

PANEL 4: BEAR BEHAVIOUR

Reproductive Synchrony in the Female Black Bear

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INTRODUCTION

One of the serious drawbacks in black bear (*Ursus americanus*) research and management studies in the past has been the lack of an accurate way to determine the age of wild black bears. The development of the tooth section technique for annuli counts to determine ages of various mammals has provided biologists with a most useful and effective tool. Its application to the wildlife field has been widespread and rapid. In areas where large samples of a wildlife population can be obtained each year, accurate aging provides a reliable means of keeping tabs on the annual dynamics of these populations.

The black bear of New York State have been protected since 1904 and, during that time, have been harvested primarily by hunters incidental to seeking white-tailed deer. Samples of the hunter-bear take have been examined since 1953 at volunteer big game check stations. The information recorded on bears at these stations has been used mainly to aid in determining the total number of bears harvested annually. This has been the principal statistic collected annually on our wild bear population. However, the verification of a means of age determination for bears in New York by examining sections of canine teeth made the collecting of bear teeth an important new aspect of our bear research and management program.

PROCEDURES

Efforts were made to obtain lower canine teeth from bears harvested during the legal hunting seasons from 1964 through 1968. All licensed taxidermists in New York State were contacted in an effort to gain the cooperation of those handling bears. Each was furnished an illustrated instruction sheet with information on how to cut the anterior portion of the lower jaw to include both canines. Emphasis was placed on making the cut close to the first molar so that the lower canine root would not be disturbed. They were also furnished plastic bags, ties, labels, a postcard for requesting additional materials and a reprint describing the age determination technique (Free & Sauer 1965). Card-board shipping boxes for sending the excised lower jaw via express collect were furnished in 1964 and 1965. Special expansion envelopes of sturdy paper were used in 1966, 1967 and 1968 for sending the excised lower jaw directly through regular mail service. Taxidermists handling the largest numbers of bears were contacted individually prior to the hunting season and several times during the hunting season. Successful bear hunters were contacted at big game check stations on major highways and at hunting camps and homes and asked to cooperate in this study. Whenever possible the anterior portion of the bear's lower jaw containing the canine teeth was removed. When this could

not be done, the hunter was given a set of instructional materials and shipping containers similar to those provided the taxidermists.

Canine teeth were loosened from the lower jaws by boiling and pulled for an initial examination. Canine teeth from cub and yearling bears were separated from older bear teeth by gross examination (Sauer *et al.* 1966). Three experienced observers examined each tooth independently for yearling determinations. Whenever any differences of opinion occurred between the observers as to whether the tooth was from a yearling bear or not, the tooth was sectioned and processed along with the older teeth.

When sex was not determined by examination of the carcass by qualified personnel, sex was determined by tooth measurement using the gauge and techniques described by Sauer (1966).

Canine teeth from bears 2¹/₂ years and older and from questionable yearling bears were decalcified, sectioned, stained and mounted as described by Sauer *et al.* (1966). The tooth sections were then examined under a microscope and cementum layer counts made. Three observers made independent counts in 1964, 1965, 1966 and 1968. Two observers made independent counts in 1967. These counts were compared and sections with differing counts were reexamined, discussed and reconciled in most cases. Summary tables were then prepared showing the sex and age structure of the sample by year of collection.

FINDINGS

The cooperation of taxidermists and successful hunters resulted in a collection of canine teeth from bears. Teeth from 421 bears were collected from the Adirondack Region during the 1964-1968 period, representing 19.0 percent of the 2,213 bears calculated to have been harvested. The regular big game (deer and bear) hunting season ran from October 25 through the first Tuesday in December each year. In addition, a special bear season was held prior to the regular big game season in 1964 (October 2-11) and in 1968 (October 1-15). Actual numbers collected and the percent representation by age and year of collection are shown in Table 1.

Cubs were not included in this paper because it is felt that they were not represented in true proportion to their abundance. Hunters are reluctant to harvest them in the field and just as reluctant to bring those killed to check stations or taxidermists.

Note, in Table 1, the similarity between the age structures for 1964, 1966 and 1968 in contrast to the age structures for 1965 and 1967. A multinomial chi-square test substantiated the even year similarities, the odd year similarities and the contrast between the two groups. The age distributions of the odd numbered year group of 1965 and 1967 were significantly different from those of the even numbered year group of 1964, 1966 and 1968, while there was no significant difference within each group.

