

U. S. Department of the Interior
Fish and Wildlife Service
P. O. Box 277
King Salmon, Alaska 99613-0277

12 April 1988

Francis R. Cook
Editor, Canadian Field-Naturalist
National Museum of Natural Sciences
P. O. Box 3443, Station D
Ottawa, Ontario K1P 6P4
Canada

Dear Sir:

I have enclosed a revision of ms 86133, "Brown Bear Ursus arctos with Six Young", along with the "original" you sent me in your correspondence dated 3 April. I have used the reviewers suggestions in all cases, including the deletion of a paragraph. I hope this provides a shorter and clearer presentation.

You will also notice that I included V. D. Berns as a junior author, which is different from the original. Vern is now retired, and warrants junior authorship for the observations contributed.

I do hope you find the present version acceptable for publication.

Warm regards,



Randall J. Wilk
Wildlife Biologist

Brown Bear, Ursus arctos, with Six Young

Randall J. Wilk,¹ John W. Solberg², Vernon D. Berns³ and
Richard A. Sellers⁴

Alaska Peninsula/Becharof National Wildlife Refuges, U. S. Fish
and Wildlife Service, P. O. Box 277, King Salmon, Alaska

99613-0277

²*Present address: U. S. Fish and Wildlife Service, Office of
Migratory Bird Management, 730 Simms Street, Golden, Colorado
80401

³*Present address: 4207 Cliffside Road, Kodiak, Alaska 99615

⁴*Alaska Department of Fish and Game, P. O. Box 37, King Salmon,
Alaska 99613-0037

Wilk, Randall J., John W. Solberg, Vernon D. Berns, and Richard
A. Sellers.

A Female Brown Bear (Ursus arctos) accompanied by six young was
observed on the Alaska Peninsula in 1983 and 1984. The
circumstances surrounding the independent observations suggest
the group was the same one both years. It may have been the
result of orphaned or abandoned cubs being adopted, or an
extremely rare occurrence of a litter of sextuplets.

Key Words: Alaska, Alaska Peninsula, Brown Bear, cub adoption,
litter size, Ursus arctos

Sizes of litters of Brown Bears (Ursus arctos) have been reported in numerous studies. In ~~Southwestern~~^a coastal Alaska, data on age composition of Brown Bears are obtained from aerial surveys or streamside counts conducted in remote and essentially undisturbed areas where bears congregate on salmon (Onchorynchus spp.) spawning streams during summer and early fall (Klein 1958; Erickson and Siniff 1963; Troyer and Hensel 1964; Hensel et al. 1969; Glenn et al. 1976). Although it has generally been assumed that "litters" or "family groups" classified during surveys are siblings born at the same time of the same female, it has been suggested that abandonment with adoption is the likely explanation for large litters reported (Mundy and Flook 1973: 12; Bunnell and Tait 1985: 318). However, Hensel et al. (1969: 363) reported seven litters with four young from Kodiak Island and Alaska Peninsula and found no evidence of adoption. Evidence of adoptions (Erickson and Miller 1963) include known differences in age (Craighead et al. 1969: 462), and size and coat color disparities (Erickson 1964). Cubs we observe together (accompanied by an adult - the presumed mother) with similar physical and behavioral attributes are tallied as "litters" during stream surveys. We report here an unusually large litter of Brown Bears seen from a small aircraft.

On 24 and 26 August 1983, and again on 27 August 1984, Berns (pilot) and Solberg observed a female Brown Bear

accompanied by six young. These observations occurred while they were conducting aerial surveys of bears on streams on the Alaska Peninsula National Wildlife Refuge, Alaska. The sightings occurred in the upper reaches of two adjacent streams on the southeast side of lower Ugashik Lake ($57^{\circ} 26'N$, $156^{\circ} 41'W$); maximum linear distance between observations was 2 to 3 km. The young were classified as a litter of 1.5 year-olds in 1983 and "older cubs" (≥ 2.5 years old) in 1984, based on subjective judgement of their comparable size and coat color uniformity. Both observers were experienced in bear surveys, Berns having extensive experience on Kodiak Island and the Alaska Peninsula.

