Faragó S., Csányi S., Heltay I. és Kőhalmy T.: A vadászati-vadgazdálkodási oktatás helyzete Magyarországon. *(The status of hunters and game management education in Hungary.)*

This paper presents and analyses the history and current status of hunters and game management education in Hungary. The authors compare the levels of education, and the differences and similarities of programs at various institutions. During the last decade especially the higher education showed fast development. Consequently, the diversity and quality of education available are available. Based on their findings and experiences the authors propose changes and modifications at all levels of education in curricula, funding of practical studies, and improving educational materials.

Csányi S.: Populáció-rekonstrukció alkalmazása a muflonállomány létszámának meghatározására. *(Population reconstruction of the past population size of mouflon in Hungary.)*

Similarly to other big game species in Hungary, the reliability of spring population reports and the size of mouflon (Ovis gmenili musimon) population had been debated recurrently during the last decades. Age-data collected on the horns presented for trophy evaluation provides an opportunity for retrospective population estimation and analysis. For this purpose I collected the data published by the National Trophy Evaluation Committee and used a deterministic population reconstruction model. Based on these data, male cohort sizes and population estimates could be calculated from 1981 to 1996. I compared the results with the spring population sizes reported in the annual game management statistics and found a good fit of numbers. Depending on the values of parameters used the reconstructed population sizes ranged between ±10% of the reported numbers. The reconstructed population sizes showed the same increasing and decreasing trend indicating that the reported population sizes had been well indexing the long term changes of the population. On the basis of the modeling it some of the parameters seem to be essential to achieve better fit (fecundity and actual mortality rates), and also to improve the efficiency of game management. In spite that the method can only be used to determine population sizes 10 years in the past its results can improve the understanding of population dynamics and processes.
Seasonal diet of red deer (Cervus elaphus) showed that deer consumed mainly browse species in various environments of Hungary. Diet composition may depend on the dynamics of the available sources and the nutrient values of dominant plants. Therefore, a study of shorter interval can reveal the relationships between the changes in quantitative and qualitative characteristics of plants and food choice of deer during the vegetation period. Diet composition of red deer was studied by microhistological analysis of homogenized fecal samples (n=237) collected in 2-4 weeks intervals in May-November, 2000. Vegetation survey was also conducted at the same time. Percent canopy cover of each browse species, forbs, and grasses were estimated on 10m² sampling plots (n=17). Qualitative characteristics of diet were characterized by the weighted (W) proportion of crude protein content relative to crude fiber content (WCP/WCF) at each sampling time followed a pilot study on the effect of different vegetation types on crude protein content of black locust (Robinia pseudoacacia) and elder (Sambucus nigra).

The variances of crude protein/crude fiber ratio were low among vegetation types when annual shoots of black locust and elder were collected in the same day (black locust = 31.07±1.665 % CV=5.36% n=5, elder = 33.17±1.098% CV=3.31% n=4.).

Red deer diet was dominated by browses (63±18.2%), however, the browse consumption decreased linearly from August to the end of sampling time. Deer consumed mainly black locust and elder among browse species with a high percent occurrence (100%, and 92%, respectively).

Preferences for black locust (PI=0.85-0.97) were significantly high (p<0.05) almost in each sampling time. We suppose that red deer could feed on the annual and last year's fallen leaves of black locust. The litter consumption might be an outcome of generally low levels of plant biomass and high forage quality. Browses were completed mainly by black horehound (Ballota nigra) and alfalfa (Medicago spp.) among forbs.

Diet quality was more or less stabilized around 1% WCP/WCF content during the vegetation period that is about twice than that of large herbivorous species of grazing type. High diet quality was originated mainly from elder, alfalfa and black horehound. The results suggest that managers should consider that inspite of heterogeneous food sources deer seek for abundant food of high nutritive values.
Náhlik A., Borkowski J., Tóth R. és Nacsa J.: A gímszarvas téli táplálékfelvételének néhány jellemzője. (Some aspects of the foraging ecology of red deer.)

