

RECORDING OF BODY TEMPERATURE FROM FREE ROAMING WILD MAMMALS

One objective of our biotelemetry research has been to telemeter 24-hour or nycthemeral body temperature patterns from free-roaming wild mammals. In addition we have sought to correlate changes in body temperature with observed changes in animal activity and behavior. We are exploring the possibility of correlating seasonal behavior patterns and seasonal environmental changes with seasonal changes in body temperature. Our goal is to eventually obtain nycthemeral body temperature patterns continuously over extended periods of time, but to date we have been limited by lack of automatic recording equipment.

A deep body, or "core temperature", can apparently be obtained at a depth of about 7 cm. We decided to start with shallower implants that would give temperatures approximating a deep body temperature and yet might tend to vary more with changes in animal behavior and activity. In our initial experiments we've been concerned with developing techniques and exploring possibilities.

The first body temperature transmitter designed by Joel Varney, consisted of a modified tracking transmitter with the pulse (signal) regulated by a thermistor probe attached to the ends of lead wires. It was designed to measure and monitor body temperature variations between 94.0° F., and 102.0° F. The number of pulses counted per minute was converted to

temperature by means of a temperature versus pulse rate chart. A stop watch was used and two or more counts were made to check each temperature recorded. Portable receivers with loop antennas were usually employed. On occasions three-element yagis and portable quad antennas were used permitting body temperatures to be monitored at distances up to ten miles away. Body temperatures and ambient temperatures were recorded near simultaneously and in most cases at definite intervals. Ambient temperatures were either telemetered or taken with standard thermometers in the vicinity of the instrumented animal. The pulse frequency modulation system worked well for our initial field experiments. The first unit was set for roughly 100 pulses per minute at 98.0° F. Ambient temperatures had a small effect on accuracy and amounted to about one degree indicated temperature error for a 20° ambient temperature change. Corrections were made to compensate for this.

The first body temperature transmitter was placed on cow elk #8 at Old Faithful in the winter of 1966. The experience gained led to some changes in transmitter and probe design. In the second model several components were removed from the transmitter to the probe to reduce the temperature range to which they are subjected. The size of the probe was increased and thus was not as suitable for deep implants. The next model will be miniaturized. However, this modification reduced the error in indicated probe temperature to less than one degree Fahrenheit for any ambient temperature between

-40 and +100° F. The error due to battery voltage variations is a 0.7° F. apparent temperature increase at 80% of battery life (approximately 1.5 months). This error is largely eliminated by the use of new batteries. The pulse rate for various probe conditions were as follows:

1. Normal operation pulse rate from 59 to about 145
2. Probe temperature below 80° F., pulse rate 59 ppm
3. Probe partially disconnected (one wire broken) 49 ppm
4. Probe entirely disconnected (all wires broken) 54 ppm

The transmitter was constructed so that it would still continue to pulse even if the probe or the wires were broken. This permitted uninterrupted location and tracking thus assuring rapid transmitter recovery.

During 1966 and early 1967, we instrumented three different cow elk (*Cervus canadensis*) and one black bear (*Ursus americanus*) with body temperature transmitters. From the elk we obtained five 24-hour or nycthemeral body temperature patterns. The elk that were instrumented included elk number 8 at Old Faithful, and elk numbers 9 and 10 at Norris. Whenever possible, the activity of the radio instrumented animals were observed while monitoring the body temperature.

All of the animals were anesthetized and then instrumented with a transmitter-collar assembly consisting of transmitter, battery pack and tuned loop antenna (Craighead 1963 and Craighead 1965). A small patch of hair or fur was shaved from the neck region and the temperature probe inserted under

the skin and eased into the muscle tissue to a depth of 3 to 4 cm. The incision was disinfected with alcohol, the opening then sutured with surgical gut and the lead wires sutured and tied to prevent movement of the probe.

BODY TEMPERATURES FROM ELK

The results of telemetering body temperature from three different elk are shown in (Table 1) and on the 24-hour body temperature graphs of elk numbers 8, 9, and 10.

Elk #8 showed the greatest spread (4° F. (1/29-1/30) in body temperature. The accuracy of the first model transmitter and probe used on this elk were slightly affected by ambient temperature changes. This may account for the greater temperature spread, even though corrections were made to compensate for indicated error.

There were no detectable changes in body temperature with changes in behavior or activity of this animal except in one instance. The instrumented cow elk was cornered in deep snow on January 31, and was forced to alter her course of travel. Although, there was no apparent increase in physical exertion, the animal became nervous and agitated. Over a half-hour period the body temperature rose from 97.8° F. to 99.5° F. with only an accompanying 3° rise in ambient temperature from 24° F. to 27° F. This was an apparent 1.7° F. rise in body temperature. The temperature rise started when the elk's path was blocked and she appeared alarmed, even frustrated. It is possible that there was some relation between the

temperature rise and the animal's behavior.

The minimum body temperature of elk #9 was 97.5° F. and occurred at 0330, 0730, 0800, and 0930 on September 2. The maximum temperature recorded was 100.0° F., and occurred at 1930 on September 2, (Table 1).

The body temperature of elk #9 fluctuated more during daylight hours (1000-1930) of warmer ambient temperatures than during the cooler hours of darkness (2130-0530). During the period of greater fluctuation, the elk was more active-moving and feeding.

Norris elk number 10 was immobilized with sucostrin on October 20, and instrumented after dark at 1750. The 24-hour monitoring to obtain a nycthemeral body temperature pattern was begun the next morning at 0940 on October 21. It was completed at this same time on October 22. The body temperature of the elk was recorded every 15 minutes and the ambient temperature every half hour. The maximum body temperature obtained was 102.25° F., and the minimum body temperature was 99.5° F. This was a temperature span of 2.75° F. The maximum body temperatures were obtained at 1230 and at 1345 and the minimum between 2400 and 0515. The maximum body temperature (102.25° F.) occurred with an ambient temperature of 23° F., and the longest period of minimum body temperature (99.5° F.) occurred with ambient temperatures ranging from 16° F. to 18° F.

The body temperature tended to remain more stable at

night, that is, it fluctuated less than during the daylight hours. The average body temperature of elk number 10 ran about 2° higher than that of elk number 9. It is difficult to explain just what might have caused this, but it may be significant that the body temperature was taken during the breeding season.

