

# Litter Size and Age of First Breeding of Florida Black Bears

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*Abstract:* We estimated litter size and age of first reproduction of female black bears in Florida from the examination of 139 female reproductive tracts. Corpora lutea occurred in 81 of the tracts. The number of corpora lutea per tract, a close approximation of litter size, averaged 2.6 (range: 1–4). Most (75%) female bears bred initially when 2.5 years old, and the remainder at 3.5 years. Litter sizes and age of first breeding of female black bears in Florida are comparable to those found in other productive areas of eastern North America.

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The historic range of the Florida black bear (*Ursus americanus floridanus*) included Florida, southern Georgia, and southern Alabama (Hall and Kelson 1959). Bears remain widely distributed, but the current distribution is patchy because of habitat loss associated with modern human settlement and urban and agricultural development.

Reproduction is one of the most important aspects of a species' life history, yet there is little published information on this topic for the Florida black bear. Harlow (1961) reported litter size based on observations of 10 females accompanied by cubs; the average litter was 2.2 cubs, with a range of 1–4. Wooding and Hardisky (1988) determined the age of first reproduction for 2 females radio-monitored in Ocala National Forest to be 3 and 4 years old, respectively.

The objective of this study was to determine litter size and age at first reproduction of female Florida black bears. These reproductive parameters were estimated by examining female reproductive tracts collected from bear carcasses. The technique has been widely used to assess reproduction in female black bears (Table 1), and works well with black bears for 2 reasons. First, corpora lutea are an indication of breeding because black bears are induced ovulators (Wimsatt 1963, Boone et al. 1996). Second, counts of corpora lutea closely approximate litter size because black

**Table 1.** Litter size and age of first breeding of black bears in North America.

Reference	Location	Litter size (method <sup>a</sup> )	Age of first breeding
Alt 1989	Pennsylvania	3.0 (CO)	1.5 years
Maddrey 1995	North Carolina	2.4 (CP)	1.5 years
Hellgren and Vaughan 1989	Virginia	2.3 (CO) 1.8 (CL)	2.5 years
Carlock et al. 1983	Southern Appalachians	2.5 (CL) 2.6 (PS)	2.5 years
This study	Florida	2.6 (CL)	2.5 years
McLaughlin et al. 1994	Maine	2.5 (CO)	3.5 years
Erickson and Nellor 1964	Michigan	2.4 (CL) 2.2 (CO)	3.5 years
Poelker and Hartwell 1973	Washington	1.9 (CL) 1.9 (PS)	3.5 years
Jonkel and Cowan 1971	Montana and Washington	1.9 (CL)	4.5 years

<sup>a</sup>CL = corpora lutea, PS = placental scars, CP = corpora lutea and placental scars, CO = cub observations.

bears exhibit “relatively low ova loss and low intra-uterine mortality of embryos and fetuses” (Erickson and Nellor 1964:39).

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## Methods

Female reproductive tracts ( $N = 139$ ) were collected during 1978–1992 from the carcasses of black bears killed by hunters ( $N = 69$ ), vehicles ( $N = 66$ ), or poachers ( $N = 4$ ). Bears ( $N = 130$ ) were aged by tooth replacement or by cementum annuli in a premolar tooth. Bear carcasses were obtained throughout Florida, but most originated in and around Apalachicola National Forest ( $N = 66$ ), Ocala National Forest ( $N = 29$ ), Osceola National Forest ( $N = 19$ ), and Big Cypress National Preserve ( $N = 14$ ). Carcasses were collected throughout the year.

Tracts were stored prior to examination either frozen ( $N = 84$ ) or in formalin or alcohol ( $N = 55$ ). Tracts were examined macroscopically without staining following the methods of Kirkpatrick (1980). Litter sizes (1, 2, 3, or 4) by age class were compared using Fisher’s exact test (Steele and Torrie 1980). Bears  $\geq 6$  years old were grouped in 1 age class for the comparison.

Litter size was estimated only from counts of corpora lutea. Other studies have also used placental scars to estimate litter size in black bears (Table 1), but we found it difficult to interpret the scars because of variability in their intensity. Collins (1974) had similar problems interpreting placental scars in black bears. Although we did not use placental scars as a measure of litter size, they were used with corpora lutea to

assess the age of first reproduction. Only distinct scars were counted, and it was assumed the scars were <12 months old.