By examining the first three age classes in Table 1 for the five year period a consistent pattern of high and low representation of animals in these age classes is apparent. The sample was composed of 101 yearlings or 37.1 percent during 1964, 1966 and 1968 and 12 yearlings or 8.0 percent during 1965 and 1967. There were 15 age class 2 bears or 5.5 percent for 1964, 1966 and 1968 and 50 age class 2 bears or 33.6 percent for 1965 and 1967. Age class 3 animals also show this alternate pattern with 52 bears or 19.1

TABLE 1. NUMBER AND PERCENT OF ADULT BLACK BEARS SAMPLED FROM THE ADIRONDACKS, 1964-1968, BY AGE AND YEAR OF HARVEST.*

Age Class	1964		1965		1966		1967		1968	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
1	41	41.5	5	5.9	41	37.0	7	10.9	19	30.7
2	4	4.0	30	35.4	6	5.4	20	31.2	5	8.1
3	17	17.2	8	9.4	24	21.6	4	6.3	11	17.7
4	8	8.1	9	10.6	3	2.7	2	3.1	2	3.2
5	3	3.0	8	9.4	8	7.2	3	4.7	7	11.3
6	6	6.1	4	4.7	2	1.8	2	3.1	—	—
7	1	1.0	2	2.3	3	2.7	5	7.8	1	1.6
8	1	1.0	7	8.2	5	4.5	7	10.9	4	6.5
9	5	5.1	2	2.3	—	—	—	—	3	4.8
10	1	1.0	2	2.3	4	3.6	3	4.7	3	4.8
11	3	3.0	1	1.2	—	—	2	3.1	—	—
12	1	1.0	—	—	2	1.8	—	—	4	6.5
13	3	3.0	1	1.2	3	2.7	1	1.6	—	—
14	—	—	1	1.2	—	—	3	4.7	—	—
15	1	1.0	1	1.2	1	0.9	1	1.6	—	—
16	1	1.0	2	2.3	—	—	1	1.6	—	—
17	—	—	—	—	3	2.7	—	—	2	3.2
18	—	—	—	—	1	0.9	2	3.1	—	—
19	—	—	—	—	—	—	—	—	—	—
20	—	—	—	—	1	0.9	—	—	—	—
21	1	1.0	—	—	2	1.8	—	—	—	—
24	1	1.0	—	—	1	0.9	—	—	—	—
25	1	1.0	1	1.2	1	0.9	—	—	1	1.6
29	—	—	1	1.2	—	—	—	—	—	—
30	—	—	—	—	—	—	1	1.6	—	—
Totals	99	100.0	85	100.0	111	100.0	64	100.0	62	100:0

* This table includes 216 males, 193 females, and 12 bears of unknown sex.

percent for 1964, 1966 and 1968 and 12 age class 3 bears or 8.0 percent for 1965 and 1967.

Figure 1 shows that high cub productivity during 1963, 1965 and 1967 directly influenced the number of yearlings present in the population 1964, 1966 and 1968. The high number of 3½ year olds in 1964 presupposed high cub production in 1961. For example, from Figure 1 it can be seen that the contribution of the 1963 year class made up 41.5 percent of the 1964 sample (age class 1), 35.4 percent of the 1965 sample (age class 2), 21.6 percent of the 1966 sample (age class 3), 3.1 percent of the 1967 sample (age class 4) and 11.3 percent of the 1968 sample (age class 5). In the total five year sample of 421 bears, there were 104 bears or 24.7 percent from the 1963 year class.

