

SURVIVAL OF INTRODUCED BLACK BEAR CUBS IN SHENANDOAH NATIONAL PARK, VIRGINIA

DANIEL W. CARNEY¹, Department of Fisheries and Wildlife Sciences, 110 Cheatham Hall, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

MICHAEL R. VAUGHAN, Virginia Cooperative Fisheries and Wildlife Research Unit, 100 Cheatham Hall, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

Int. Conf. Bear Res. and Manage. 7:83-85

Efforts to introduce orphaned or abandoned bear cubs (*Ursus* spp.) to foster mothers in New York (Clarke et al. 1980), Maine (Hugie 1982), Minnesota, Idaho, and Pennsylvania (Alt and Beecham 1984) have produced successful adoptions in most cases. Jonkel et al. (1980) and Alt and Beecham (1984) suggested that fostering cubs may be a viable management alternative for threatened or endangered bear species.

We conducted a radiotelemetry study of black bears (*U. americanus*) in Shenandoah National Park (SNP), Va., from 1982 to 1985. While attempting to immobilize females in their dens, we encountered several cases of cub abandonment. In each case, we introduced the abandoned cubs to foster mothers. This paper reports the results of those introductions.

STUDY AREA

Shenandoah National Park is a 777-km² strip of rugged terrain along the Blue Ridge mountains between Front Royal and Waynesboro in north-central Virginia. Elevations range 274–1,234 m. Mixed hardwood forests, including chestnut oak (*Quercus prinus*), red oak (*Q. rubra*), and tulip poplar (*Liriodendron tulipifera*) dominate the area. Precipitation averages 129.5 cm of rain plus 122 cm snow. Mean January and July temperatures are -3° and 19°C, respectively.

METHODS

We trapped bears with Aldrich leg hold snares and culvert traps and immobilized them with intramuscular injections of ketamine hydrochloride and xylazine (dosage rate was 6–11 mg/kg of the mixture). We fitted radio-transmitter collars (Telonics, Inc., Mesa, Ariz.: reference to products or trade names does not imply endorsement by the U.S. Government) to most of the adult females that we captured. During

the winter, we visited the dens of radio-collared females to determine the sex ratio and number of cubs. We monitored radio-collared females after den visits or other activities that might disturb them in their dens. If they left the den area, we tracked them continuously for 24 hours. We considered cubs abandoned if the mother made no attempt to return to the den site within 24 hours. We collected abandoned cubs in a 0.30 m × 0.45 m milk crate lined with cloth bedding and marked them with numbered metal (National Band and Tag Co., Newport, Ken.) or plastic (Allflex Tag Co., Culver City, Calif.) ear tags. We then introduced them to females with newborn cubs of their own. When possible, we introduced cubs into dens of older, more experienced bears rather than young bears or females with their 1st litters. We preferred tree dens with above-ground entrances for introductions because the occupant could not see the researcher approach; therefore den abandonment was less likely. When possible, we introduced cubs on the same day that they were picked up. If we had to keep them overnight, we fed them a mixture of warm cow milk and raw eggs from a baby bottle, ad libitum.

We dropped introduced cubs into the den entrance or, with tree dens, on top of the mother bear and considered introductions successful if we saw the mother licking the cub after the introduction or if we saw the introduced cub with the mother bear after den emergence. We attempted to observe the family groups throughout the summer to determine if cub losses occurred. We visited dens of foster mothers the winter following the introductions to confirm the number of yearlings with the mothers.

RESULTS

We introduced 7 cubs (6 females, 1 male) to 8 foster mothers during a 3-year period. Although the median age of females captured in SNP was 3 years, most of the females that received introduced cubs were 6+ years of age. Two of the selected foster mothers had not successfully raised cubs previously. Only 1 (12.5%) introduced cub was known to be

¹Present address: Box 31, East Glacier Park, MT 59434.

rejected. In that case, upon approaching a tree den of a 1st-time mother, the researcher observed her running out of a ground bed that she had constructed near the tree, leaving her single natural cub at the bed. The cub to be introduced was placed with the mother's natural cub and the researcher left the area. Radio signals indicated that the mother returned to the den within 4 hours and left again. In the next 20 hours the mother moved farther from the den site and showed no signs of returning. We returned to the den site and found only the introduced cub. We later confirmed that the mother had taken her natural cub with her after she returned. We fed the twice-abandoned cub and successfully introduced it to another foster mother in a tree den.

One foster mother lost her radiocollar before den emergence, so we never knew the outcome of 1 introduction. There was no evidence to indicate that the cub was not accepted. We successfully introduced 5 other abandoned cubs to foster mothers (3 tree dens, 2 ground dens). We observed 4 with their family groups after den emergence. We did not see 1 family group after den emergence, but saw the mother licking the introduced cub immediately after the introduction.

Three of the foster mothers that accepted cubs had 2 cubs of their own. Sightings of the family groups in August indicated that 2 (66.6%) had lost 1 of the 3 cubs in their litter. Den checks the following winter confirmed that only 1 had successfully raised the extra cub through the summer and denned with a larger litter than she produced. Two foster mothers with an unknown number of their own cubs lost their entire litter during the summer. We never determined the fate of the other 2 introduced cubs because their foster mothers lost their radiocollars.