Elk #10 was kept in sight during the daylight hours and her behavior and activity observed and recorded. She remained alone in a very limited area throughout most of the day. Prior to immobilization and instrumenting she had been closely associated with other members of a harem group. Only one possibly significant correlation was made with changes in activity and changes in body temperature. Prior to 1600 the elk's temperature ranged between 100.5° F. and 102.25° F. At 1600 the harem herd and the harem bull from which she had been separated moved into an open meadow near the instrumented cow. She could now readily hear them as well as scent them. At 1610 the cow arose and at 1615 she started moving toward the herd that was visible four to five hundred yards away. At 1610 her body temperature was still 102.25° F. but when she started moving toward the herd it registered 99.5° F. and remained here until 1630. After this, the body temperature varied some but more or less leveled off at a lower level of 100.5° F. from 1645 to 2345. It then dropped to 99.5° F. and remained steady until 0515. The body temperature remained consistently lower after the cow elk detected and rejoined

the herd. It is possible that there was a correlation between reuniting with the herd and the drop in body temperature. From this exploratory work it appears that some changes in body temperature may reflect changes in animal activity or behavior. The temperature fluctuations do not appear to be explained by temperature changes caused by muscle action, however there is a possibility that these are normal 24-hour variations in body temperature that appear to coincide with changes in behavior and activity. From the graphs it can be seen that ambient temperatures dropped during the hours of darkness and rose during the day usually reaching a maximum about noon or soon after.

Low and high body temperatures tended to coincide with low and high ambient temperatures and thus with darkness and daylight. Generally speaking the periods of greatest elk activity were during the daylight hours and during the hours of higher ambient temperatures.

The results to date indicate that a 0.1 degree accuracy in temperature measurement would provide a more sensitive record of temperature fluctuations and a better basis for interpretation. Longer continuous periods of recording nychthemeral body temperatures are needed and this will require automatic recording equipment.

Interpretation of future results should be facilitated by obtaining simultaneous body temperature recordings and an activity pattern from the same elk. One probe would measure

deep body temperature and the other temperatures at a depth of only a few centimeters. The feasibility of obtaining body temperature measurements over a period of time from wild free-roaming mammals was demonstrated and information obtained for perfecting equipment and refining techniques.

BODY TEMPERATURE FROM BLACK BEAR

Our experience in telemetering body temperature from free-roaming elk paved the way for attempting to telemeter a nycthemeral body temperature recording from a "hibernating" black bear. A long range objective of our research is and has been to develop electronic equipment capable of telemetering significant information from hibernating black and grizzly bears. During the winter of 1967 we made three trips to the Gibbon River in Yellowstone National Park to record body temperature from a "hibernating" male black bear. The first trip was made January 26-28, the second January 30-31, and the third February 20-21.

Participation in Dr. Vincent J. Schaefer's Seventh Field Research Expedition provided the opportunity to instrument this "hibernating" black bear. Our objective was to simultaneously telemeter the body temperature of the bear, the den temperature, and the outside air or ambient temperature. Our plans had included recording the body temperature by means of an automatic chart recorder, but unfortunately this was not ready in time for the expedition use.

At about 1000, on January 27 we injected the bear with

125 mg. of Sernylan (Phencyclidine hydrochloride). This was a dose of about one mg/lb. of body weight. We shaved a small area on the back of the neck of the anesthetized bear, made an incision and inserted the temperature probe to a depth of about 4 cm. This was a shallow implant under the skin to about 3.5 cm. into the muscle tissue. The incision was then sutured with a surgical needle and gut.

The body temperature of the bear, the temperature of the den chamber, and the outside ambient temperature were monitored each half-hour from our camp in the canyon below the bear's den. All three transmitters simultaneously transmitted the data on a frequency of 32.01 MC. Differences in pitch and pulse rate enabled us to readily differentiate the signals and to count the pulses from each transmitter. The ambient temperatures were obtained both by use of a standard thermometer and by telemetry.

At 1700 on the 27th we monitored the bear's body temperature and obtained 83.5° F. with a transmitter pulse rate of 64. The den temperature was 28° F., and the outside air temperature 31° F. (Figure 2). The 83.5° temperature at this time was in contrast to an earlier body temperature at 1400 of 96.0° F., obtained by the use of a rectal thermometer. The rectal temperature of 96.0° F. was taken about two hours after the bear had been anesthetized. The drop in body temperature to 83.5° F. was apparently due in part to chilling and in part to the effect of the drug. Such an effect has

been observed with this drug in some monkeys and in the *Anabis baboon*.

At 1200 on January 28 the pulse rate of the transmitter on the bear registered 103 pulses per minute. The bear was resting but awake. Right after this a flash bulb alerted and disturbed him. He came out of the den, thwarting our attempts to stop him. A few minutes after he had climbed to the snow slope above the den, the transmitter recorded a pulse rate of 102 per minute (no change). At 1230 with the bear still in the snow above the den the transmitter recorded a pulse rate of 101 (91.5° F.), and at 1248 still a pulse rate of 101. Approximately an hour after leaving the den at 1305, the transmitter pulse rate was 110, at 1320 the pulse rate was 114 (94.5° F.) and continued to climb to 122 pulses per minute (96.75° F.) by 1430. It is of interest that there was no immediate or rapid increase in body temperature coinciding with the bear's increased physical exertion. This might be interpreted as no detectable local increase in heat from muscular activity.

Our objective on the January 30-31 visit was to monitor the body temperature of the bear for a 24-hour period. We began at 1445 on January 30. Over the 24-hour period the temperature of the den varied from $26-30^{\circ}$ F., but remained relatively constant at $26-28^{\circ}$ F. The ambient temperature varied from $15-30^{\circ}$ F. The bear's body temperature dropped to a minimum of 93.75° F. and reached a high of 96.25° F., a variation of 2.5° F. (Fig. 2). In general the variation in body tempera-

ture coincided with the variation in ambient temperature as well as with the less changeable den temperature. Although the bear was in a dark den his body temperature rose by day and dropped at night.

