Cub adoption by a translocated Louisiana black bear

John F. Benson[1] and Michael J. Chamberlain

School of Renewable Natural Resources, Louisiana State University, Baton Rouge, LA 70803, USA

Abstract: We documented the adoption of a cub by a female Louisiana black bear (*Ursus americanus luteolus*) after the cub was apparently abandoned by its biological mother. The adoption and presumed abandonment took place in a reintroduced population and involved recently translocated bears. We are unaware of previous published descriptions of free ranging female black bears adopting cubs without human intervention.

Key words: adoption, American black bear, cubs, denning, Louisiana, reintroduction, translocation, *Ursus americanus luteolus*

Ursus 17(2):178–181 (2006)

Natural cub adoption has been reported for free ranging polar (*Ursus maritimus*) and brown (*U. arctos*) bears (Erickson and Miller 1963, Craighead et al. 1969, Barnes and Smith 1993, Atkinson et al. 1996, Derocher and Wiig 1999, Lunn et al. 2000). Female American black bears (*U. americanus*) with newborn cubs readily adopt unrelated cubs placed in their dens by humans (Alt 1984, Alt and Beecham 1984, Rogers 1986, J.F. Benson, personal observation). Jonkel et al. (1980) stated that natural cub adoption has been reported for black bears, but they did not describe details. We are unaware of published descriptions of free ranging female black bears adopting cubs without human intervention. Alt (1984) investigated occurrence of natural adoption by black bears by marking 93 litters (266 cubs) in natal dens and checking dens the following winter to see if any marked cubs were found with foster mothers; however, he found no evidence of adoption. Here we report a cub adoption by a translocated adult female Louisiana black bear (*U. a. luteolus*). This female had a known litter size of 1 and adopted a second cub that we believe was abandoned by another translocated female. The adoption was documented in March–April 2005 during fieldwork for the Louisiana black bear repatriation project.

In an attempt to establish an additional population of the federally threatened Louisiana black bear (Neal 1992) and to promote connectivity and gene flow among populations, we translocated 23 adult females with 55 cubs to unoccupied habitat in central Louisiana between 2001–2005 using the winter soft release technique (Eastridge and Clark 2001, Van Why 2003, Benson 2005). Most (91%) bears were captured in the Tensas River Basin (TRB) population in Northeast Louisiana prior to translocation. During March 2005, 7 adult females and 15 cubs were released into Three Rivers Wildlife Management Area in central Louisiana. All adult females were fitted with radiotransmitters and placed with their cubs into wooden den boxes at the release site. We attempted to locate these females daily following release to monitor movements and survival using standard radiotelemetry triangulation (White and Garrott 1990).

The adult females involved in the adoption were bears D21 and T5. D21 was translocated on 15 March 2005 with 2 cubs, whereas T5 was translocated on 16 March 2005 with 1 cub. These 2 adults and their cubs were released into artificial den boxes separated by 1.6 km. Between 15 March and 26 March, D21 exhibited relatively small movements between successive locations ($\bar{x} = 232.3$ m, range = 22.9–370.7 m, $n = 6$) and was always located <300 m from her den box. On the morning of 28 March, D21 had moved 3.8 km east from her last location (3.9 km east from den box), and we became concerned about potential cub abandonment. We were unable to locate D21 during the evening of 28 March, and by morning of 29 March she had moved 3.7 km northwest of her previous location (4.2 km northeast from the den box). At this point we strongly suspected cub abandonment had occurred and walked into the den box in an attempt to locate the cubs. Although we were unsuccessful, a strong signal from T5's radiotransmitter indicated she was close to D21's den box. Standing at the den, we heard a strong signal on T5's radiofrequency without a cord or antenna attached to the telemetry receiver, indicating that she was in the immediate vicinity (likely <30 m). To our knowledge, this was the first time T5 had been in this area and away from her den box. We ceased searching around the den box of D21 to prevent further disturbance to T5.

[1]Present address: Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, 566 Commercial Boulevard, Naples, FL 34104, USA; john.benson@myfwc.com

For the next 3 days we were unable to locate D21 despite extensive ground tracking. On 2 April, we located D21 via aerial telemetry 17.8 km to the northeast, and her location indicated that she had crossed the Mississippi River. We located her twice more during April via aerial telemetry, and the distances between successive locations were 14.5 km (5 days between locations) and 25.7 km (21 days between locations). Although we documented translocated females with cubs making large movements (>14 km) and crossing rivers later in the year, we have not documented these behaviors for females with cubs during March or early April (J.F. Benson and M.J. Chamberlain, unpublished data). Presumably, cubs lack the strength and mobility for such movements during early spring. D21's movement patterns were similar to 2 other females known to have abandoned cubs after relocation to central Louisiana in that she left the release site shortly (<2 weeks) after release, made large, directional movements, crossed a large river during late March–early April, and never returned to the area of her den box. Additionally, she produced a litter of cubs the following winter (2006), indicating that she lost her 2005 litter at some point during the year. Thus, although we cannot be certain, we suspect that D21 abandoned her cubs.