In all cases, the female and young were fishing in narrow, shallow areas about 6-8 km above the lake, and were relatively isolated from the generally greater bear concentrations downstream. When the survey aircraft passed over, the whole group responded, with the six smaller bears following the adult into riparian shrub cover nearby. The predilection for bears to use the same fishing sites from year to year (Erickson and Miller 1963; Glenn et al. 1976; V. G. Barnes, personal communication) and the physical similarities of the young suggest the bears were the same group both years and may have been sextuplets. As far as we know, observations of six young with a maternal female Brown Bear in an apparent enduring relationship have not been reported elsewhere in the literature.

During fishing activities, some family groups of bears are gregarious, and others apparently develop a level of territorial tolerance which enables litters to intermix occasionally, resulting in families exchanging cubs (Glenn et al. 1976; L. Aumiller, personal communication), and thereby increasing the probability of adoptions (Erickson and Miller 1963; Erickson 1964) from abandonment of young. We have firsthand evidence of recent adoptions of cubs on the Alaska Peninsula. On 3 August 1985, during a study of Brown Bears at streams on Becharof National Wildlife Refuge, Wilk observed a female with two yearling cubs and one cub of the year (age classes based on obvious size and pelage differences). On 3 August 1986, in the same study area, Wilk observed another female with the same complement and age composition of young. C. P. Dau (personal communication) observed an adoption that occurred on Izembek Refuge of the southern Alaska Peninsula in 1984. He reported that a 16-year-old female with two cubs of the year was captured and radio collared in Right-hand Valley on 30 July. The next day, the family group was observed together during a tracking flight, and was subsequently observed on 6 August. On 10 September, a third young was seen with the three bears. The additional cub of the year was judged to be about 1/3 smaller than the other two.

Cub exchanges and litter mixing resulting in females temporarily with six young have been reported at McNeil River by

Erickson and Miller (1963) (also see Murie 1981: 75) and Glenn et al. (1976). In the latter paper, it was not possible for the authors to determine the final status of the family groups that apparently changed litter complements on a daily basis for the duration of fishing activities over the summer. These accounts suggest that cub exchanges or abandonment with adoption are perhaps not as rare on the Alaska Peninsula as might be in other areas of the species range, or that circumstances are such that biologists on the peninsula have more opportunity to observe these occurrences.

Nevertheless, the occurrence of more than four young in a litter of Brown Bears is rare (Onoyama and Haga 1982). Bunnell and Tait (1985) tabulated sizes of 824 litters from 6 populations of Brown Bears of which only 20 groups had 4 young, and one had five (6 of the 21 were from captive bears). Only three known observations of females with five young have been recorded from Kodiak Island (V. G. Barnes, personal communication). Females with five young were observed only twice in a 15-year study (1963-1978) on the Alaska Peninsula (Modafferi 1984). Recent data from the Alaska Peninsula further support the rarity of females with more than four young (Table 1). Only five groups with four young, and none with more than four were tallied from over 1500 classified except for the groups of six reported here.

TABLE HERE

The "litter" of six young could have been the result of an abandoned or orphaned litter being adopted by a female and her cubs, or was a group of sextuplets. Indications were that the relationship among these bears was a lasting one (i.e., at least August 1983 - August 1984). The observations provided no evidence of intermingling of young from different family groups nor adoption, but we cannot conclude empirically that the young were siblings. A high nutritional plane, contributing to higher reproductive rates and larger litters (Craighead et al. 1976; Bunnell and Tait 1981; Modafferi 1984; Knight and Eberhardt 1985) such as the high protein diet of salmon enjoyed by bears on the Alaska Peninsula might also increase the likelihood of the occurrence of large litters of Brown Bears.

Acknowledgments

We thank V. G. Barnes, L. P. Glenn, G. R. Michener, K. I. Wilk, E. J. Savery, and four anonymous reviewers for comments which improved an early version of the manuscript. Brief discussions with F. C. Dean, and H. V. Reynolds were also helpful. We thank C. P. Dau for his account of cub adoption. J. E. Sarvis, Izembek Refuge, allowed us the use of unpublished data used in Table 1.