Characteristics of browsing the forest regenerations and the consumption of supplementary given food of red deer were investigated. On a 10,000 ha territory managed by a forest management unit all the regenerations were fenced in due to the high browsing pressure. In the course of the experiment three plots of 0.5 ha-s each regenerated by oak (Quercus robur) were left unfenced. On the side of one plot a feeder was built in which sugar beet slices were given supplementary. On the side of another plot corn fodder was offered, while the third one served as a control. All three plots were surrounded by sandy bands, to be able to count how many deer stepped in weekly the respective plot. During the freeze days deer used significantly less the regeneration plots, and consequently browsed less. The same was found during the snow cover. Although snow was as shallow as 5 cm in average, it caused a change in feeding strategy of deer. Regenerations covered by snow did not offer enough forage anymore, because the hiding of the forbs and grasses. On weeks with snow cover red deer consumed significantly more sugar beet slices, than on weeks without snow. On the days without snow cover the later the week during the winter was, the more sugar beet was consumed. Giving supplementary corn or sugar beet significantly increased browsing pressure caused in average by one deer in the neighbouring of the feeders.

Szemethy L., Mátrai K., Bíró Zs. és Katona K.: A gímszarvas szezonális területváltása egy erdő-mezőgazdaság élőhelyegyüttesben. (Seasonal habitat change of red deer in a forest-agriculture complex.)

A long-term radiotelemetry study in red deer (Cervus elaphus Linné, 1758) was carried out in a lowland forest-agriculture complex, Hungary between 1993-2000. Earlier observations suggested a seasonally changing population distribution between the forest and agricultural habitat. Red deer concentrated in the forest in winter, but they appeared in the agricultural field in summer. We investigated the ranging mechanisms behind this phenomenon. We set up two alternative hypotheses; home range expansion and home range shift. Weekly localisations revealed that nine of 28 hinds shifted from the forest to the agricultural area for a longer period in summer. During that staying in the field no daily passages occurred between habitats. Remaining part of the animals obtained a home range inside the forest throughout the whole year. Diet composition analysis using indicator plant species showed that expansion of forest home range to the field and use of both
habitats at the same time does not exist. These ranging patterns were stable between years, if an animal shifted in a year it shifted again in consecutive years and vice versa. Our results could be useful for a successful management of red deer populations in such complex habitats and decrease their agricultural damages.

Katona K., Zákonyi T. és Szemethy L.: A gímszarvas napi aktivitásmintázatának biotelemetriás vizsgálata. (Biotelemetry study of the daily activity pattern in red deer.)

Daily activity pattern of red deer is poorly known in Hungary. Observations of hunters suggest an intensive activity peak around sunset. However, there is a lack of knowledge on the daytime activity pattern, which would be important to determine, whether this activity peak around sunset exist and the circadian pattern has only one peak. Therefore our purpose was to describe daily activity pattern of red deer and determine its general characteristics and evaluate inter-individual variability. It could provide information on a basic status, which could alter according to different disturbing effects.

Between 04. 27 - 07. 18. 2001. radiotelemetry study was carried out on 12 red deer individuals (11 hinds and one stag) in a forested area, Hajósszentgyörgy, Hungary. Every individual was observed during a continuous 24 h period and activity data were collected by a biotelemetry method and in 4 individuals by triangulations at the same time. We found that some of the individuals clearly show an activity peak around or after sunset, but in other cases the pattern is even along the day. Inter-individual variability was, therefore, high. Considering parallely the locomotor activity data, we conclude, that after sunset red deer show a high activity (20-23 h), but additional intensive activity periods occur during daytime. Travelled distances were low, which means that red deer hinds use a small daily home range.

