

PANEL 2: DENNING-CONTROL MECHANISMS, SITE SELECTION AND PHYSIOLOGY.

SUMMARY OF DISCUSSION

M.Barrett. Dr. Craighead, you mention that denning was probably instinctive and that during a given storm, many bears appear to head towards their denning areas. Now I'm curious about the time sequence here. Were you able to document that some of the bears started to prepare their dens well in advance of the time that they probably would need them or was it an immediate thing.

F. Craighead. We feel it's instinctive for the grizzly bear to dig a den. We have found in the case of several of them, very good natural shelters within a 100 yards or so of areas where they have had difficulty digging a den in a rocky soil and yet they didn't use the natural shelter. The timing is varied with individuals. I think I mentioned that the earliest den digging that we recorded was September 3, another September 8. The latest den preparation was in the middle of November, just prior to entering the den for the winter. These were bears which had been disturbed at a former den and had abandoned the den and then dug another one. Grizzly No. 202 that I mentioned took off and left his regular fall haunt, went down into the Yellowstone Canyon and immediately started preparing a den. This was at the end of October—early November. Then it did not enter the den until about the middle of November. The time that they start digging the dens seems to vary quite a bit but there usually is a triggering snow storm as far as we've been able to determine that finally puts all of the bears, at more or less a given elevation, into their dens at the same time. We feel that a combination of storm, snow on the ground, snow accumulating, gradually lowering temperatures with a final storm followed by cold weather, puts the animals in for the winter sleep. We've had them return to their dens with a storm maybe putting down 6-8 inches of snow. If this is followed by a warming trend, temperatures up in the 40's, maybe even 50's at midday, then grizzlies don't enter their dens, they wait for the next storm. It seems quite definite that environmental factors influence the final movement to and entering the den. As I mentioned, this is varied by as much as a month over a 9 or 10 year period.

J. Lentfer. I can comment on observations on the Alaska peninsula. We feel that the females with young go in first and the males stay out longer and we have not been able to relate it to a definite climatic event. They probably do go in after there is snow on the ground and the weather is fairly cold, but in flying over the area we'd gradually see fewer and fewer bears and we assumed from this that they had gone into their dens.

A. Pearson. My question is directly related to this because of my experience with the grizzlies in south-western Yukon. Through tracking and radio transmitting, we know that the sows with young enter before the males. In our country we have, as I said, 1900 foot valley bottoms and peaks up to 7600 feet. I have not found a grizzly den yet that was not between 3800 and 4000 feet in a sub-alpine zone—a dug den again. We do find that when there's snow at that altitude on a north exposure, there are many other areas without snow and the snow doesn't seem to be quite as important there. For example, last year, 1969, we had, during the fall, two sows with radio collars—one with 3 yearlings and one with 1 yearling, each in separate dens. The entrances were open, no snow whatsoever, and we could go each day and look inside the dens, hovering over them with a helicopter. The temperatures were warm during the day, up

to 40°F; nice clear high pressure conditions. We tried our best to find out if those bears came out of the den once they had gone in and I'm quite confident that once they went in, they did not come out again, even though they were active. We could see them moving in the den by shining a powerful light in there. One bear would peek out and then another one. It doesn't seem that there is this trigger mechanism that Drs. Craighead seem to have in Yellowstone.

I. McT. Cowan. I wonder if a significant variable for timing hibernation could be the input of the length of time and intensity of human predation on bears in different parts of their range? In the Yellowstone area, the bears were living in contact with Indian groups, which used bear claws as symbols of success as hunters. A bear enclosed in a den, without snow cover, is a very vulnerable creature. Consider areas where human predation on grizzlies was a significant selective force. In this situation a bear that retired during a snowstorm could not be tracked to its den because its tracks would be obscured by snow. This behaviour pattern would not be of selective advantage where human predators were not tracking bears to their dens.

F. Craighead. I feel it does have definite survival value and it certainly occurs in the Yellowstone area. The black bear in the same region does not do it.

L. Miller. There is one other thing I'd like to bring up about when bears go into hibernation. In the Alaska Peninsula there are several streams that have salmon very late into December and it's quite common to see numbers of bears on these streams in December. In other areas, not too far away, the bears have obviously dened up. So food may be an important factor.

J. Craighead. Mr. Hensel, you had a total of about 126 dens that you observed and that you located from the air. Could you tell me in what proportion or what number of those, you actually observed bears in the den or right at the den site?