On February 20 we made a return trip to the black bear den along the Gibbon River. The purpose was to obtain another nycthemeral body temperature pattern. We hoped to measure body temperature with the bear sleeping and more lethargic than previously. A brief period of monitoring indicated that the temperature probe had pulled out of the bear. We were unable to get a 24-hour body temperature pattern but we were able to measure the temperature of the microclimate between the bear and his well insulated bed. On one occasion we obtained 122 pulses per minute. This converted to a temperature of 96.75° F. The bear was apparently lying on the probe and we were measuring the temperature between the bear's body and his thick insulated bed fashioned from a porous mixture of dry pine needles and finely shredded twigs. This was supported by the fact that the temperature was erratic, fluctuating from 96.50° F. at 1015 to 83.0° F. at 1030; 87.50° F. at 1037, and 88.0° F. at 1055. The body heat from the bear was apparently trapped in a thin layer, or microclimate, between the bear and his well insulated bed. When the bear moved, the probe moved, temperature conditions changed and thus the erratic readings. At the time of the highest temp-

erature measurement, it is quite likely that the probe was against a portion of the bear's body where the hair was thin and heat conduction from the body efficient.

We ran a check by placing a thermometer against our skin and insulated from outside temperatures by several layers of underwear, shirt and down jacket. The temperature recorded in this manner was 95.0° F. It appears possible, though surprising, to have obtained a bed temperature nearly 2° F. higher than this. However, it is quite likely that the bear's body temperature at this time was in the neighborhood of 100.0° F. and this is indirectly substantiated by his unusual alertness and excessive activity. All equipment was subsequently checked and found to be functioning properly, thus the temperature recording of 96.75° F. plus or minus 1° F. must be accepted as approximately correct.

The microclimate that we measured between the bear and his bed, constitutes an area of approximately three quarters of the bear's body surface when curled up in his bed. The insulated bed was eighteen inches deep by thirty inches in diameter, cup-like in shape with nearly perpendicular walls against which the bear's body fit snugly (Fig. 3). When the bear was curled up in a sleeping position, he was slightly below the rim of the cup. Within the confines of the thick accumulation of bed material the bear was "hibernating" in a microclimate, partially of his own making and to a certain

extent controlled by his own thermoregulatory system. The temperature of the den chamber or cave (space above and around bed) remained quite constant responding slightly to changes in ambient temperatures, as revealed by the graph (Fig. 2). Due to an upward slope from the cave entrance to the top of the bear's bed, heat radiated from the sleeping bear was trapped in the upper reaches of the low cave. This undoubtedly had some warming effect on the entire interior of the den but not as much as might be anticipated because of slow transfer of heat from the thin microclimate surrounding the bear.

It is of interest that the bear's rectal temperature soon after he had been roused and immobilized on January 27 was 96.0° F. and the body temperature variations over the 24-hour monitoring period (January 30-31) ranged from 93.75° F. to 96.25° F. This suggests that the "hibernating" or dormancy temperature was influenced by the environmental temperature or microclimate enveloping the bear, and that this in turn was to a considerable extent regulated by the body temperature of the bear. In other words the bear's body temperature tended to conform to the environmental temperature of the microclimate which in this case was greatly influenced by the bear himself.

In contrast to this black bear den another that we have observed and entered during winter with the bear present had no bedding whatsoever. The bear slept on the earthen floor.

This den was very close to and warmed by a thermal spring. The den temperature, though unfortunately not taken, was in the neighborhood of room temperature (72° F.).

The foregoing observations seem to indicate that black bears like true hibernators (Kayser, C.H. 1961) look for, build or improve shelters trying to create the conditions of a constant environmental temperature. In these two cases different conditions altered the approach that the bears took to obtain rather constant environmental conditions during their period of dormancy. It seems likely that the average environmental temperatures obtained were higher than those that might be frequently experienced by "hibernating" bears in this region of long winters, deep snow, and low ambient temperatures.

Folk and Brewer reporting on studies of winter lethargy of black and grizzly bears in captivity found that two black bears and one grizzly bear as cold weather developed (as low as -60° F.) gradually spent more time in dens. All three bears became dormant in the sense that they did not leave the curled-up position for as long as a month at a time.

The two black bears we studied and observed under natural hibernating conditions were lethargic but were not observed in a state of deep dormancy. This does not infer that in the course of the winter they did not attain a state of hypothermic lethargy. Only that when we observed them they

were readily roused and on occasions quite active. They were not exposed to den environmental temperature conditions as low as those of Folk's bears in captivity. Possibly the immediate environmental or microclimatic temperature established, in part, by the bear determines the degree of dormancy or lethargy needed and achieved. Winter sleep conditions of wild bears may vary greatly with individuals and may also vary greatly from those observed under conditions of captivity. Extended periods of monitoring body temperature, bed and den temperatures of different bears under a variety of "hibernating" conditions might reveal interesting information on factors affecting dormancy.

