

The Winter Diet of Wolves in Bieszczady Mountains

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Thirty-one stomachs of wolves shot in Bieszczady Mountains were collected during two consecutive hunting seasons. Deer tissues amounted to over 55% and wild boar tissues to almost 11% of stomachs content. It appears, that the carcasses of domestic livestock used as a bait consist a significant component of wolves diet in winter (over 30% of stomachs content). The authors estimated, that the food requirements of an average wolf in winter, could be covered by consuming two red deer.

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1. INTRODUCTION

In Central Europe, the wolf *Canis lupus* (Linnaeus, 1758) still remains a very controversial animal. Within twentieth century the density of this species dropped considerably due to intensive extermination, and now in many countries, wolves are on a very edge of extinction. Such a situation awakens to the risk of loosing one of our big predators and brings many conservationists to action. Unfortunately on the other hand, wolves are often regarded as bloodthirsty pests, which are nothing but a constant threat to livestock. This point of view is also supported by many hunters who consider the wolf a competitor and blame it for loosing trophy-quality stags.

Some of these controversions are caused by the lack of data on wolves diet. Most of studies on the ecology of this species were carried out in North America (Mech, 1966, 1970, 1977; Guyt, 1972; Floyd *et al.*, 1978; Scott & Shackleton, 1980; Ballenberghe, 1985) in sparsely populated areas where conflicts between wolves and man are much less likely to happen. Even in Minnesota, only 3% of wolf scats contained remains of livestock (Fritts & Mech 1981). Only recently, several papers on food habits of European wolves were published (Miłkowski, 1986; Salvador & Abad, 1987; Reig & Jędrzejewski, 1988).

In Poland, wolves were treated as pests till 1975 when their number dropped to about 100 individuals. Since then, the wolf has a status of game species, with five months season closed for hunting. That allowed to raise the number of wolves which presently in the whole country can be close to 1000 individuals (Bobek *et al.*, 1987). Bieszczady Mountains, where dwells a considerable number of Polish wolves (the official data of Krosno Forestry District showed 250 individuals in 1987), are probably the most suitable region in Europe to study the ecology of this species. Particularly, the data on food habits, are necessary to unburden the discussion over the wolf from often groundless opinions. This study concerns the winter season, when wolves have no access to livestock, and game species remain the most important source of available food.

2. STUDY AREA, MATERIALS AND METHODS

Studies on the composition of wolves' diet in Bieszczady Mountains were carried out for two consecutive hunting seasons *i.e.* between September 1st and March 30th in 1986/87 and 1987/88.

Bieszczady Mountains, situated in southeastern Poland in the Krosno Province, occupy only small part of Carpathian Range and presently they are the least populated region of Poland. The joint forested area of six forest districts covered by this study (Baligród, Cisna, Komańcza, Lutowska, Stuposiany, and Wetlina) reaches 120,000 hectares. *Fagetum carpaticum* is the dominating forest association in Bieszczady (up to 90%). Forests cover about 40% of this area (Kosobucka, 1981). According to the data of Krosno Forestry District, red deer *Cervus elaphus* (Linnaeus, 1758), is undoubtedly the most numerous among big game species (almost 3000 individuals). Due to severe winters, and the presence of big predators, the numbers of roe deer *Capreolus capreolus* (Linnaeus, 1758) and wild boar *Sus scrofa* (Linnaeus, 1758) are relatively low. The population of European bison *Bison bonasus* (Linnaeus, 1758) is estimated at about 250 individuals. Between 1980 till 1987, 40% of wolves harvested in Poland were shot in the Krosno Province. The average body weight of an adult individual was 41.2 kg (Okarma, in press).

During this study, stomachs from 31 specimens, and data on sex and approximate age were collected. Stomachs were removed within 48 hours since shooting a wolf and stored in a freezer. After thawing, a whole stomach was weighted and then the content was washed out. Afterwards, the empty stomach was weighted and filled with water to determine its capacity. Stomach content was washed on two sieves with screen sizes of 1 and 1.5 mm, at first with warm and later with cool water. Hereafter, the following fractions were separated: hair, hide, bone, meat, fat, gristle, and plants. Remaining, was the unidentifiable fraction which consisted of completely digested, pulpy stomach content.

After determining the wet weights of particular fractions, samples were dried in 60°C for 48 hours.

The identification of particular game species eaten by wolves was based on specific differences in the microstructure of hair (Dziurdzik, 1973; Leśniewicz,

unpubl. data). In some stomachs of wolves shot at the bait, no hair were found since animal carcasses used for this purpose are often skinless. Thus, when in stomach content no hair were found, it was assumed as containing only a bait.