## Results and Discussion

Corpora lutea were observed in 81 reproductive tracts. The number of corpora lutea per reproductive tract averaged 2.6 (4 tracts had 1 corpora lutea, 34 had 2, 36 had 3, and 7 had 4).

Ages were assigned to 78 of the bears whose reproductive tracts contained corpora lutea. The mean number of corpora lutea (CL) and standard error (SE) of the means by age class for the tracts containing CL were as follows: 2-year-old ( $N = 9$ ), 2.11 (SE 0.22); 3-year-old ( $N = 13$ ), 2.46 (SE 0.18); 4-year-old ( $N = 9$ ), 2.00 (SE 0.22); 5-year-old ( $N = 10$ ), 2.50 (SE 0.21); and  $\geq 6$ -year-old ( $N = 37$ ), 2.90 (SE 0.11). The 2 oldest bears in the sample (16 and 18 years old) had neither corpora lutea or placental scars. The oldest bear with corpora lutea was 15 years old.

Litter size, as estimated by corpora lutea, differed by age class when all age classes were considered ( $P = 0.027$ ). In single comparisons between age classes, litter sizes were different only between 2 year olds and bears  $\geq 6$  years old ( $P = 0.023$ ), and between 4 year olds and bears  $\geq 6$  years old ( $P = 0.003$ ). The smaller litter sizes of 2 year olds, or first-time breeders, has been documented elsewhere (McLaughlin et al. 1994, Noyce and Garshelis 1994). The small litter sizes of 4 year olds in the sample is difficult to explain.

Black bear litter sizes, as approximated by corpora lutea counts, were similar in Florida to other locations in North America (Table 1). In general, throughout the species' range, black bear litters average 2–3 cubs (Table 1).

We found no evidence of breeding in females <2.5 years old ( $N = 20$ ). Twelve reproductive tracts of females 2.5–3.0 years of age were examined; 9 (75%) contained corpora lutea, indicating breeding at age 2.5. Black bears in Florida breed in summer and give birth in January or February after a 7-month gestation period (Erickson and Nellor 1964, Pelton 1982, Wooding and Hardisky 1988). If the 2-year-old females with corpora lutea had survived, and their pregnancies gone to term, they would have given birth to their first cubs when they were 3 years old.

Fifteen reproductive tracts of 3-year-old females (all 3.75 years old) were examined. Three contained placental scars (interpreted as an indication they had bred at age 2.5 years and produced a litter at age 3 years) and 13 contained corpora lutea (indicating breeding at age 3.5 years). One tract of a 3-year-old contained both placental scars and corpora lutea (indicating she bred at age 2.5, produced cubs at age 3, and bred again at age 3.5). This is unusual because black bears normally breed every other year (Pelton 1982). The most plausible explanation for breeding in consecutive years is that the female's first litter died soon after parturition, a common occurrence in black bears for first breeders (Alt 1982, McLaughlin et al. 1994), thus allowing her to recycle and breed again.

Most (75%) female bears in our sample bred initially when 2.5 years old, and the remainder at age 3.5 years. The high proportion of 2-year-olds breeding in Florida

is comparable to that found by Alt (1989) for Pennsylvania (82%) and by Maddrey (1995) for coastal North Carolina (64%).

In our sample, 75% of the 2-year-olds and 87% of the 3-year-olds were pregnant. These data appear inconsistent considering the normal litter frequency of 1 litter every 2 years. There are at least 2 plausible explanations for these data. One is that a high percentage of the pregnancies of 2-year-olds do not go to term, or the litters are lost soon after parturition, thus enabling the females to breed again at age 3.5 (Alt 1989). The placental scar data supports the interpretation that the pregnancies did not go to term (only 1 tract of a 3-year-old contained corpora lutea and scars). However, it should be remembered that we found it difficult to distinguish placental scars, so the lack of scars in our sample of 3-year-olds was inconclusive. A second explanation for the high proportion of pregnant 3-year-olds is that the sampling procedure selected against 3-year-olds with cubs. This interpretation is consistent with the fact that 11 of the 15 3-year-olds were killed by hunters, and that hunting regulations prohibited killing females with cubs.

Data collected in this study will be useful for modeling population demographics of black bears in Florida. However, they represent the maximum reproductive potential and should be used with this caution in mind.

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