SHEDDING OF FOOT PADS BY BLACK BEARS DURING DENNING

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This paper describes the shedding of foot pads by black bears (*Ursus americanus*) during winter dormancy. In most mammals, cells of the foot pads are lost as a result of activity and are replaced simultaneously by new cells produced in underlying epidermal layers (Bloom and Fawcett, A textbook of histology, p. 481, 1968). No doubt this process also occurs in active bears. However, late in dormancy bears also shed the keratinized portions of their pads in large pieces or as single units over a period of a few days or weeks.

The only available references to the shedding of foot pads are those in accounts of aboriginal beliefs. The Cree of Manitoba and Saskatchewan thought that bears ". . . eat the skin off the palms of their fore-paws" (Hallowell, Amer. Anth., 28:1-175, 1926), and the Salteaux of northern Ontario believed that bears lick their paws during the winter (Masson, Les bourgeois de la compagnie du Nord-Ouest, L'lmprimerie General A. Cote et Cie, Quebec, p. 345, 1890). Indians of Alberta and British Columbia believed that the feet of bears are sore and inflamed when they leave their dens in early spring, and the same belief was held by the Montagnais-Naskapi of Quebec (Hallowell, 1936). Similarly, the Yezo aborigines of northern Japan believed ". . . that when bears come out in the spring their feet are so tender that they cannot move far from their dens" (Batchelor, The Ainu and their folklore, p. 472, 1901, cited by Hallowell, 1926). Moreover, a myth that bears sustain themselves during the denning period by licking or sucking nourishment from their paws was prevalent in northeastern North America, northern Europe, and northeastern Siberia during the eighteenth and nineteenth centuries (Pinkerton, A general collection of the best and most interesting voyages and travels in all parts of the world, p. 415, 1810; Masson, 1890; Hallowell, 1926). From conversations with residents of Minnesota, I have found that some people support this belief even today.

To investigate the basis for such thought, I took the opportunity to examine foot pads of 178 wild black bears during a three year study in northeastern Minnesota. From 1970 to 1973, thirty-two bears one year of age or older were examined between 7 March and 10 April shortly before they emerged from their dens. The foot pads of 26 of these either were loosened around the edges or were in advanced stages of being shed (Fig. 1). Plantar pads were shed as several pieces; digital pads sometimes were shed as single units. Pads being shed were 1 to 4 millimeters (mm) thick and heavily keratinized.

All pads of the other six denning bears already had been shed, and new pads were developing at the time of inspection. Freshly exposed pads were less than 1 mm thick and seemed to be sensitive and easily injured. Bears flinched when their developing pads were touched even though the animals were lightly anesthetized with immobilizing doses of phencyclidine hydrochloride and promazine hydrochloride. The feet of one bear bled slightly when it walked approximately 100 meters on crusted snow after being disturbed from its den on 16 March. Following immobilization, examination showed that the bleeding was due to scuffing of the new pads and premature loosening of unshed portions of old pads. No pads were examined in late April or May, but by June they were more heavily keratinized and the tenderness had disappeared. Pads of the 126 bears examined between 4 June and 2 January were not shedding but showed a gradual thickening and loss of pliability that continued at least through the seasons of activity.

The factors that cause shedding of old pads are unknown at present. Freezing apparently is not involved because (1) bears usually sleep with at least their rear feet in a

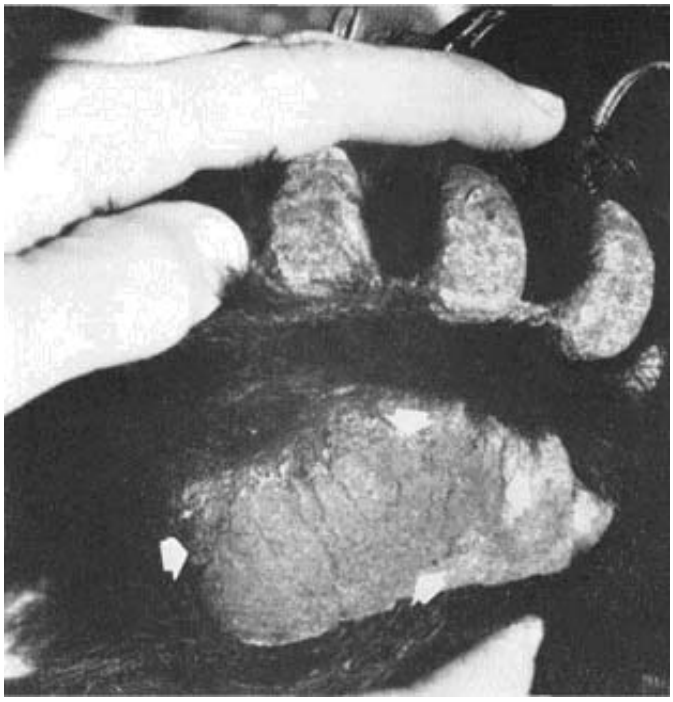

FIG. 1.—Right forepaw of denning black bear on 19 March 1973. Arrows indicate the unshed portion of the plantar pad which varied from 1 to 3 millimeters in thickness. Digital pads and the light-colored portion of the plantar pad were newly exposed and less than 1 millimeter in thickness.

warm location under their bodies, (2) pads of all bears one year of age or older were shed even though temperatures in dens completely covered with snow were not lower than -9°C, and (3) pads of 20 cubs born in January or early February apparently were not shed even though they were exposed to approximately the same temperatures as were the pads of adults.

Telemetry data from approximately 20 instrumented bears each spring showed that most bears emerge from their dens when ambient temperatures of more than 10°C cause rapid melting of snow. In 1971 and 1972, these events occurred in early and mid-April, respectively, and most bears remained near their dens until mid- to late April when the ground became sufficiently free of snow to permit travel and feeding. In the spring of 1973, rapid melting occurred about three weeks earlier than usual, and bears emerged in late March while most of them were still shedding foot pads. Although the ground was nearly free of snow by early April, most bears did not begin to travel widely before mid-April, about the time they began travelling in 1971 and 1972 when snow conditions were "normal" for the area. Physical and physiological factors involved in postdenning "lethargy" are not well known, but one such factor may be tender paws, as claimed by Yezo aborigines.

Portions of old foot pads were found in two scats near entrances of dens in the spring of 1972. This suggests that aboriginal reports of bears licking and eating their pads were correct. Hallowell (1926) could not find evidence of such beliefs among Indian tribes of the north Pacific coast or the southern United States where bears usually do not den

for long periods. Perhaps annual shedding of foot pads is limited to bears that have lengthy denning periods.

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