3. RESULTS

The average biomass of a wolf stomach with content was 739.7 ± 361.1 g and the average capacity 2.8 ± 0.51 l, while the average biomass of stomach content was 416 ± 364.7 g (one of sampled stomachs was found empty) (Fig. 1).

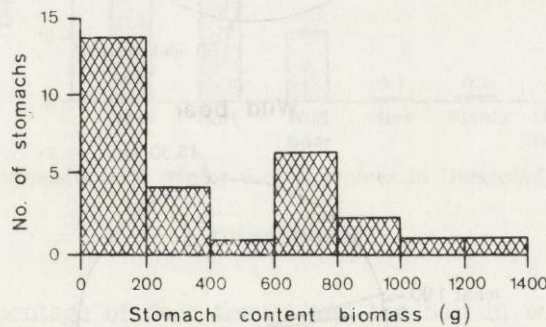


Fig. 1. The content biomass (g) for 30 stomachs of wolves shot in Bieszczady Mountains (the only one empty stomach is not included).

Bone composed 40.9% of stomach content (dry weight), meat 23.6%, hair 21.2% hide 11.8%, fat 1.4%, gristle 0.2, and plants 0.2%. The unidentifiable fraction made 0.7% of dry weight of an average stomach content.

The percentage of particular fractions was also estimated separately for stomachs containing only bait (carrion), deer (red deer and roe deer) tissues or wild boar tissues (Fig. 2 a, b, c).

The analyses of the microstructure of hair allowed to estimate the specific composition of wolves' diet. Deer were the most important prey (up to 55.4% of dry weight). The carrion of livestock, laid out under high seats as a bait, made 32.7%, while wild boar and hare represented only 10.9 and 0.1% of wolves' diet (Fig. 3).

The comparison of two studied seasons showed small differences in the composition of wolves' diet. Significantly different, according to *t* and one-way ANOVA tests, was only the percentage of bait ($p \leq 0.05$). Chi-square test showed that also the differences between two seasons in frequency of particular game species and bait were insignificant ($p \leq 0.05$).

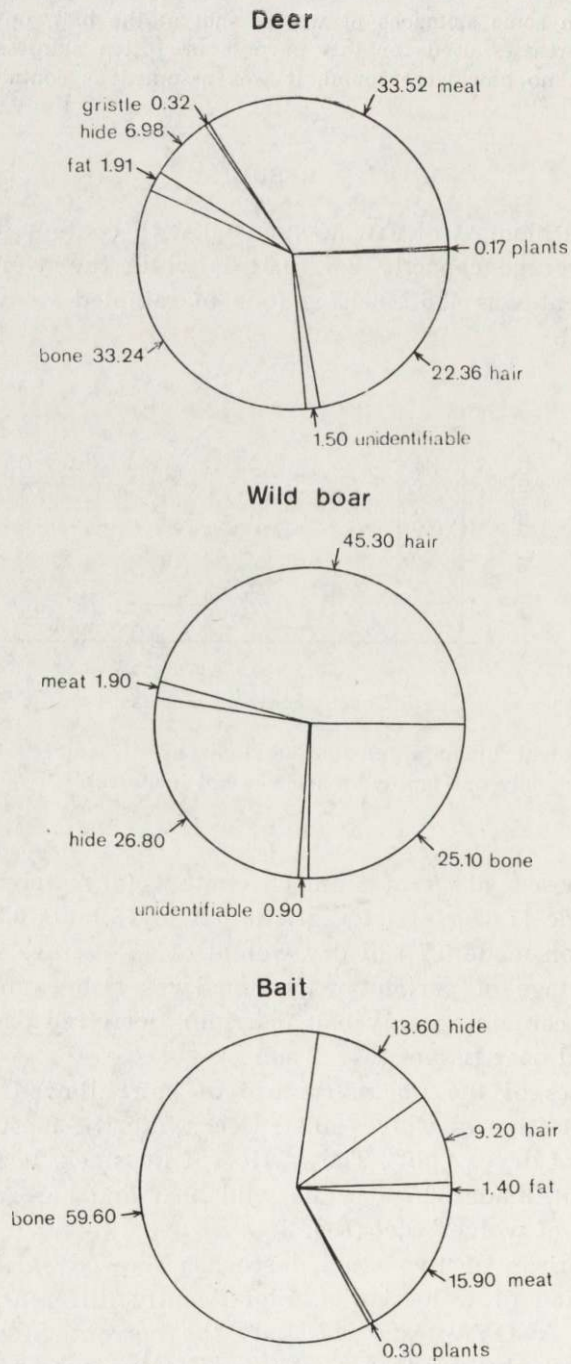


Fig. 2. The percentage of meat, fat, bone, gristle, hide, and hair in the dry matter of stomachs content of wolves which fed on: deer, wild boar, bait.

