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Authors: Dunbar, Michael R., Cunningham, Mark W., Wooding, John B., and Roth, Randy P.

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Cryptorchidism and Delayed Testicular Descent in Florida Black Bears

Michael R. Dunbar,^{1,2} Mark W. Cunningham,¹ John B. Wooding,¹ and Randy P. Roth,^{1,3} ¹Florida Game and Fresh Water Fish Commission, Wildlife Research Laboratory, 4005 South Main Street, Gainesville, Florida 32601, USA; ²Present address, National Biological Service, National Wildlife Health Center, 6006 Schroeder Road, Madison, Wisconsin 53711, USA; ³Present address, 7531 SW 3rd Place, Gainesville, Florida 32607, USA

ABSTRACT: Retained testes were found in 11 (16%) of 71 black bears (*Ursus americanus*) examined over a 3-year period in Florida (USA). Four of the 11 bears were older than one year and weighed more than 32 kg; therefore, they were considered to be cryptorchid. The remaining seven bears may have had delayed testicular descent due to their apparent normal immature development. This is the first known published report of the prevalence of cryptorchidism and apparently normal delayed testicular descent in a black bear population.

Key words: Black bear, *Ursus americanus*, cryptorchid, testes, reproduction.

Testicular descent in mammals is the process by which the testes move from their initial position, immediately caudal to the kidneys, into the scrotum. While normally an event of fetal life, it is not unusual for the complete descent into the scrotum to be delayed until several months after birth (Jones and Hunt, 1983). However, retention of one or both testes beyond this time constitutes cryptorchidism. Cryptorchidism is a developmental defect and is usually considered a permanent condition. The retained testis may be found within the abdominal cavity, inguinal canal, or subcutaneously near the scrotum.

Cryptorchidism can be heritable and is believed to result from a sex-limited autosomal recessive, or in some species, dominant gene (Rhoades and Foley, 1977). A polygenic mode of inheritance has been suggested by Robinson (1987) to occur in domestic cats. However, other factors may result in cryptorchidism, including prolonged breech labor (Depue, 1984), navel infections during testicular descent (Romagnoli, 1991), exposure of the fetus to an increased maternal estrogen concentration (Depue et al., 1983), or antiandrogenic chemicals (Hutson et al., 1994), or mater-

nal vitamin A deficiency during fetal development (Wilson et al., 1953).

Cryptorchidism has been reported in humans (Depue, 1984), many species of domestic animals (Claxton and Yeates, 1972; Hayes, 1986; Romagnoli, 1991; Millis et al., 1992), and several species of wild carnivores including maned wolves (*Chrysocyon brachyurus*), (Burton and Ramsay, 1986), Florida panthers, (*Felis concolor coryi*), (Roelke et al., 1993), and mountain lions (*Felis concolor*) (Barone et al., 1994). Cryptorchidism in black bears (*Ursus americanus*) has only rarely been observed in the southeastern United States by M. R. Vaughan (pers. comm.) and one case in south Florida (USA), by J. W. McCown (pers. comm.), but has not been reported previously in published literature. We provide information on the prevalence of cryptorchidism and apparently normal delayed testicular descent in black bears in one population.

Seventy-one male black bears from Florida were examined that were either live-captured and released ($n = 20$) or found dead ($n = 51$). Six bears were captured in northern Florida (30°20'N, 82°30'W) from 14 July to 24 August 1994, and 14 in the central portion of the Florida panhandle (30°30'N, 84°00' to 85°00'W) from 7 June 1995 to 20 July 1995 using Aldrich foot-snares (Johnson and Pelton, 1980). Trapped bears were immobilized with tiletamine hydrochloride and zolazepam hydrochloride (Telazol®, Fort Dodge Laboratories, Incorporated, Fort Dodge, Iowa, USA) at a dose of 4.5 mg/kg. Drugs were administered with a gas-powered dart pistol (Telinject USA, Incorporated, Saugus, California, USA). After immobili-

zation, bears were weighed and their testes were examined by palpation of the scrotum. Age of 33 bears was determined using morphological characteristics and tooth eruption and wear (Marks and Erickson, 1966) while the age of 38 bears was determined from cementum annuli in a premolar (Willey, 1974). Bears were arbitrarily assigned a birth date of 1 January.

Bears found dead died of vehicular collision ($n = 47$), gunshot wound ($n = 3$), or from capture-related injuries ($n = 1$), and were collected from 30 September 1993 to 18 July 1995 throughout Florida during all months of the year. Bears were stored at -20°C and the thawed carcasses were weighed and subjected to a complete necropsy. During necropsy, the scrotum of each bear was palpated for presence of descended testis. If a testis was found to be undescended, the subcutis, inguinal canal, and abdomen were incised to locate and examine the testis. Testes of cryptorchid bears were measured to the nearest mm for total length, width, and circumference.