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BLACK BEAR #2

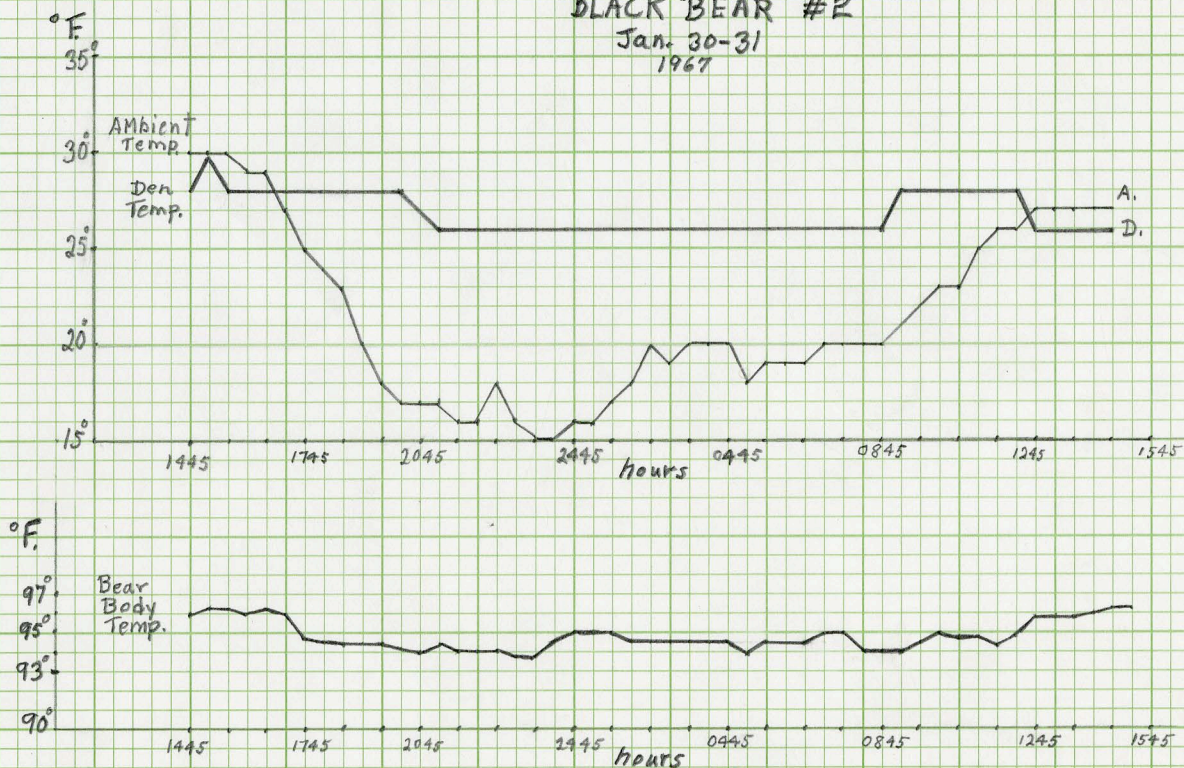
Gibbon River

Jan. 27-28
1967



BLACK BEAR #2

Jan. 30-31
1967



THE YELLOWSTONE

By DAVID de L. CONDIN
Chief Park Naturalist
Yellowstone National Park

THE YELLOWSTONE GRIZZLY is one of nature's masterpieces of rhythm. It moves with a speed and grace amazing for an animal so closely related to the ambling rolly polly black bear.

The grizzly is easily recognized in the field by its many outstanding physical characteristics; the silhouette reveals the dished face, the alert ears, the high roach on the front shoulders and the glowing halo of reflected light from the silver tipped hairs of the beast's splendid coat. The grizzly, on close examination, has other physical differences which readily distinguish it from its neighbor, the American black bear. It has a broad head, with most specimens showing a concave profile. The forepaws are armed with pronounced and easily seen long curved claws. The roach on the front shoulder in most individuals is very evident and looks like a hump.

The silvery sheen of the hair will glisten white as the shifting movements catch the light.

The grizzly displays as much range in general color variation as does the black bear. There will be specimens which are nearly white in appearance and others which will look coal black

until the light catches the silver tips to reveal the bear's true identity. In addition to these extreme contrasts, there are all variations in between.

The species, as I have observed it, does not meet the sporting magazines specifications for size. Actually it is conceded by those acquainted with the grizzly that an average weight for mature animals will approach 400 pounds for females and between 500 to 600 pounds for males. Occasional animals may get larger. Each grizzly has its own distinct personality and peculiar physical appearance and characteristics.

In 1942 I had the opportunity to measure and weigh five mature animals which were killed as a management measure and obtained the following data:

Sex	Total Length	Weight
Male	76½ inches	497 lbs.
Male	77 "	590 "
Female	67 "	346 "
Female	68 "	340 "
Female	66 "	375 "

All of these animals were old as indicated by their dentition and claws. The larger male was considered to be huge in size and was a problem to handle, but on the platform scales,

It was nearly as pretty as the one they had seen in the village.

Then they walked to the edge of the clearing and waited. Some of them went to sleep. But before daylight they were all awake and went back to look at the tree. Each found a present.

For Pungy, there was a little sack of corn; for Puff, a carrot; for Scolder, berries and nuts; for Scowler, a wreath of tender plants; for Busy, some tender bark from an aspen tree; for Switch, some sweet-tasting leaves; for Zippy, nuts, fruit and mushrooms; for Twinky, a big piece of cheese; and for Shy-Tim, a bundle of the tenderest, sweetest grass he had ever seen.

For a few minutes the animals were as happy and excited as anyone can be on Christmas morning. Scolder chattered louder than ever. Zippy was so excited he tripped over his present and fell on his nose. Even old Scowler, the moose, tried to smile.

But after they had looked at their presents carefully, they were disappointed. There was nothing but food in the packages and they already had plenty to eat. Wasn't Christmas supposed to mean something else? The animals looked at each other and wondered.

It was then that the strangest thing of all happened. From high up in the tops of the tallest pines there came the softest ringing of bells that you can imagine. You and I couldn't have heard it. But you know that animals can hear many sounds that we cannot hear.