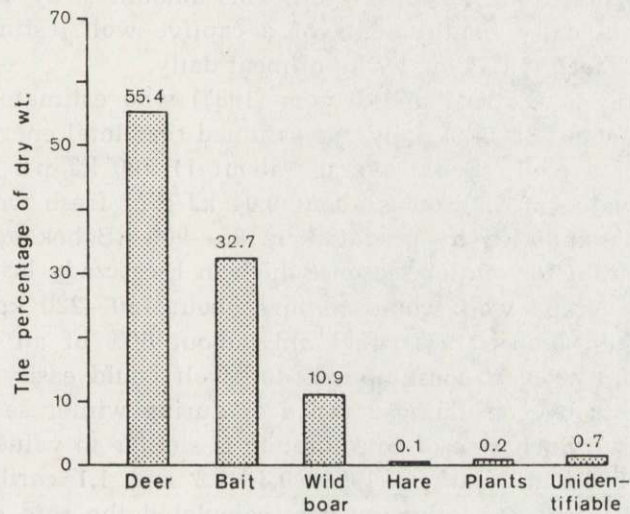


Fig. 3. The composition of winter diet of wolves in Bieszczady Mountains.

4. DISCUSSION

The high percentage of deer tissues and the bait in wolves diet indicates, that at least in winter, they tend to maximalize the intake of food by looking for a prey of considerable size, which can provide forage for several days. The similar tendency was observed in various regions of North America: Wisconsin, British Columbia, Minnesota, and Alaska (Thompson, 1952; Scott & Shackleton, 1980; Floyd *et al.*, 1978; Holeman & Stephenson, 1981; James, 1983).

The low percentage of wild boar tissues in wolves' diet in Bieszczady Mountains is similar to data of Reig and Jędrzejewski (1988) from Białowieża Forest and of Bibikov (1985) who found that in 11 regions of USSR, wolves prey on wild boar only sporadically. Also, despite of quite high population number of European bison in Bieszczady, there were no bison hair found in sampled wolf stomachs. Similar observations were reported by Bibikov (1985) from USSR.

We attempted to calculate food requirements of wolves in Bieszczady Mountains from the amount of non digestible deer tissues found in wolves' stomachs and the known percentage of particular tissues and organs in an average red deer carcass (Bobek & Perzanowski, unpubl. data). For that purpose, only stomachs containing exclusively deer tissues were taken into account. In these stomachs, hair and deer hide amounted to 1750 g of fresh mass. According to the percentage of these tissues in the carcass of red deer, we calculated that on average, each of these 12

wolves consumed 1.1 kg of venison. This amount is by 35% lower, than the minimal daily requirements of a captive wolf, estimated by Kuyt (1972) and Mech (1977) for 1.7 kg of meat daily.

According to Okarma and Koteja (1987) who estimated the BMR of a wolf for about 3900 kJ daily, we assumed that total energy expenditure (ADMR) of a wolf, should average about 11 700 kJ per day. Since the energetic value of venison is about 9.04 kJ/g of fresh weight, and such a food is assimilated by predators in 85—90% (Bobek *et al.*, 1984), we calculated that for winter season (which in Bieszczady lasts for 120—150 days) an average wolf would require about 180—220 kg of meat. Assuming after James (1983), that only about 60% of an average kill is available for wolves' consumption, one wolf could easily cover its food requirements by consuming 2 red deer during winter season (*i.e.* about 0.5 monthly). Such rate of consumption is similar to values suggested by Kelsall (1960) and Parker (1972) 0.3—1.2 and 1.1 caribou/wolf/month respectively, however other authors calculated the rate of consumption for 1.9 (Kuyt, 1972) to 2.5 caribou/wolf/month (James, 1983).

The results of our calculation, fit quite well into data of State Forest Administration of Krosno Forestry District, which report the incidence of 250 wolves at area of 570 200 ha of forests, and about 250 red deer, 90 roe deer and 40—90 wild boar killed by these predators during winter season. Of course, this data concern practically only adult individuals, since calves or fawns are usually completely eaten and their remains are very difficult to find. The comparison of calculated food requirements and the number of animals actually killed by wolves deny common beliefs as if the phenomenon of surplus killing was typical for these predators. The results of our study show, that in regions with high density of deer (which is the case of Bieszczady Mountains) wolves use them as a main source of winter food, however when carrion is routinely laid out as a bait, it makes an attractive source of supplemental food.