On 29 April, we triangulated T5 and walked into the location in an attempt to visually determine if her cub was still with her. As we approached, we did not see T5 but the signal was very loud without the antenna or cord attached to receiver, indicating that she was in the immediate vicinity. At this point we clearly saw 2 cubs emerge from behind some vegetation and climb a tree. This was surprising given that T5's original litter size was 1. We quickly scanned the area in and around the tree to determine if additional cubs were present and then left the area to prevent further disturbance to T5 and the cubs. We did not obtain definitive visual confirmation of cub survival for T5 after 29 April, but we received multiple unconfirmed reports from people in the area indicating that T5 had 2 cubs as late as July 2005.

Given that T5 apparently acquired an additional cub sometime during March or April and was close to D21's den box at the time the latter abandoned her den, we assume that T5 adopted at least 1 of D21's cubs. We are reasonably sure that all females in the area ($n = 5$) were translocated individuals whose movements we regularly monitored. T5 was never detected near other denning females during the period of the cub adoption. No females were in the area when we observed the 2 cubs near T5. The exact circumstances surrounding the adoption are unknown, but the most parsimonious explanation is that D21 abandoned her cubs and T5 found and adopted at least 1 unattended cub. When young black bear cubs are left by their mothers, they often cry loudly (J.F. Benson, personal observation), and this noise could have attracted T5. An alternate explanation is that T5 acquired an additional cub from D21 while the latter was still at the den with her cubs and that perhaps an agonistic encounter between the adults prompted D21 to leave the area. This seems unlikely because T5 did not enter the area of D21's den until after D21 had moved approximately 4 km from the den.

T5 had a history of accepting and attempting to raise unrelated offspring. On 30 March 2003, a translocated female (D6) abandoned 3 cubs after her release onto Lake Ophelia National Wildlife Refuge in central Louisiana. We recovered all 3 cubs in the artificial den box, transported them to the source population in the Tensas River Basin (TRB), and placed 2 cubs with T5 in her den in a baldcypress (*Taxodium distichum*) tree cavity. We observed T5 on 10 May 2003 with 5 cubs during routine telemetry. We do not know her original litter size in 2003, but given that mean reported litter size in the TRB is 2.43 (range = 1–4, $n = 23$; Benson 2005), it seems probable that she was attempting to raise at least 1, and likely both, orphaned cubs.

The social circumstances and evolutionary significance of cub adoption have been discussed for polar and brown bears (Erickson and Miller 1963, Atkinson et al. 1996, Derocher and Wiig 1999, Lunn et al. 2000). Kinship theory is a possible mechanism explaining cub adoption, because females could accrue inclusive fitness benefits by raising the offspring of close relatives (Hamilton 1964*a*, 1964*b*; Atkinson et al. 1996; Lunn et al. 2000). Lunn et al. (2000) rejected this explanation because female polar bears known to have exchanged cubs in their study were not closely related. Theoretically, kinship theory could explain the evolution of adoption for black bears because females often establish home ranges within or adjacent to those of their mothers (Rogers 1987); therefore, if a female encounters unattended cubs they are likely closely related. However, we suspect that attempting to raise additional cubs probably decreases the probability of survival of the original cubs (her direct offspring), which would not be a beneficial fitness trade-off. The females involved in our observation of adoption were probably not closely related because they were translocated from different subpopulations of the TRB and their proximity during April 2005 had nothing to do with normal female black

bear socio-spatial patterns. Given that the spacing of these bears was strongly influenced by placement of den boxes, our report may be a poor indicator of factors influencing this behavior in non-reintroduced populations.

We agree with research suggesting that mistaken identification of offspring when females contact unrelated cubs is the most plausible proximate explanation of cub adoption by bears (Erikson and Miller 1963, Atkinson et al. 1996, Lunn et al. 2000). Bears are generally solitary, with the exception of mother–offspring groups, and typically occur at low densities. Thus, selection for offspring recognition is probably weak compared with more gregarious species (Breed and Bekoff 1981, Atkinson et al. 1996, Lunn et al. 2000). Reports of cub adoption by brown bears have occurred at highly clumped food sources, where litters were mixed and mothers may have been unable to discriminate between their offspring and those of other bears (Erickson and Miller 1963, Barnes and Smith 1993), and similar circumstances have been suggested as an explanation for cub adoption by polar bears (Lunn et al. 2000). Black bears occasionally congregate at highly concentrated food sources (Young and Ruff 1982, Rogers 1987), but we believe this is unlikely to result in cub adoption for several reasons. Alt and Beecham (1984) found that with human-assisted adoption events, females readily adopted cubs during denning (until late Apr) but generally rejected and killed unrelated cubs later in the year. This suggests that black bears are only receptive to adopting cubs during denning in winter and early spring (Jan–Apr). Because parturient female black bears are unlikely to be concentrated at food sources during this period of receptivity (parturient females are usually in dens and foods are often scare during this period), mistaken identity while at clumped food sources remains an unsatisfactory explanation of cub adoption by black bears.