A long-term radiotelemetry study in red deer (Cervus elaphus Linné, 1758) was carried out in a lowland forest-agriculture complex, Hungary between 1993-2000. Earlier observations suggested a seasonally changing population distribution between the forest and agricultural habitat. Red deer concentrated in the forest in winter, but they appeared in the agricultural field in summer. We investigated the ranging mechanisms behind this phenomenon. We set up two alternative hypotheses; home range expansion and home range shift. Weekly localisations revealed that nine of 28 hinds shifted from the forest to the agricultural area for a longer period in summer. During that staying in the field no daily passages occurred between habitats. Remaining part of the animals obtained a home range inside the forest throughout the whole year. Diet composition analysis using indicator plant species showed that expansion of forest home range to the field and use of both habitats at the same time does not exist. These ranging patterns were stable.
between years, if an animal shifted in a year it shifted again in consecutive years and vice versa. Our results could be useful for a successful management of red deer populations in such complex habitats and decrease their agricultural damages.

Pandur J.: A gímszarvas a dámszarvas és az őz hullott agancsának kémiai összetétele. (The chemical composition of roe deer, fallow deer, and red deer antlers.).

In order to study the mineral and organic composition of antlers, fallen hard antler samples comprising three each of red deer (Cervus elaphus), fallow deer(Dama dama) and roe deer (Capreolus capreolus). Dry matter, sulfur, magnesium, sodium and amino acids of extracted protein were similar among the three species. It was concluded the ration of apatite to protein in the fallen hard antlers of the three species of deer was different.


The effect of supplemental feeding of roe deer has been investigated. Feeding has been performed since 1993, from 1996 a special pelleted forage for antler developing has been given. The supplemental feeding resulted in the significant body weight increase of the does culled, but no body weight increase was proved in the case of bucks. However, changes of the does' body weights through the years investigated were only slightly determined by the supplemental feeding. The body weights were varying in a very similar manner with another, control territory, although the yearly mean body weights were almost each year higher in the treated territory. The maximum diameter of the ovaries of the does' in the treated area was significantly longer, than that in the control area. Although the number of the corpora lutea was higher in the treated area, the difference was not significant, probably due to the relatively small sample size. A significant increase of the antler weights was found beginning from 1997. The increase was due to the bucks 6 years and older. No increase of the antler weight of young bucks was detected. While no trophy weights exceeding 400 gramms had been culled between 1991 and 1997, since 1998 5 of them have exceeded 400 gramms, and one of them even 500 gramms. Antler weights of the bucks of the control area did not show any significant change, and none of them have exceeded 400 g since 1991.
Gazdag F.: Adatok a vaddisznó táplálkozásáról. (Data on the food habits of wild boar.)

The author analyzed the stomach content of 33 wild boar shot by hunters. According to his data plants consisted of >95% of the food consumed. The food items showed a low variability 80-85% were belonging to 1 or 2 plant species. Fifty percent of the animals consumed different kinds of animals but animal food ranged only between 2-3% of the total stomach contents. The share of fruits was also low. Wild boar regularly consumed the leaves of grasses at low quantities (1-2% of stomach content).

Bíró Zs. és Szemethy L.: A Kovács-Heltay fél melényúj gazdálkodási modell kritikája és továbbfejlesztésének lehetősége. (Critique of and proposal for developing the "Kovács and Heltay" hare management model.)

Brown hare management is the most important sector for the game managers of the small game based hunting estates. During the last three decades hare population density decreased continuously. The brown hare is an "r" strategy species, so its population density fluctuates significantly among the years. The game managers have to adjust the harvest rate to the actual density. Moreover, the timing of hunting is also an important part of the effective management, because the late hunting (winter) jeopardizes the basic population. That was why Kovács and Heltay (1985) worked out a hare management model, which need field tests to explore its potential end limitations. The density estimation of hares by spot-lighting in early spring is necessary to reach a more precise estimation of the population number, than the game managers' guess. At the same time the estimation of the rate of young/old individuals caused difficulties in the calculation of harvesting rate. There was problems with the timing of hunting (late autumn and winter), with the too small sample sizes at the hunting or with the selective hunting methods. Thus the young/old ratio was biased and the calculated hunting bag was too small or even negative. We improved this model with a secondary population estimation in early autumn and we eliminate to assess the young/old ratio. There are some new elements in our model, namely the estimation of nutritional condition, the diet and the reproductive performance of the animals. Game managers get information with these methods about the summer and winter mortality of hares and about the main plant species of the hare diet. Thus they could intervene in the summer or winter feeding of hares decreasing the mortality. Management implications were given to use the Kovács-Heltay model where the assumptions can be accomplished or to use the improved model in the hare management.
The golden jackal was one of our indigenous carnivores. It was present in the Hungarian fauna for centuries, but considered as extinct in 1989. In the second half of 1990's it repatriated spontaneously and established breeding and increasing populations in three southern countries of Hungary, namely in Somogy, Baranya and Bács-Kiskun.