Mean (\pm SD) age for 48 aged bears was 3.4 ± 3.0 yrs and ranged from 0.5 to 15 yr; the mean (\pm SD) weight was 92 ± 52 kg and ranged from 9 to 205 kg. Eleven (16%) of 71 black bears had either one or both testes undescended. Four (5.6%) of 71 bears were considered either unilaterally ($n = 3$) or bilaterally ($n = 1$) cryptorchid because of their apparent maturity; > 1 yr of age and weighing ≥ 32 kg. Seven (9.9%) of 71 bears with either unilaterally ($n = 1$) or bilaterally ($n = 6$) retained testes may have had normal delayed testicular descent because of their normal immature development. Six of the seven bears were < 1 yr of age and weighed < 32 kg; one weighed 20 kg but was 1.2 yr old.

The seven bears believed to have normal delayed testicular descent came from several different populations throughout Florida. The three bears considered cryptorchid were of eight examined from the western portion of the Florida panhandle ($30^{\circ}45'\text{N}$, $85^{\circ}00'$ to $87^{\circ}30'\text{W}$). The fourth

cryptorchid bear was one (1.6%) of 63 examined from the remainder of the state.

The four cryptorchid bears were either killed by vehicular collision ($n = 3$) or from a gunshot wound ($n = 1$). Ages ranged from 1.8 to 4.0 yr and body weights from 32 to 155 kg. They were all in good body condition. One bear had both testes retained, two had the right, and one the left testis retained. Three bears' testes were located subcutaneously near the external inguinal ring, and one bear's testis was located intra-abdominally. In all cases, the retained testis was measurably smaller than the descended testis.

The prevalence of cryptorchidism in non-inbred domestic animals varies by species and breed. Hayes et al. (1985) reported a 1.2% prevalence of cryptorchidism in a sample of 1.2 million domestic dogs. Millis et al. (1992) examined 1,345 domestic cats and found a 1.7% prevalence of cryptorchidism. Barone et al. (1994) found a 3.7% prevalence of cryptorchidism in apparently non-inbred mountain lions (*F. concolor*), compared to a 50% incidence in apparently inbred free-ranging Florida panthers (Dunbar, 1994).

The 5.6% prevalence of cryptorchidism we found in Florida black bears sampled statewide may be a normal prevalence in a non-inbred population. However, the three of eight observed in the western portion of the Florida panhandle is apparently abnormal and could be a result of inbreeding. Some inbred populations of other species exhibit congenital anomalies including a high prevalence of cryptorchidism (Claxton and Yeates, 1972; Burton and Ramsey, 1986; Roelke et al., 1993).

Our finding that testes of black bears do not descend until about 1 yr of age or upon reaching a body weight of approximately 32 kg has not been previously reported. Erickson et al. (1964) examined testes of seven cubs in Michigan (USA) ranging in age from 0.6 to 0.7 yr and did not mention any occurrence of retained testes. Therefore, delayed testicular de-

scent in black bears in Florida may be abnormal or unique to bears in Florida.

We examined only one < 1 yr old bear. It had a body weight of 27 kg and a single descended testis; the second testis was retained. We examined nine bears ranging in age from 1.0 to 1.9 yr with weights ranging from 25 to 61 kg that had normally descended testes. One 1 yr old bear with fully descended testes weighed 38 kg. The only bear < 32 kg that had normally descended testes was 1.4 yr old.

In our study, it appears that factors involved with testicular descent in young bears may include age and body weight. Based on our limited data we believe that black bears from Florida that are > 1 yr of age weighing \geq 32 kg with retained testes should be classified as cryptorchid, and bears \leq 1 yr of age and weighing < 32 kg with retained testes should be classified as apparently normal until further information is available.

Inbreeding as a cause of cryptorchidism in Florida black bears cannot be discounted because bear populations in the western portion of the Florida panhandle, where 75% of the cryptorchid bears were found, are small and fragmented (Brady and Maehr, 1985). No evidence was found of exposure to environmental contaminants. However, nutritional deficiencies during a critical period of sexual morphological development is a possible explanation.

This study should assist researchers in identifying true cryptorchidism from apparently normal delayed testicular descent in Florida black bears. Our reported prevalence of cryptorchidism and delayed testicular descent in black bears may also assist researchers in identifying populations possibly suffering from inbreeding, exposure to certain biohazardous chemicals, nutritional deficiencies, or other factors.

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