We suggest, alternatively, that proximity of den sites could allow multiple parturient females to come into close proximity during winter–early spring when they are apparently receptive to accepting orphaned cubs. Admittedly, the den boxes of D21 and T5 were separated by 1.6 km, and therefore not spatially close. However, in the TRB most females den in baldcypress tree cavities, suitable denning trees appear to be highly clumped into several swamps where such trees are abundant, and relatively high reuse of den trees may suggest that den sites are limited (Benson 2005). We documented multiple cases of 2 parturient females denning in trees separated by <100 m in this population (J.F. Benson and M.J. Chamberlain, unpublished data). We believe these relatively clumped denning sites could facilitate occasional adoption if cubs are orphaned during winter or early spring because these cubs would be likely to cry loudly and could attract parturient females denning nearby. Genetic investigations of natural cub adoption (see Lunn et al. 2000) in relation to den site dispersion could explore this hypothesis.

Acknowledgments

We thank J. Raithel for field work, helpful discussions during manuscript preparation, and for reviewing this manuscript. We thank A. Crook for field work and library assistance. We thank the following for assistance with field work: H. Raithel, S. Ginger, and B. Tabor. Funding and support were provided by the School of Renewable Natural Resources at Louisiana State University (LSU), the LSU Agricultural Center, the US Fish and Wildlife Service, Louisiana Department of Wildlife and Fisheries, US Department of Agriculture/APHIS/Wildlife Services, CoyPu Foundation, Boone and Crockett Club, Pope and Young Club, Black Bear Conservation Committee, Johnston Science Foundation, and Cleco Corporation. This manuscript was approved for publication by the Director of the Louisiana Agricultural Experiment Station as manuscript number 05-40-0706.

Literature cited

ALT, G.L. 1984. Cub adoption in the black bear. Journal of Mammalogy 65:511–512.

———, AND J.J. BEECHAM. 1984. Reintroduction of orphaned black bear cubs into the wild. Wildlife Society Bulletin 12:169–174.

ATKINSON, S.N., M.R.L. CATTET, S.C. POLISCHUK, AND M.A. RAMSAY. 1996. A case of offspring adoption in free-ranging polar bears (*Ursus maritimus*). Arctic 49:94–96.

BARNES, V.G., JR., AND R.B. SMITH. 1993. Cub adoption by brown bears, *Ursus arctos middendorfii*, on Kodiak Island, Alaska. Canadian Field-Naturalist 107:365–367.

BENSON, J.F. 2005. Ecology and conservation of Louisiana black bears in the Tensas River Basin and reintroduced populations. Thesis, Louisiana State University, Baton Rouge, Louisiana, USA.

BREED, M.D., AND M. BEKOFF. 1981. Individual recognition and social relationships. Journal of Theoretical Biology 88:589–593.

CRAIGHEAD, J.J., M.G. HORNOCKER, AND F.C. CRAIGHEAD, JR. 1969. Reproductive biology of young female grizzly bears. Journal of Reproduction and Fertility 6:447–475.

DEROCHER, A.E., AND Ø. WIIG. 1999. Observation of cub adoption in polar bears (*Ursus maritimus*). Arctic 52: 413–415.

EASTRIDGE, R., AND J.D. CLARK. 2001. Evaluation of 2 soft-release techniques to reintroduce black bears. Wildlife Society Bulletin 29:1163–1174.

ERICKSON, A.W., AND L.H. MILLER. 1963. Cub adoption in the brown bear. Journal of Mammalogy 44:564–565.

HAMILTON, W.D. 1964*a*. The genetical evolution of social behaviour. I. Journal of Theoretical Biology 7:1–16.

———. 1964*b*. The genetical evolution of social behaviour. II. Journal of Theoretical Biology 7:17–52.

JONKEL, C., P. HUSBY, R. RUSSELL, AND J. BEECHAM. 1980. The reintroduction of orphaned grizzly bear cubs into the wild. International Conference on Bear Biology and Management 4:369–372.

LUNN, N.J., D. PAETKAU, W. CALVERT, S. ATKINSON, M. TAYLOR, AND C. STROBECK. 2000. Cub adoption by polar bears (*Ursus maritimus*): determining relatedness with microsatellite markers. Journal of Zoology (London) 251:23–30.

NEAL, W.M. 1992. Threatened status for Louisiana black bear and related rules. Federal Register 57:588–595.

ROGERS, L.L. 1986. Long-term survival of adopted black bears in suboptimal habitat. Wildlife Society Bulletin 14:81–83.

———. 1987. Effects of food supply and kinship on social behavior, movements, and population growth of black bears in northwestern Minnesota. Wildlife Monographs 97.

VAN WHY, K.R. 2003. Feasibility of restoring the Louisiana black bear (*Ursus americanus luteolus*) to portions of their historic range. Thesis, Louisiana State University, Baton Rouge, Louisiana, USA.

WHITE, G.C., AND R.A. GARROTT. 1990. Analysis of wildlife radio-tracking data. Academic Press, Toronto, Ontario, Canada.

YOUNG, B.F., AND R.L. RUFF. 1982. Population dynamics and movements of black bears in east central Alberta. Journal of Wildlife Management 46:845–860.

Received: 21 November 2005
Accepted: 6 January 2006
Associate Editor: R. Harris