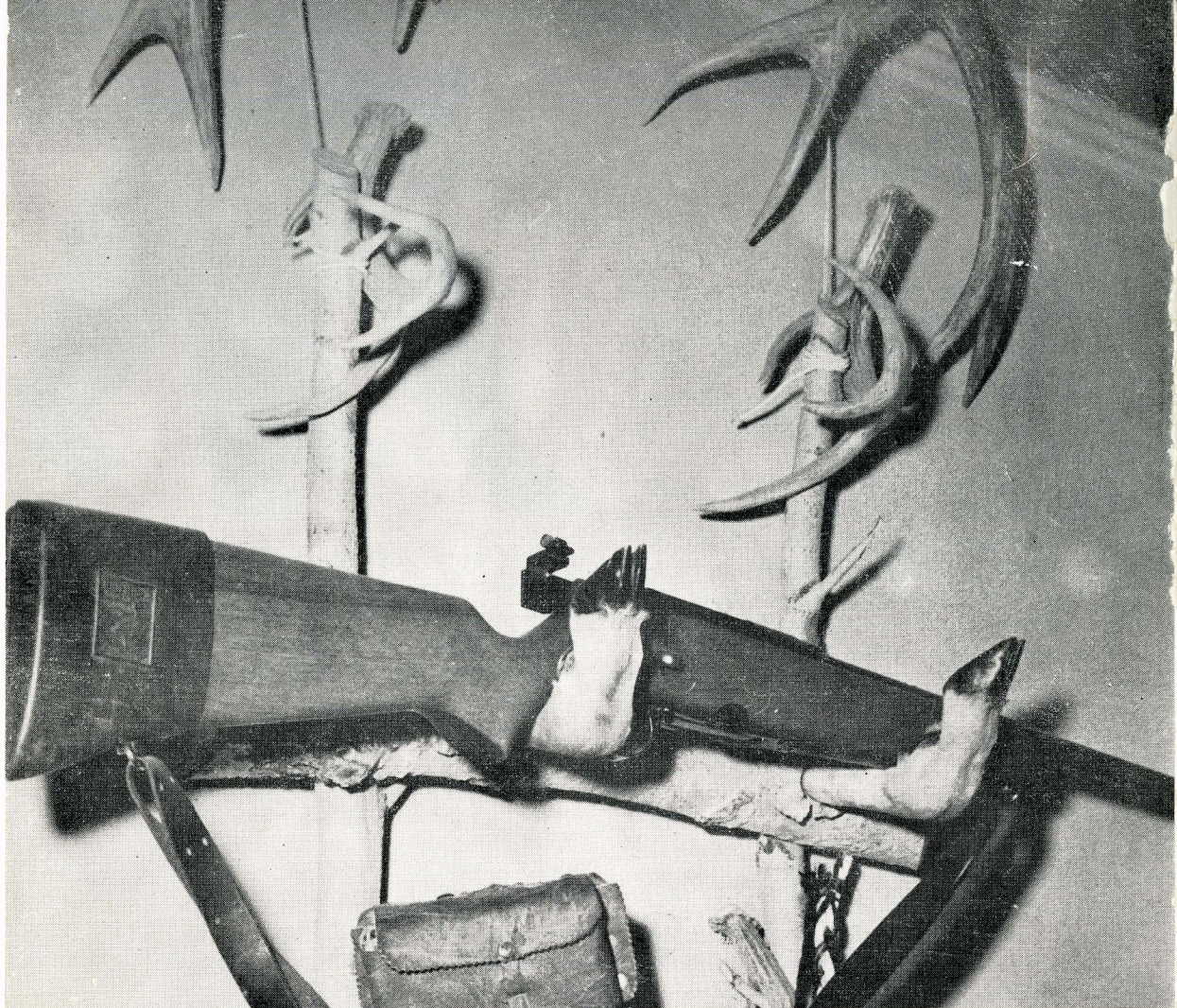
As they listened, a shaft of light shone down through the trees, lighting the whole clearing. The light was so bright it blinded them for a moment. They blinked their eyes to see better. Every twig and blade of grass glistened like silver in the sun. Through the music of the bells came a whispering so low that even Shy-Tim had to strain his ears to hear. But each of the animals heard and this is what it said:

"I love each of you who cannot speak as much as anyone."

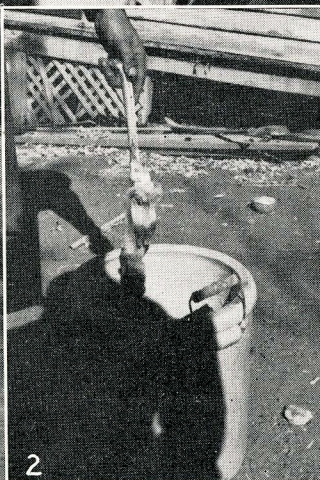
The light faded as quickly as it had come. But high up in the pines the bells kept ringing and the Christmas tree sparkled in the moonlight. The animals were as happy as anyone in the whole world — especially Shy-Tim who had followed the bells until he had discovered why they ring at Christmastime.



Wasn't Christmas supposed to be something else? The animals looked at each other and wondered.



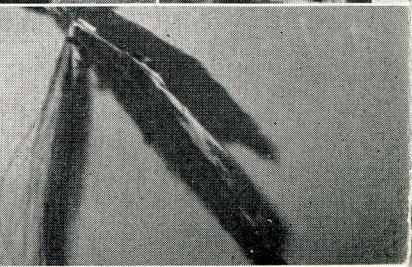
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2



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to 600 Pounds

often visited these areas and a continued observation of the bear until late at night has disclosed that an appreciable number will come in to feed with and fraternize with other grizzlies. Bear trails radiate out from these spots like the spokes from the hub of a wheel.

Maximum numbers seen or reported during the past season have been—Gardiner disposal area 13, Rabbit Creek area 22, and Trout Creek 54, a sight record of 94 grizzly bear. On July 27 at Trout Creek there was in sight at one time 7 females with 2 cubs each; 1 female with 3 cubs; 1 female with 3 yearlings; 2 females with 2 yearling; 3 three year old bear; 2 large males with ears missing and 14 assorted adult bear or a total of 54. These animals came from all directions of the compass and some appeared to have traveled long distances in haste.

There is considerable written into the records indicating that during the summer months a concentration of the major portion of Yellowstone's grizzly population focuses near the three refuse disposal areas referred to. A search of the monthly reports of the Superintendent and a perusal of the Yellowstone Nature Notes points up the fact that rangers and others report seeing grizzlies in remote areas in both the spring and fall but rarely in the summertime. During the mid-summer period very few reports are on record of these bear being seen with any frequency or in numbers in the outlying sections of the park. Of 21 stories written about grizzly incidents in areas which could be considered not readily accessible to these



focal points of summer concentration 15 incidents occurred before June 15 and 4 after September 15. Of the two records written up during mid-summer one was July 8 and the other June 20.

These observations provide a clue to the probable grizzly population and present estimates indicate that there is probably between 120 and 180 of these animals living in Yellowstone.

Each year some grizzlies roam beyond the boundaries of the park and are either killed by hunters and predatory animal trappers or are successful in establishing themselves in a new environment. No pronounced change in the park's apparent population has been noticed. It is hoped that the increasing pressure of visitor use can be absorbed without bringing added jeopardy to the continued well-being of the grizzly.

May the time soon come when public apathy to the ever diminishing numbers of these Silver Ghosts be changed to one of aroused interest in expanding their range areas and increasing their numbers to the point that there will never be reason to fear for their continued existence in the United States.



The black bear, during this era, not only frequented the dump areas but evolved into a race of roadside beggars which each season present a serious man-bear relationship problem. Considerable property damage is attributable to the contemptuous familiarity of black bear with man. Each season of recent years black bear injuries to persons permitting the close approach of these animals has exceeded 40.

