

## Precision of Descriptors for Percent Marrow Fat Content for White-tailed Deer, *Odocoileus virginianus*

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Based on 168 records of both verbal descriptors of White-tailed Deer (*Odocoileus virginianus*) femur-marrow fat and percentage of fat measured later, "gelatinous" served well to distinguish fat < 46% from higher percentages. "Waxy" distinguished fat > 56%.

Key Words: White-tailed Deer, *Odocoileus virginianus*, marrow fat, nutrition, body condition.

Marrow-fat content has long been used as an index of nutritional condition, especially of ungulates (Cheatum 1949). Although marrow-fat content is only a one-way test capable of indicating an animal in poor condition but not necessarily of one in good condition (Mech and DelGiudice 1985), it remains useful for indicating poor condition. The most accurate method of measuring marrow-fat content is to remove the marrow from the femur, weigh it, oven dry it, and weigh it again. The dry weight divided by the original weight indicates the percent fat (Neiland 1970).

However, it is not always possible to collect and weigh bone marrow. For example, when one encounters a dead animal unprepared or when working in the wilderness. Then only a visual examination and verbal description are possible. There are several ways of describing marrow, usually by color and texture. The correlation between these descriptors and actual fat content, however, has not been established empirically.

Volunteer technicians described the femur marrow fat of White-tailed Deer (*Odocoileus virginianus*) and measured the fat content (Neiland 1970), and I examined the correlation between the descriptors and the actual fat measurement. Most of the deer had been killed by Wolves (*Canis lupus*), during winter, in north-eastern Minnesota from 1984 to 1990. Some 20 technicians were involved, and they examined femur marrow from 168 Deer. Descriptors used could be checked on a form and included "pink," "red," "white," "firm-waxy," "greasy," and "gelatinous."

I sorted the data file by percent marrow fat and found that the only descriptors that were consistent and reasonably well correlated with actual fat content were "gelatinous" in 15 (50%) of 31 cases with < 46% fat, and only 5 (4%) of 139 cases > 46% fat, and "firm-

waxy" used in 84 (66%) of 127 cases with > 56% fat, and only 1 (3%) of 39 cases with < 56% fat.

"Gelatinous" or "jelly" seems to be an adequate descriptor for femur-marrow fat < 46%, and "firm-waxy" for marrow fat > 56%, at least in White-tailed Deer. The percent femur-marrow fat that indicates poor body condition might vary by species, but Ballard et al. (1987) found that the mean marrow fat of starved Moose (*Alces alces*) was 52%. Thus merely being able to distinguish gelatinous marrow fat from waxy would be useful to distinguish individuals in poor condition.

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### Literature Cited

- Ballard, W. B., J. S. Whitman, and C. L. Gardner.** 1987. Ecology of an exploited wolf population in south-central Alaska. Wildlife Monographs Number 98. 54 pages.
- Cheatum, E. L.** 1949. Bone marrow as an index of malnutrition in deer. New York State Conservation 3: 19-22.
- Mech, L. D., and G. D. DelGiudice.** 1985. Limitations of the marrow-fat technique as an indicator of condition. Wildlife Society Bulletin 13: 204-206.
- Neiland, K. A.** 1970. Weight of dried marrow fat as indicators of fat in caribou femurs. Journal of Wildlife Management 34: 904-907.

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