The golden jackal’s taxonomical classification presented some difficulty in the last century to naturalists, zoologists and hunters. They mistake it for red fox, wolf, dog or hybrids because of its lifestyle, habitat and appearance. Now it is obvious, that the predator with various name, who lived in Hungary for ages is equal to the canine living at the Balkans, Canis aureus.

The species is a new and uncommon member of the Hungarian fauna. Its monitoring is complicated because of its hidden way of life and similar appearance to red fox. The status of the jackal is contradictory both game management and mass media, because of its sudden occurrence, obscurity and potential damage in livestock and wildlife.

Our aim was to get acquainted with this predator using all the available international and Hungarian literature, to evaluate its possible impact on the game management.

Our results show, that the golden jackal settled down again in the southern region of Hungary and also appear in more and more areas of the country. By the reason of previous results of food-habit studies, golden jackal doesn’t cause any damage neither livestock nor stock of games.

The diet of the golden jackal and paralelly the red fox were studied by scat analysis in the centrum and edge of the range in Hungary (n= 330 and 24 for the jackal in the two areas; and n= 300 and 11 for fox). Small mammals were dominant in the diet of jackals (83-97% depending on the season in the centrum and 56% in the edge of range in winter and early spring; biomass data). Ungulates consumed only 2.5-5.5% in the centrum area and carcasses (mainly wild boar) were secondary important food taxa on the edge of range (41%). Hare consumption was low (0.1% in summer and 2% in autumn and missed in winter and spring) in the centrum area and was 0.3% in the edge area. Consumption of pheasant was 4% in spring and under 0.5% in the further seasons in the centrum area and not occurred in the edge area. The consumption of domestic animals was not...
important. The diet of jackals and foxes in both areas was not differed significantly. Trophic niche overlap between the medium-sized predators was high (70-95% in the centrum area and 72% in the edge of range).


Country wide data were collected the occurrence of otter (Lutra lutra) fifth time between 1990 and 2001 by mail questionary survey. The questionary was sent to the game management units on the basis of National Game Management Database address list. We gathered information about the occurrence (none, stable, occasionally occur) and the density (specimen./1000 ha) of otter. Map views were performed on digital maps of Hungarian hunting areas as well as on the Hungarian part of the map by Universal Transverse Mercator (UTM), with grid cells of 10 X 10 km. Our results were compared to the earlier data which were collected by field work on the recomendation of international otter survey. Our results showed theranges of otter could be considered stable and the density could be slowly increasing. Our data quite similar which were collected by field work, so the mail questinary survey is an efficient method for the collected of country-wide data about the occurrence of otter. Because of the otter occur in their original environment and their population-density is at a stable or slowly increasing level their protective status should remain unchanged. It is important because of the damage caused by otter are increasing in private ponds and it is to be feared that the owners will solve theirs problem alone with drastical tool. At the other hand its necessary to solve the compensation the reliable damage caused by otter.

Lanszki J. és Körmendi S.: A vidra haltáplálék-választása halastavakon. (Fish selection of otters living by fish ponds in Hungary.)