Fortunately the grizzly bear has not developed a social attitude which has led to his frequenting roadsides and campground areas in any appreciable number. Whenever a grizzly has begun roadside panhandling or regular inroads into campground or cabin areas, it has been the policy of the Service to immediately trap this bear or family of bears and remove them from temptation and the potential of forming bad habits, which they might later teach to others. Grizzlies have not been permitted to rear their young in close association with man as the black bear have been allowed to do. The potential roadside grizzly has in most instances been sent to zoos whose requests for specimens for pub-

lic exhibit are usually on file waiting for just such a bear to put in an appearance. Campground prowlers are trapped and hauled to remote areas where they usually remain out of contact with man. The persistent bears who return and become a continuing hazard are killed as a human protection measure.

These management procedures, combined with the elimination of the once popular grizzly bear feeding grounds at Canyon and Old Faithful, are important keys to the success of having grizzlies and people both in Yellowstone. The abandonment of this practice of having the large crowds of people near the bear has, in all probability, contributed a great deal toward keeping the grizzlies from becoming as familiar with man as the black bear are now. The absence of this familiarity and lack of fear of man has tended to keep grizzlies from becoming a more serious management problem than they have been.

Since 1916 in the management of the Yellowstone grizzly population it has been necessary to kill at least 84 grizzlies to assure public safety and protection of property. There have

Grizzlies Are Big . . . Weighing up

been 12 additional bear killed for use by museums in preparing habitat groups and 38 have been shipped to zoos for use as exhibit animals for public display. The over all reduction of these 134 animals in the 40 year period means that an average of about 3.3 animals a year have been removed as a management measure, with many of them continuing to live and serve as displays for man's enjoyment.

There have been occasions when grizzlies have frightened people in campgrounds and cabin areas and at times they have done extensive physical damage to property. On these occasions immediate steps have been taken to eliminate the troublesome bears with the result that they have not brought in others or been permitted to persist in their depredations.

During the span of 40 years since

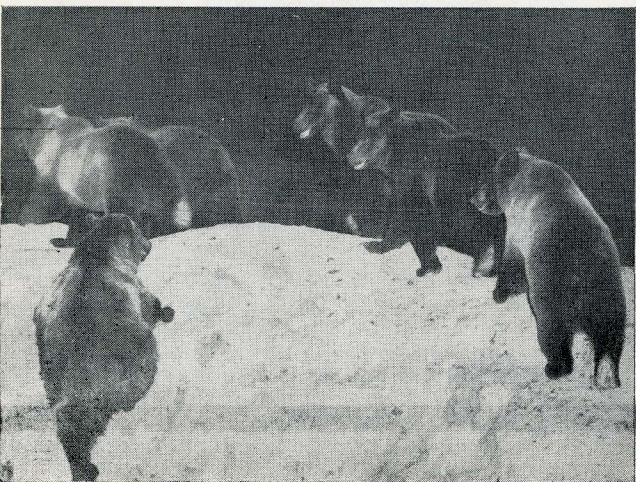
1916 records indicate that 8 injuries to people have been attributed to grizzly bear. One of these was so severe that Mr. Frank Welch of Electric, Montana, who was attacked on September 7, 1916 by a large grizzly, 10 miles east of Squaw Lake, died at the Fort Yellowstone hospital in Mammoth several days later. This is the only record of a fatality caused by a grizzly attack in Yellowstone. Two of the other persons involved with grizzlies were seriously injured but recovered without ill effects. During the same 40 year period 19,466,218 people have used the park — many have wandered its trails in the back-country, thousands have camped in remote areas and to have not more than 8 injured by contacts with the grizzly is evidence to me that man and the bear can both use the same areas without serious hazard to either if reasonable precautions are used.

The data on a grizzly population for Yellowstone can at best be only an estimate and that figure has varied a great deal through the years. In 1916 it was reported that a few were seen during the year but no estimated population figure was made. In 1920 the estimated total number in the park was 40, by 1941 this had grown to an amazing 320. The estimates became more realistic by 1950 when it was thought that there might be 180 grizzly bear within the confines of the park.

It is the opinion of some of those who have closely observed the grizzly and his habits that during mid-summer the population centers around or near the land fill garbage disposal areas. During the summer of 1956, I



Grizzlies are generally sociable but occasional disputes have been fatal.





Grizzlies are sociable, at least in family groups, Females usually have twins and triplets, more rarely one or four. They tend to travel in family groups and the young have been known to run together until they are five years old.

there are still extensive areas where the quality of habitat is adequate to support reasonable populations of grizzlies.

The decline has been caused by man's attitude toward the bear and conflicts which have arisen between man's use of the land and the use the bear would make of the same area. The intrusion of man into the domain in which the bear once roamed free from molestation has been its downfall. The branding of the grizzly as a hazard to man's interests started destruction of the species, then predator control practices increased the tempo and sport hunting took its toll until we have left but a remnant of a noble race and are justly concerned about its well-being.

Fortunately some states are recognizing the desirability of retaining the species and they either permit no hunting of grizzlies or have closed areas where grizzlies are afforded protection from hunting pressure. Colorado has given the species complete protection in the last remaining area where it occurs within the State.

Yellowstone National Park has long been noted for the grizzly population

which is an important part of the wildlife resources the park preserves for the people. With a visitation of 1,368,515 people during 1955 and that number already exceeded in 1956, the park management has so far been able to successfully keep the large grizzly population from seriously conflicting with the interests of man. Both man and the grizzlies are so far, successfully using the Yellowstone countryside.

In managing park use every effort is made to avoid creating situations where the grizzly and man might mix and come in conflict. Through the years efforts have been made to prevent the grizzly from becoming as familiar with man as have the black bear. To date, such management measures have met with a marked degree of success.

In 1919, to satisfy the desire of visitors to see both black and grizzly bear, dumps were established at Canyon and Old Faithful where people could go and watch the bear which were attracted to the area by the waste food stuffs from eating establishments. This was the beginning of a bear feeding practice which continued until the end of the season in 1941.

other but occasional disputes have at times been fatal.

The grizzly in motion is in direct contrast to the black bear. Instead of a rolling amble, he seems to express joy in motion and when traveling rapidly across country might remind the observer of a pacer horse in action. On a high run a grizzly can gallop faster than a man could hope to run. They have been observed catching moose and elk. In freshly plowed road cuts where they could be accurately paced they have been clocked at speeds just above 30 miles an hour.