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REFERENCES

1. Ballenberghe V. 1985: Wolf predation on caribou: the Nelchina herd case history. *J. Wildl. Manage.* 49: 711—720.
2. Bibikov D. I., 1985: The wolf, Nauka Publishers: 1—602 Moscow.
3. Bobek B., Morow K. & Perzanowski K., 1984: *Ekologiczne Podstawy Łowiectwa*. PWR.L; 1—314 Warszawa.
4. Bobek B., Kosobucka M., Perzanowski K. & Zieliński J. 1987: A mutual re-

- relationship between wolves and red deer in Poland. Proc. XVIIIth IUGB Congress, Kraków 1987 (in press).
5. Dziurdzik B., 1973: Klucz do oznaczania włosów ssaków Polski. Acta Zool. Cracov., 18: 73—92.
 6. Floyd T. J., Jordan P. A. & Mech L. D., 1978: Relating wolf scat content to prey consumed. J. Wildl. Manage., 42: 528—532.
 7. Fritts S. H. & Mech L. D., 1981: Dynamics, movements and feeding ecology of newly protected wolf population in northwestern Minnesota. Wildl. Monographs, 80: 1—80.
 8. Holeman D. F. & Stephenson R. O. 1981: Prey selection and consumption by Alaskan wolves in winter. J. Wildl. Manage., 45: 620—628.
 9. James B. S., 1983: Seasonal movements, summer food habits and summer predation rates of wolves in northwest Alaska. M. Sc. Thesis, University of Alaska, Fairbanks: 1—103.
 10. Kelsall J. P., 1960: Co-operative studies of barren ground caribou 1957—58. Can. Wildl. Serv., Wildl. Manage. Bull. Ser. 1, 15: 1—145.
 11. Kosobucka M., 1981: Liczebność i pozyskanie jelenia w polskich Karpatach. M. Sc. Thesis. Jagiellonian University, Department of Animal Ecology, Kraków, Poland: 1—22.
 12. Kuyt E., 1972: Food habits and ecology of wolves on barren ground caribou range in the North-Western Territories. Can. Wildl. Serv. Rep. Ser., 21: 1—34.
 13. Mech L. D., 1966: The wolves of Isle Royale. Nat. Parks Fauna Ser., 7: 1—210.
 15. Mech L. D., 1970: The wolf: ecology and behaviour of an endangered species. Nat. His. Press, Doubleday, New York: 1—389.
 16. Mech L. D., 1977: Population trend and winter deer consumption in a Minnesota wolf pack. [In: R. L. Philips & C. Jonkiel (eds.) "Proc. 1975 Predator Symp."] Montana 1975.
 17. Miłkowski L., 1986: Wilk i ryś w Puszczy Białowieskiej, Łowiec Polski, 10: 18—19.
 18. Okarma H., (in press): Present status, distribution and numbers of wolves in Poland. Acta theriol.,
 19. Okarma H. & Koteja P., 1987: Basal metabolic rate in the gray wolf in Poland. J. Wildl. Manage., 51: 800—801.
 20. Parker G. R., 1972: Biology of the Kaminuriak population of barren-ground caribou. Can. Wildl. Serv. Rep. Ser., 20: 1—95.
 21. Reig S. & Jędrzejewski W., 1988: Winter and early spring food of some carnivores in the Białowieża National Park, eastern Poland. Acta theriol., 33: 57—65.
 22. Salvador A. & Abad P. L., 1987: Food habits of a wolf population (*Canis lupus*) in Leon Province, Spain. Mammalia, 51: 45—52.
 23. Scott B. M. V. & Shackleton D. M., 1980: Food habits of two Vancouver Island wolf packs: a preliminary study. Can. J. Zool., 58: 1203—1207.
 24. Thompson D. Q., 1952: Travel, range and food habits of timber wolves in Wisconsin. J. Mammal., 33: 429—442.

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SKŁAD ZIMOWEGO POKARMU WILKÓW W BIESZCZADACH

Streszczenie

W ciągu dwóch sezonów łowieckich (1986/88) zebrano w Bieszczadach 31 żołądków pozyskanych tam wilków (Ryc. 1). Analiza składu treści pokarmowej, oparta na strukturze włosów gatunków stanowiących pokarm wilków wykazała, że ponad 55% treści pokarmowej stanowiły tkanki jeleniowatych, niemal 11% tkanki dzików, a aż w ponad 30% była to przynęta wykładana pod ambonami łowieckimi (Ryc. 3).

W oparciu o udział procentowy tkanek trudnostrawialnych (skóra, sierść) w tuszy jeleniowatych (Ryc. 2), oszacowano że średnio, każdy z upolowanych wilków, którego żołądek zawierał tylko tkanki jeleniowatych, zjadł 1.1. kg mięsa. Na podstawie danych o metabolizmie bazalnym wilków wyliczono, że potrzeby pokarmowe przeciętnego wilka w Bieszczadach w ciągu zimy, pokryte być mogą przez skonsumowanie w tym okresie dwóch jeleni.