Literature Cited

- Bunnell, F. C., and D. E. N. Tait. 1981. Population dynamics of bears - implications. Pages 75 - 98 in: Dynamics of large mammal populations. Edited by T. D. Smith and C. Fowler. John Wiley & Sons, New York.
- Bunnell, F. C., and D. E. N. Tait. 1985. Mortality rates of North American bears. Arctic 38: 316-323.
- Craighead, J. J., M. G. Hornocker, and F. C. Craighead, Jr. 1969. Reproductive biology of young female Grizzly Bears. Journal of Reproduction and Fertility Supplement 6: 447-475.
- Craighead, J. J., F. C. Craighead, Jr., and J. Sumner. 1976. Reproductive cycles and rates in the Grizzly Bear, (Ursus arctos horribilis), of the Yellowstone ecosystem. International Conference on Bear Research and Management 3: 381-390.
- Erickson, A. W. 1964. A mixed-age litter of Brown Bear cubs. Journal of Mammalogy 3: 312-313.
- Erickson, A. W., and L. H. Miller. 1963. Cub adoption in the Brown Bear. Journal of Mammalogy 44: 584-585.
- Erickson, A. W., and D. B. Siniff. 1963. A statistical evaluation of factors influencing aerial survey results in Brown Bears. Transactions of the North American Wildlife Conference 28: 391-409.

Glenn, L. P., J. W. Lentfer, J. B. Faro, and L. H. Miller. 1976.

Reproductive biology of female Brown Bears (Ursus arctos),
McNeil River, Alaska. International Conference on Bear
Research and Management 3: 381-390.

Hensel, R. J., W. A. Troyer, and A. W. Erickson. 1969.

Reproduction in the female Brown Bear. Journal of Wildlife
Management 33: 357-365.

Klein, D. R. 1958. Southeast Alaska Brown Bear studies. Alaska
Department of Fish and Game Federal Aid in Wildlife
Restoration Final Report. Project W-3-R-13, Juneau, Alaska.
21 pp.

Knight, R. R., and L. L. Eberhardt. 1985. Population dynamics
of Yellowstone Grizzly Bears. Ecology 66: 323-334.

Modafferi, R. D. 1984. Review of Alaska Peninsula Brown Bear
investigations. Alaska Department of Fish and Game Federal
Aid in Wildlife Restoration Final Report. Projects W-17-10,
W-17-11, W-21-1, W-21-2, and W-22-1. Juneau, Alaska. 43
pp.

Mundy, K. R. D., and D. R. Flook. 1973. Background for managing
Grizzly Bears in the National Parks of Canada. Canadian
Wildlife Service Report Series No. 22. 34 pp.

Murie, A. 1981. The Grizzlies of Mount McKinley. Scientific
Monograph Series No. 14. U. S. Department of the Interior,
National Park Service, Washington, D. C. 251 pp.

WILK, SOLBERG, BERNIS, SELLERS, BROWN BEAR Ursus arctos WITH 9
SIX YOUNG

Onoyama, K., and R. Haga. 1982. New record of four fetuses in a litter of Yezo Brown Bear (Ursus arctos yezoensis) Lydekker with mention of prenatal growth and development. Journal of the Mammalogy Society of Japan 9: 1-8.

Troyer, W. A., and R. J. Hensel. 1964. Structure and distribution of a Kodiak bear population. Journal of Wildlife Management 28: 769-772.

Table 1. Frequency (%) of observed sizes of "litters" of Brown Bears from aerial surveys on the Alaska Peninsula.*

Size of litter	Cubs		Total
	Of the year	Yearling or older	
1	20.7	29.5	25.2
2	51.1	47.4	49.2
3	27.2	21.8	24.5
4	0.9	0.9	0.9
5			
6		0.4	0.2

*n = 1520 observations including replicate surveys. Locations: McNeil River 1979-1985; Izembek Refuge 1968, 1976-1983, 1985; Black Lake 1982-1986; Canoe Bay 1983; and Game Management Unit 9A 1982; Becharof Refuge 1980-1986; Alaska Peninsula Refuge 1981-1984, 1986; all U. S. Fish and Wildlife Service and Alaska Department of Fish and Game, unpublished data; Becharof Lake 1974 (Troyer, W. 1975. Brown Bear studies-Katmai. National Park Service Report, Anchorage, Alaska. 17 pp.).