It is generally conceded that the grizzly is king of the mountain fastness, but on a number of occasions he has met more than his match and the battered remains of one has revealed the tragic outcome of a struggle to the death. In July, 1951, Park Ranger Joe Way found the battered carcass of a large mature female grizzly which had apparently misjudged the power of a mature buffalo.

Will such wilderness tales continue to occur for those fortunate enough to find them or will the day come when this silver ghost of moving rhythm will no longer roam the mountains because the wild areas are gone and there is no place left for these phantoms of the night?

Increasing evidence points toward a continued decline in the grizzly bear population of the United States. Some persons concerned about the perpetuation of this outstanding species think that the grizzly is now dangerously close to extermination within the continental limits of the United States.

Yellowstone National Park, with its rigid program of wildlife protection, has become one of the last extensive wilderness areas where the grizzly has freedom to roam unmolested in numbers comparable to or even greater than in the era of the fur trapper and

trader who left us legends about the great white bears.

Glacier National Park follows closely behind Yellowstone as a sanctuary for the grizzly. Montana, with vast wilderness areas in its National Forests, reports the greatest grizzly population of any state and their estimated 439 are more grizzlies than the entire combined population of the species found in the remaining 47 states and the National Parks which have this bear within their boundaries.

The latest published inventory of big game animals of the United States gives an estimated total population of 844 grizzly bear for the country. Men who are familiar with grizzlies, their habits and environment, think this figure a generous and optimistic one.

The magnificent grizzly was commonly seen and once ranged from the California coast through the Rocky Mountains and onto the plains of the Dakotas, Nebraska, Kansas and Texas. His range extended from the Brooks Range in Alaska to Old Mexico. Today, in the United States, he is reported from Colorado's San Juan Mountains, where a few are retted to remain; Washington, which says it may have one or more; Idaho, with probably 50 to 60; Wyoming, with an estimated 25 to 50; Montana's liberally estimated population and those found in Grand Teton, Glacier and Yellowstone National Parks.

The future for this species is dark unless attitudes, policies and regulations change so that the animal can re-establish itself on some former range areas and in addition, unless it is afforded greater protection in those ranges where it is now found. It is not the destruction of, or lack of availability of habitat for this species which has brought its decline for



"... one of nature's masterpieces of rhythm"

he only approached the 600 pound mark.

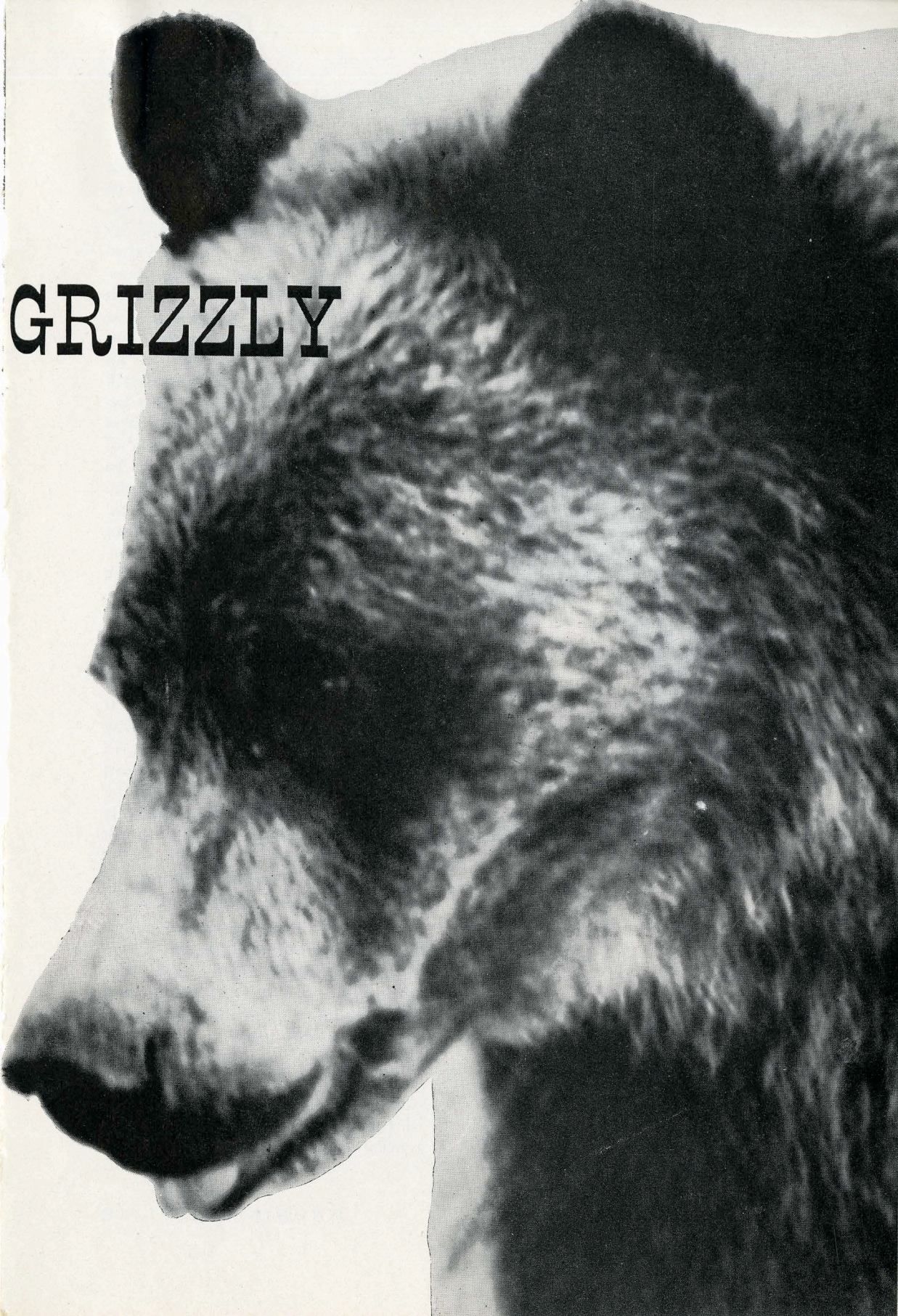
The grizzly is an alert and wary creature, largely nocturnal in his movements through areas subject to continued use by man. They have exceptional hearing and a highly developed sense of smell. It is said that they have poor eyesight, but on occasions I have had them rear and watch me pass at distances of one-half mile or more. They are exceedingly adept at rearing up and standing in an upright position and will often walk for several steps on their rear feet before dropping to all fours. They show an alertness to and an awareness of the activity going on around them. In general they are timid and wary and at every opportunity avoid close proximity to man; this factor may account to some degree for the limited number which are seen by people in back country areas.