The fish prey selection of otters was examined by eutrophic fish ponds (Fonó and Boronka Nature Conservation Area). The correlations coefficients between the otters' fish diet and the available fish stock were generally close, e.g. at the Fonó Fishpond during a 6 year period, the values received were 0.56 (P<0.05), 0.87 (P<0.001), 0.93 (P<0.001), 0.79 (P<0.05), 0.36 (NS), and 0.81 (P<0.001), while during a 2 year period at the Boronka Nature Conservation Area they were 0.02 (NS) and 0.33 (NS), respectively. The occasionally low correlation coefficients indicated that the
otters' fish prey selection was determined not only by the availability of species, but also by its size \( (rs=0.70, P<0.01) \). The fish preference calculations were performed with Ivlev's index of preference \( (E_{i}\text{, min.}:-1, \text{max.}: +1) \). Regardless of species, the otters avoided \( (E_{i}=-0.51) \) fish heavier than 1000 g, with a preference for individuals weighing between 500 and 1000 g \( (E_{i}=0.79) \). No substantial or clear preference was observed in the weight range below 500 g \( (E_{i}=-0.02-0.38) \). The preference for fish in accordance with their characteristic sites of occurrence within the body of water was also significant \( (P<0.01) \). They avoided fish living primarily in open water \( (E_{i}=-0.64) \) and to a lesser degree those occurring near the pond bed \( (E_{i}=-0.22) \). They favoured fish inhabiting the area with a covering of aquatic plants \( (E_{i}=0.46) \) and showed a preference to a lesser degree for fish living in the shallow littoral regions \( (E_{i}=0.14) \). The correlation between the frequency of occurrence and the biomass data of the otters' diet was analysed using samples collected at the Ponds of Petesmalom, the Lanköci Forest, and the Tetves Stream. Data according to the various taxa showed significant \( (P<0.001) \) Pearson correlation coefficients of 0.92 \( \text{(mammals)} \), 0.80 \( \text{(birds)} \), 0.93 \( \text{(reptiles and amphibians)} \), 0.90 \( \text{(fish)} \), 0.88 \( \text{(invertebrates)} \) and \(-0.78, P=0.066 \) \( \text{(plants)} \). The data indicates that frequency of occurrence of prey taxa quantify the consumed biomass with high reliability.

Apáthyné Tóth M.: A szőrcsapdázás alkalmazásának lehetőségei és korlátai. (Hair capture: possibilities and restrictions of the method.)

Detecting animals based on their signs (indicies) have always uncertainty but this is an integral part of field research. Identification of some species on the basis of hair samples can provide easy way to prove the presence of target mammals. Adjusting this simple method mentioned as "hair-trapping, -snare, -tubing, -capture" is recommended to wildlife management and conservation biology.

Aims of the project presented here were (1) to evaluate the efficiency of different kinds of tubes, (2) to detect small carnivores and their potential preys moving on ground level. The experimental area was located at the protected Somlyó hill region which is an island-like habitat with divers vegetation and climatic mosaics. I tested 100 hair tubes (25 pieces / diameter of 30, 50, 65, 105 mm), and investigation sessions ware run for two months in 2002. Detection rate of small rodents and insectivore mammals are absolutely higher \( (30-60\% - \text{tubes with diameter 30-65mm}) \), but species specific identification is difficult, often impossible. Detection rate of small carnivores was lower \( (5-20\%) \), probably as a consequence of their low density and high sensitivity of these species (excluding the less suspicious domestic cats). The hair capture method provides data on the community structure.
of predators and preys, the migration between neighbouring habitats, but it would be improved by longer and continuous sampling.

Gál J., Marosán M., Faragó S. és Sándor G.: A balkáni gerle vizsgálata a Lajta – Projectben. (Study on the turtle doves in the Lajta-Project, Hungary.)

Turtle doves (Streptopelia decaocto, Friv.) are common in in Hungary since the mid-twenty century. In spite of this very few data are available on the body size measurements, food habits, and veterinary status of this species. The authors presents these information on the basis of turtle doves collected in the Lajta-project. Their findings support the important seed consumption of turtle doves, especially from cultivated plants.