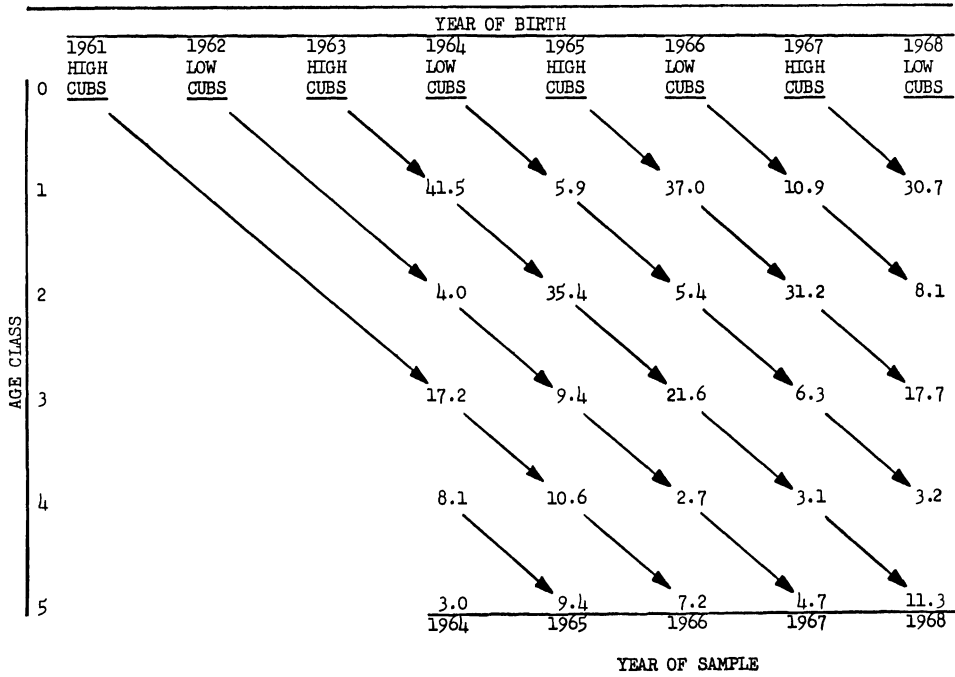


Fig. 1 The contribution of year classes to the annual harvest sample.

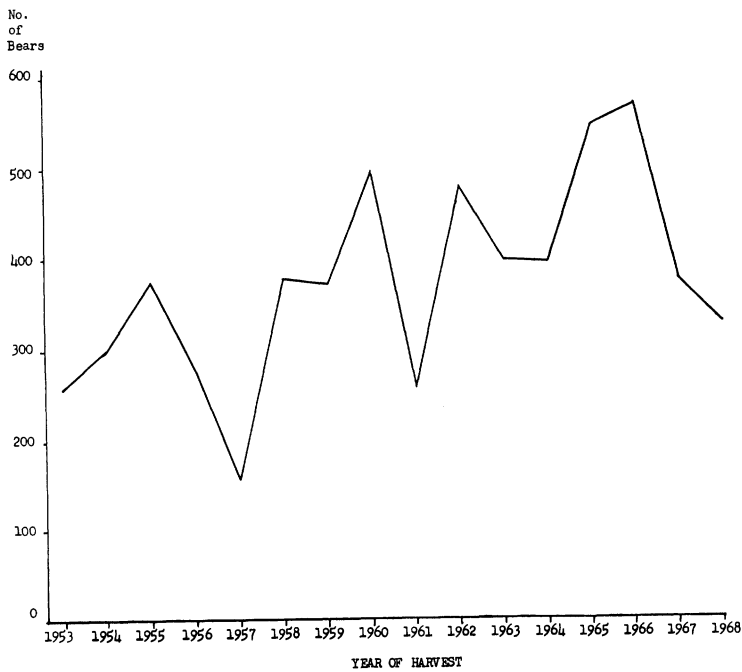


Fig. 2 Black Bear Harvest from Adirondack Region—New York State.

Conversely, the 1964 year class made up only 5.9 percent of the 1965 sample, 5.4 percent of the 1966 sample, 6.3 percent of the 1967 sample and 3.2 percent of the 1968 sample. For the four year sample (1965-1968) of 322 bears only 17 (5.3 percent) were from the 1964 year class. For the three year sample (1966-1968) of 237 bears, 72 (30.4 percent) were from the 1965 year class. These alternate year patterns substantiate the establishment of synchronous breeding behaviour for female bears from the Adirondack Region of New York State.

The influence of this synchronous behaviour resulting in high productivity in alternate odd-numbered years reflected in the five year sample can also be demonstrated in the annual harvest data. Table 2 summarizes the calculated bear harvest in the Adirondack Region from 1953 through 1968, including the special early season harvests of 127 in 1963, 22 in 1964, and 58 in 1968.

TABLE 2. CALCULATED BLACK BEAR HARVEST
FROM THE ADIRONDACK REGION OF
NEW YORK STATE

Year of Harvest	Number of Bears
1953	256
1954	298
1955	374
1956	274
1957	156
1958	377
1959	370
1960	495
1961	255
1962	479
1963	397
1964	395
1965	545
1966	569
1967	376
1968	328

Figure 2 is a graph of the calculated legal bear harvest from the Adirondack Region for 1953 through 1968 including the early bear season. Of the eight odd numbered years expected to be low, one (1955) was a peak, while of the eight even numbered years expected to be high, two (1964 and 1968) were troughs.

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