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Smelly

The food of a grizzly can be anything that we can conceive of as being edible. They are definitely omnivorous and consume probably as much vegetative as they do animal food. It is not uncommon to see them grazing in a meadow, eating the fruits of shrubs or feeding on the pine nuts from a squirrel cache. In the spring they are commonly seen methodically hunting the calving areas of elk herds for young calves and each spring brings reports of grizzlies killing and eating mature elk, moose and bison.

The social habits of these interesting animals could well be the subject for an entire book. Suffice to say they are sociable, at least in family groups. The females most commonly have 2 or 3 cubs—more rarely 1 or 4. They tend to travel in family groups. These groups of young have been known to run together until they have attained the age of 5 years. They are in general sociable and tolerant of each

GRIZZLY



Jim Stingley

Nat Reed, Asst. Sec of the Interior

"The grizzley bear situation in Yellowstone National Park? I haven't got enough time to talk to you about that (on the telephone) That's a long, long story.

"You've got some great sources, though. You've got Starker Leopole at Berleley who was on the Grizzley Bear Team. You can talk to the Craigheads and get their side of it, and Dr. Glen Cole at Yellowstone.

"But you should talk with all of these men in very precise terms and I would take my time. Because you are talking about one of the most difficult natural resourcex problems in North America. And it is one that has become a very emotional situation. What it needs right now is very hard, pragmatic, scientific research.

"We are entering into a phase beginning next spring when the bears come out of hibernation...we will be putting additional manpower into the field to more properly judge the numbers and the numbers of young and yearlings...both figures which are absolutely vital if we are to determine whether the pop. continues to decline or whether it has stabalized and ~~haszhagunzah~~ ^{will begin} upward turnx without rubbish.

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Thats the problem. You also have so many years of hard feelings. Years of hard, hard and bitter feelings. You've got professional jealousy, you've got pecking order, its got to be one of the most

If I was you, I would call Starker--you've got the single greatest biologist in the world right there in Berkeley...and talk to Starker...then talk your boss into letting you fly to Montana and interview the Craigheads, and stop in at Yellowstone and talk to Jack Anderson....and then finally fly east to see me and Bob Lynn.

And Maybe then we would get the first accurate story as to where the hell the answer is....

Becuase it comes down to the basic premise...Starker and his group of biologists and zoologists believe very strongly that this population will level out once the ~~thexxargax~~ garbage bears have died or have been shot. And the free ranging bears stabalize. That this population will go back up to the carrying capacity of the eco system which we know as Yellowstone.

The Craigheads maintain that the bears have been fed so long, so many years, that they are habituated to garbage and that there is no possibility that wild, freeranging bears can exist in Yellowstone any longer.

You can't be further apart than those two views.

Now when you say the Craigheads, Boys we should go back to ~~hxxrx~~ garbage type feedint, which is sort of a zoo like situation in a ^{the middle} of national park, they say no, but you should have weaned the bears slowly off the garbage.

The problem is I made that decision the first week i was here. I concurred with the secretary's decision to cut off the garbage. So its a little late to go back two years ago.

^{He} ~~Thex@raigheads~~ ^{he} said ~~knx~~ principally objected to the cavalier manner and cold turkey apporach. And Starker was equally insistent that the cold turkey apporach was the only sane way that it be done. Because if you feed the bear a little bit less every day he still is habituated to garbage, just like he would be on a drug or on liquor.

Mr. Anderson is one of my closest friends, he is a great man, this is off the record, hes a great, wonderful, marvelous, guy. Hes the super ranger of the whole park service...but he can't stand either Craigheads. And when he took over the park the boys were running around doing their thing inside the park, knocking off bears with drugs to find out how old they were. They were pulling the bears teeth out to age the bears and then turn them loose.

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It is a very complicated and fablously interesting story, one that you can study and study and study and ohm one that you are going to have to look at in the perspective of time. You cannot make a rational judgement on this thing. Because anybody can make a computer do any damn thing they damn well want. ~~endxthkatzxanaxothaxzhir~~

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Call me from Yellowstone on Jan 4...use Jack's watt line or Call me on the 8th.....be sure and do it.



Environmental Research Institute

HEADQUARTERS
P. O. Box 156
Moose, Wyoming
89012

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January 10, 1973

Mr. James Stingley
Los Angeles Times
Times Mirror Square
Los Angeles, California 90053

Dear Jim:

I enjoyed my conversation with you yesterday and appreciate your call to inform me of your discussions in Yellowstone. I am enclosing some of the information you requested. This includes Cole's article in the Jackson Hole Guide and my rebuttal to it. Cole's article was placed in the Guide very shortly after we had gotten together and agreed that we would not try to fight this battle in the newspapers. This was their suggestion, and we went along with it. Then to our surprise this article appeared. As I mentioned to you, I refuted it because of the vast amount of misinformation that it contained.

I am also enclosing a letter from Tom Hough concerning material that he published in the Guide November 6th issue. This was background material that I gave him for his own information and which he promised to keep confidential. There was nothing in this article that I would not have published, but I did not care to have it published without my consent, particularly as I knew it would only tend to aggravate the situation. I followed this up with an apology to Jack Anderson and a copy of this letter from Tom Hough.

I am enclosing a copy of a letter that I wrote to Jim White regarding the so-called Leopold Report. You may make use of the information contained, but I would prefer that you treat the letter itself as confidential. I am sending it because I think it may be of value to you in interviewing Starker Leopold.

In addition, I am sending a letter addressed to Walter J. Hickel that John, I, and Dr. Schaefer sent with numerous enclosures on January 27, 1969. This will give you a little additional information on the research situation in Yellowstone National Park.

Mr. James Stingley

-2-

January 10, 1973

I have marked those papers that are file copies and would appreciate it if you could return them to me at your convenience.

Sincerely,

Frank C. Craighead, Jr.

FCC,Jr/jto

cc: Dr. John J. Craighead

Enclosures

Jim Stingley
Phone conversation

Nat Reed, Asst. Sec of the Interior

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