R. Hensel. Seventeen in the Alaska Peninsula and 6 on Kodiak Island.

J. Craighead. The reason I asked the question was because in the case of the grizzly bear, we started attempting to locate dens without actually tracking the bears to the den and we located what we called, day beds, which appear to be similar to the dens. Some of them are excavated 4 to 6 feet back into the soil; they're on slopes. The bears apparently use them during very warm weather and we found literally hundreds of these and I was just wondering if you have any way really of separating what might be highly developed day beds from winter dens.

Also we found that when the bears emerge—some of them will come out early in the season, in March—they'll make bough beds on the snow; we'll get a storm which will cover them with as much as 2 feet of snow, resulting in what looks like snow dens. When the snow leaves they do sometimes dig fairly elaborate day beds in the vicinity of the winter den.

R. Hensel. Yes, we found actually 2 different types of day beds, and one was pretty much associated with summer feeding habits along salmon streams, where they're feeding maybe in the early morning or the early portions of the day and towards evening. The remainder of their time, they're resting and excavating shallow beds. These are quite a bit different from the type of beds that we found in den sites and the main criterion that we go by, of course, is just the difference in the habitat. The daytime beds associated with feeding involve lowland habitat or tundra types of situations, whereas the daytime beds associated with denning are at higher elevations.

E. Folk. The consensus seems to be that often the winter den is quite far from the feeding area. Is that your impression?

J. Craighead. Most dens have been located distantly from fall and summer feeding areas and one characteristic of all the den sites we've located in Yellowstone Park is that they are very definitely isolated. They're isolated from human habitation particularly and this seems to be an important factor in den selection. They seek isolation, often in distant-timbered areas or, in the case of that one bear, on the slopes of the Yellowstone Canyon. This den was actually between 2 avalanche runs in a small stand of timber on about a 45 degree angle. In this island of timber, the majority of the trees were scarred by falling rocks. It was an area that after just a few inches of snow had fallen, was a really hazardous place to try to get to and it took us 2 days, even in the spring, to get down to the bottom of the canyon and climb back up again to the base of the cliff to get to this particular den. I just mention this because it was isolated, it was difficult to get to, and this is a characteristic of most of the dens that we have located.

J. Lentfer. Most of the feeding areas are away from the denning areas on the Alaska Peninsula.

S. Herrera. I'd like to comment on some black bear denning observations which were made during several hundred hours of observations spread over a two month period. These were repeated observations on a single black bear, a sow which had one cub of the year. The sow first came out in late February during an unseasonable melt, during the warm chinook winds that we get here. As soon as she came outside, she brought the cub out, and constructed 3 day beds within 30 feet of the den. The observation of bears re-entering the den during periods of inclement weather was exactly what I observed with her. During continued chinook conditions she was out on the day beds both day and night. Then as soon as the weather became inclement again, she would re-enter the den with the cub and stay until conditions improved. She remained at or near the den site for almost 2 months during which I was able to observe her. Then in early April the weather got good again and she left the denning area and entered the forest where I was able to track her in spring snow. I found her several hundred yards away. This time she had built a tremendous day bed. It was a structure, which I've described elsewhere, fully 18 inches thick, done out of duff from the ground. The next day a foot of snow fell but she remained on the new nest and never returned to the den. She remained on this nest for 3 or 4 days, and then the weather ameliorated completely and she started using a larger area.

E. Folk. Was this a dug den?

S. Herrero. It was an artificial culvert, under a road, so it was simply utilized. There was, however, a lot of boughs and typical denning material which had been taken inside.

A. Pearson. One thing that interests me is the re-use of dens. I found considerable evidence of re-use of dens. I could not verify whether the bear that dug the den re-used it or whether the bear used a den dug a previous year by another bear. I know of one den that was present on the study area when we arrived and was not used for 2 years. Then all of a sudden that fall a sow with a couple of young came along and reactivated the den. There was very little reactivation to do. In our country dens last a long time. There's not a great deal of slumping and falling. Now I would think that might be the case in Yellowstone also. I'm wondering whether there are a number of old den sites

around that you could equate to a population like you have, having denned for hundreds or even thousands of years ?

F. Graighead. We have indirect evidence of re-use of dens but none of the dens to which we've tracked bears by radio have been re-used. In most cases dens have either partially or completely collapsed by fall so that they couldn't very well be re-used or even re-excavated.