We monitored 10 natural family groups in addition to the family groups that contained introduced cubs. Three (30%) of the 10 litters did not survive their 1st summer. Litters that failed had 1, 3, and an unknown number of cubs. The litters of 1 and an unknown number of cubs were 1st litters for the females, but the female that lost 3 cubs had successfully raised cubs before.

In addition to post-den emergence fatalities, we found 2 cubs belonging to natural family groups dead in dens after their mothers had left the den area with the rest of their litter. In both cases the dens were in above-ground tree cavities and the cubs were part of a 1st litter.

DISCUSSION

Alt and Beecham (1984), using similar methods of cub introduction, reported a high rate of successful adoptions, and at least 9 of 21 (42.9%) cubs survived > 9 months after placement. Our adoption rate was high (> 85.7%), but the verifiable survival rate of introduced cubs was low (20.0%). We could not determine the cause of death in any case. Because all but 1 of the mothers that accepted cubs had raised cubs before the introductions, we believe that inexperience was probably not a factor in most of the failures. Rogers (1976) documented a lower cub survival rate in large litters in Minnesota. Both Rogers (1976) and Wathen (1983) related cub survival to nutritional condition of the mother. Alt and Beecham (1984) suggested that depletion of fat reserves of nursing mothers is an important consideration for cub introductions, especially in areas of poor-quality habitat, characterized by low reproductive rates and slow growth rates.

Because the survival rate of our introduced cubs (20%) was much lower than that observed in natural litters (70%), we believe that some of the deaths may have been related to the mothers' nutritional condition. Hard mast production ranged from poor to moderate to excellent during the 3-year period; the availability of most other natural foods was fairly constant (Garner and Vaughan, unpubl. data); however, we observed no difference in the survival of natural litters or introduced cubs among years. Alt and Beecham (1984) believe that the high survival rate they observed for introduced cubs was partially due to the availability of supplemental food sources. Rogers et al. (1976) and Alt (1980, 1982) reported higher reproductive success for females that supplemented their diets with garbage and other foods of human origin. Garbage comprised less than 0.51% of the annual diet of bears in our study area (Garner and Vaughan, unpubl. data). Thus, lack of a constant supplemental food source may explain the low survival rate of introduced cubs compared to that reported by Alt and Beecham (1984).

Partial litter loss did not occur in any of the natural family groups, but on 2 occasions single cubs were lost from family groups with introduced cubs. If a mother was not nutritionally capable of supplying enough milk for the extra cub, 1 cub rather than the entire litter might be weakened and thus be more vulnerable to disease or predation. An introduced cub may decrease the chances of survival for the entire

litter. Two (33.3%) of the foster mothers lost their entire litters; however, this loss rate did not differ from that of natural family groups (30%).

We attribute the deaths of the 2 cubs found in tree dens to inexperience of 1st-time mothers. Alt (1982) reported a higher rate of cub mortality in litters produced by young mothers. He attributed it to inexperience or inability of younger mothers to nourish cubs.

In conclusion, we recommend caution when introducing cubs to foster mothers in marginal or poor-quality habitat. The low success rate does not justify the possibility of reducing survival of the mothers' natural cubs. Other techniques of reintroducing cubs into the wild, such as introducing cubs after den emergence or raising and releasing cubs, are described by Alt and Beecham (1984) and Jonkel et al. (1980) and may be more successful. We also recommend that future bear studies be designed to document results of cub introductions.

LITERATURE CITED

- ALT, G. L. 1980. Rate of growth and size of Pennsylvania black bears. *Penn. Game News* 51:7-17.
- . 1982. Reproductive biology of Pennsylvania's black bear. *Penn. Game News* 53:9-15.
- , AND J. J. BEECHAM. 1984. Reintroduction of orphaned black bear cubs into the wild. *Wildl. Soc. Bull.* 12:169-174.
- CLARKE, S. H., J. O'PEZIO, AND C. HACKFORD. 1980. Fostering black bear cubs in the wild. *Int. Conf. Bear Res. and Manage.* 4:163-166.
- HUGIE, R. D. 1982. Black bear ecology and management in the northern conifer-deciduous forests of Maine. Ph.D. Thesis, Univ. Mont., Missoula. 203 pp.
- JONKEL, C. J., P. HUSBY, R. RUSSELL, AND J. BEECHAM. 1980. The reintroduction of orphaned grizzly bear cubs into the wild. *Int. Conf. Bear Res. and Manage.* 4:369-372.
- ROGERS, L. L. 1976. Effects of mast and berry crop failures on survival, growth, and reproductive success of black bears. *Trans. North Amer. Wildl. and Nat. Resour. Conf.* 41:431-438.
- , D. W. KUEHN, A. W. ERICKSON, E. M. HARGER, L. J. VERME, AND J. J. OZOGA. 1976. Characteristics and management of black bears that feed in garbage dumps, campgrounds, or residential areas. *Int. Conf. Bear Res. and Manage.* 4:169-175.
- WATHEN, G. 1983. Reproduction and denning of black bears in the Great Smoky Mountains. *Tenn. Wildl. Resour. Agency, Tech. Rep. No. 83-4.* 146pp.