproductive dynamics (Chilelli et al. 1996, Raesly 2001). Implantation and parturition dates of North American River Otters have been estimated primarily from native populations at extreme northern or southern latitudes (McDaniel 1963; Woolington 1984; Polechla 1987). Relatively little information exists on the reproductive timing of North American River Otters in introduced or restored populations, or in areas of middle latitude. It is unknown whether reproductive timing in restored populations is driven by factors related to geographic location, such as photoperiod and habitat quality, or by remnant behavioral and genetic patterns from source populations.

Knowledge of parturition timing is of interest to wildlife managers, as harvest regulations often consider the consequences of removing adult animals with dependent offspring. Our objectives were to estimate implantation and parturition dates of North American River Otters in a restored population occurring at mid-range latitudes in southern Missouri.

Study Area and Methods

We conducted our study in the Ozark region of southern Missouri (37°19'N, 91°58'W). The area is characterized by deeply dissected sandstone, limestone, and dolomite hills. There is moderate to high relief near the rivers, with limestone formations dominating much of the riparian area. Upland areas are primarily oak (*Quercus* spp.) and hickory (*Carya* spp.) woodlands with occasional pine (*Pinus* spp.) and oak woodland and cleared agricultural land. Streams of the region are influenced by numerous springs that contribute to significant base flow and limit overwinter freezing. Streams are also characterized by low turbidity and well-defined riffle–pool complexes. As such, river systems of the region tend to support high densities of North American River Otter prey and structural habitat (Hamilton 1998*; Roberts 2003).

Between 1982 and 1992, the Missouri Department of Conservation released 845 North American River Otters into various rivers in Missouri, with the majority being released in the Ozarks (Hamilton 1998*). A

TABLE 1. Estimated implantation and parturition dates for North American River Otters harvested in the Missouri Ozarks between 1997 and 1999. Mean length is crown–rump length of embryos.

ID	Age (years)	Number of embryos	$\bar{x}$ length (mm)	Harvest date	Estimated implantation date	Estimated parturition date
299	5	4	29.75	20 January 1997	7 January 1997	11 March 1997
288	1	4	124.25	February 1997	December 1996	late February 1997
248	3	4	111.25	February 1997	December 1996	late February 1997
294	4	3	124.33	February 1997	December 1996	late February 1997
647	1	1	42.00	8 January 1998	21 December 1997	22 February 1998
639	1	4	80.00	11 January 1998	7 December 1997	8 February 1998
657	4	3	51.33	17 January 1998	26 December 1997	27 February 1998
642	1	2	65.00	17 January 1998	20 December 1997	5 March 1998
1051	1	3	19.00	20 January 1999	12 January 1999	15 March 1999

small remnant population of approximately 20 individuals was thought to exist at the onset of re-introduction efforts. Most North American River Otters used during the reintroduction were live-captured and translocated from free-ranging populations in Arkansas and Louisiana in the United States and in Ontario in Canada (Raesly 2001). In 1996, the Missouri Department of Conservation determined that the North American River Otter population in Missouri was recovered, based on increasing incidental harvest and public sightings, and a public trapping season was opened.

We collected North American River Otter carcasses from trappers during the 1996-1997 (n = 140), 1997-1998 (n = 124), and 1998-1999 (n = 123) trapping seasons. All carcasses were collected within one week of harvest to reduce tissue degradation. Carcasses were aged using radiograph (Kuehn and Berg 1983) and cementum annuli analysis of canine teeth (Stephenson 1977). We collected reproductive data by examining the reproductive tracts from a random subset of carcasses. Carcasses were visually examined for the presence of embryos (Harder and Kirkpatrick 1996). Embryos were aged by measuring crown–rump length, according to Hill and Lauhachinda (1981). Implantation and parturition dates were estimated assuming an implantation time of 63 days (Cocks 1881; Polechla 1987; Larivière and Walton 1998).

Results and Discussion

Embryos were recovered from nine North American River Otters, ranging in age from one to five years (Table 1). The number of embryos ranged from one to four ($\bar{x}$ = 3.11, SD = 1.05). Estimated implantation dates ranged from 7 December to 12 January (Table 1). Estimated parturition dates ranged from 8 February to 15 March (Table 1). The exact harvest dates for three of the North American River Otters were unknown, and implantation and parturition dates were estimated as December and February, respectively.

Implantation dates in North American River Otters vary latitudinally and are thought to be triggered by photoperiod (Melquist and Dronkert 1987). At southern latitudes (which have longer photoperiods), implantation may occur as early as mid-November (McDaniel 1963), while at northern latitudes (which have extremely short photoperiods) implantation can occur as late as mid-February (Woolington 1984). Parturition dates in North American River Otters can also exhibit extreme variability across latitudes. At southern latitudes, parturition can occur as early as mid-January (McDaniel 1963). Conversely, at extreme northern latitudes, parturition may not occur until May (Woolington 1984; Noll 1988). Our estimated implantation and parturition dates fall within the range of values reported by previous researchers; this would be expected, given the mid-range latitude of our study area.

Our study population exhibited high reproductive rates (~3 young per adult) and a young age at first reproduction (Gallagher 1999). Reported reproductive rates in other populations are typically below three corpora lutea per adult (e.g., Hamilton and Eadie 1964; Lauhachinda 1978; Docktor et al. 1987), with juvenile reproduction considered anomalous (Chilelli et al. 1996). Differences in the timing and duration of estrus among age groups may affect breeding and implantation dates (Harder and Kirkpatrick 1996). Extrinsic factors such as habitat quality and forage abundance, which were very high in our study area (Roberts 2003), may also affect reproductive dynamics (Melquist et al. 2003) and thus implantation and parturition dates. We did not have a sufficiently large sample to determine age-related differences in implantation or parturition dates, but our estimated dates were well within the range of reported values, despite the high quality of habitat in our study area, suggesting that factors related to latitude (e.g., photoperiod, winter weather severity) may be more important than habitat quality in dictating reproductive timing of North American River Otters.

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