E. Folk. One interesting physiological event is plugging the digestive tract in the black bear and the grizzly bear. This is associated in some way with the process of not eating and not drinking for 4 months but, to my knowledge, there's been no proof of the plug in the digestive tract in the polar bear. I'd appreciate some comments on this. The plug is associated with denning and apparently this plug is passed several days after leaving the den.

F. Craighead. Well, we have found, of course, these lower digestive area plugs when we have worked with the bears in obtaining body temperatures and so on. We've disturbed them—some of them to the point where they have excreted these plugs and then gone on in their winter sleep, apparently without any noticeable effect.

One other thing that we've noticed, and maybe some others studying the bears have, and that is that just prior to hibernation they will have a very dark watery stool and this seems, in some cases, to be a scouring of the digestive tract in preparation for hibernation.

E. Folk. Mr. Hensel, have you observed this in Alaska bears ?

R. Hensel. Yes, we found one complete plug and remnants of a second at two widely separated den sites. One den involved a mature male. We photographed the plug which, as I recall, must have been in the neighbourhood of 32 inches in length and about 2 to 3 inches in diameter. But this broke when it was discharged; it was in segments and the terminal segment was about 10 or 11 inches in length.

E. Folk. This was passed by the animal?

R. Hensel. Yes.

E. Folk. Has anyone here dissected one? I know that Morrison has.

R. Hensel. In the case of observations in Kodiak, segments of the plug were collected and preserved, but to my knowledge they haven't been analysed. They're of a very, very dark carbonaceous substance and it appeared as if there was quite a bit of vegetative matter in the plug.

E. Folk. Dr. Craighead, did you analyse any of the ones you found?

F. Craighead. We haven't definitely analysed these but they have contained quite a bit of vegetation. It seems, in just a quick examination, as though they may be a combination of vegetation and other food that the bear fed on just prior to going into hibernation.

R. Russell. The reason I am interested is that I have just been finishing a food habit study on polar bears in the Hudson Bay and James Bay region and, when collecting faeces, I did find three scats, which may have been plugs. They were in fairly close proximity and they may have been from one bear. They were found in front of a den, I'm not sure whether it was a summer den or a winter den, and when I analysed them, I found them to be around 75% sand. They were quite compact and heavy and the vegetation was mixed in. Things like birch (*Betula*), *Lycopodium* and some moss and leaves of *Salix* and *Betula*

again. Now I wondered at the time if this was a plug. I discussed this with Dr. Jonkel, and he suggested that it may have resulted from the bear licking itself off after digging the den. This material may have adhered to the hair and during a grooming process been ingested. I was just wondering if you'd found inorganic material mixed in with plugs? Thank you.

E. Folk. This material you're talking about is somewhat unique in the animal kingdom, as far as I can see. I don't know if we're using the right word. The literature speaks of plug but there is a question whether this shouldn't be dropped as a term because we haven't any evidence that it's anything but accidental vegetation that went in 4 months before.

F. Craighead. I'll just make a remark on 2 observations that we made in regard to this. One was a radio bear that we startled close to its den and it defecated. This was just a glob of clay, as near as we could determine it, mixed with a lot of mucus. In one black bear den we found 2 stools or plugs about 6 inches long, composed of clay and the chewed up remains of white bark pine cones. The plug was very, very dense, very stiff and rigid.

C. Jonkel. In regard to black bears I have analysed several of these plugs. They were composed of materials that you would find in the den. There were chips of bark, and a lot of black bear hair, things like that, and I felt certain these were a result of grooming over the winter. During numerous observations of black bears in dens, they did move around and scratch and groom themselves and one another, if there was a family in a den. Over winter I should think they would accumulate quite a lot of material. I recall one of the polar bear scats that Dick Russel analysed that was most certainly dropped early in the spring, about the time the bear would have come out of the den. It was composed almost entirely of polar bear hair. Again, as if the bear had been picking this up over the winter.

K. Mundy. I had the good fortune when I was working on bears in 1961 and 1962 to obtain a female grizzly shot in the Swan Hills, I believe it was on the 28th of January. It was an adult bear, she had 2 young bears in the den with her. The details are a little foggy, whether they were cubs of the year or 2½ year olds, but I had the good fortune to go through the entire alimentary tract for parasites. The gut was clean, it was essentially a starved bear, with an enlarged bile duct. The first metre, I believe, of the duodenum was stained with bile. The rest of the gut was empty except for the last metre which had a long, sort of viscous plug. It was about a metre long and it was composed almost entirely of hair.