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HABITAT USE, DAILY ACTIVITY AND FEEDING OF THE GEESE OF LAKE FERTŐ

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Abstract

S. Faragó: Habitat use, daily activity and feeding of the geese of Lake Fertő

Geese wintering at Lake Fertő commute some 60–70, sometimes even 100 km daily to reach feeding habitats. The action radius of the geese changes in the course of the wintering period in correlation with the food supply and with the energy needed for the acquisition of food. Cereals and stubble play a leading role in habitat selection. The most important food source is maize, both in the case of Bean Geese (66.7 Fr%) and in the case of White-fronted Geese (56.5 Fr%). Both the habitat use and the results of bromatological studies showed a predominance of agricultural habitats as food sources for geese in north-west Hungary. A rich supply of food is not in itself sufficient if other ecological factors (precipitation e.g.) are at a minimum. A change in the ownership or in the production structure of an area may lead to a decline or even disappearance of the present food sources of geese. A higher incidence of conflicts resulting from the damage done by geese, and an increase in the frequency of disturbance on fields may force the geese to abandon an area. The Hungarian Waterfowl Management Plan intends to use every effort to prevent such.

Introduction

Lake Fertő is one of the most important areas in the Pannon region in terms of wintering and migrating geese. The importance of the region is underlined by its location on the border of two different countries, Austria and Hungary. While research in the area goes back as far as the 1960s on the Austrian side, intensive studies only began in the early 1980s in Hungary. The request and need for collaboration was natural as the lake is, despite political borders, one ecological unit, with those geese that spend the night on Austrian territories often moving to Hungary during daytime to feed.

The importance of the present work is emphasized by the lack of any previous research from the western part of the Carpathian Basin, moreover, other Hungarian studies are also at least 10 or 20 years old. The target of this research was to discuss one of the most important relationships that influences the wintering and migration of goose species, namely the characterisation of the feeding habitat, and therefore provide an answer to the question of whether the food supply plays a role in the population decline of the geese in the Pannon region.

The studies were completed by the *Department of Wildlife Management of the University of Forestry and Timber Industry* in collaboration with the scientists of the *Biologische Station Neusiedler See* (Illmitz) and the *Institut für Wildbiologie*

und Jagdwirtschaft (BOKU, Wien). The *Hungarian Goose Research Project* is supported by the *Hungarian Institute of Ornithology of the National Office of Nature Conservation.*

Materials and methods

The action radius of the geese from Lake Fertő, the location of the feeding grounds and the feeding habitats were identified in three west Hungarian counties (Győr-Moson-Sopron, Vas and Veszprém) in the season of 1990/91 based on questionnaires circulated through local chapters of the hunting association and based on our own data gathered during several excursions. The direction of the movement of arriving or leaving geese onto and from feeding grounds was also recorded with the purpose of collecting information on which roosts the geese were arriving from. This information was very important, as there are other significant roosts in the region beside Lake Fertő, such as the river Danube (Szigetköz), Lake Balaton and Kis-Balaton *(Faragó, Kovács* and *Sterbetz, 1991, Faragó, 1994).* The dynamics and direction of the daily movements have already been discussed in earlier studies for two of the species with long distance daily movements, the Bean Goose *(Faragó, 1991)* and the White-fronted Goose *(Faragó, 1993).* The present work serves as a follow-up of those preliminary results. The evaluation of questionnaires together with our own observations helped to identify the proportion of the most commonly used habitats and the frequency of the use of 1, 2, 3 or 4 habitats on the different hunting territories. The data were evaluated separately for the different counties and also for the whole region together.

The daily activity studies were completed for all three species in the seasons of 1990/91 and 1991/92. We made attempts to collect data on a monthly basis, and conducted evaluations sometimes several times a month. The success of these was dependent on the weather and also on the mass or the mere presence of different goose species in the area. We possess relatively complete sets of data on Bean Geese and Greylag Geese, while the sets of data are less than complete for the declining White-fronted Goose. The feeding grounds were visited usually after the completion of the data collection on the departure of the geese to the feeding grounds (09:00 a.m.) and the surveys were continued from 10:00 a.m. until 15:00 or 16:00 p.m. The behaviour patterns were recorded every 10 or 15 minutes. For the identification of the behaviour patterns the works of *Amat (1986), Schulz (1985)* and several others were considered. The following behaviour patterns were separated: foraging, normal pasture, moving (running), aggressive behaviour, comfort behaviour, resting and vigilance. The disturbance factors were also recorded, such as disturbance by human activities, deer, raptors etc. Those factors were marked by a filled circle in the figures.

There was a need for direct food studies beside the characterisation of the feeding grounds and feeding activities of the birds. These studies were possible only in the case of Bean Geese and White-fronted Geese, the

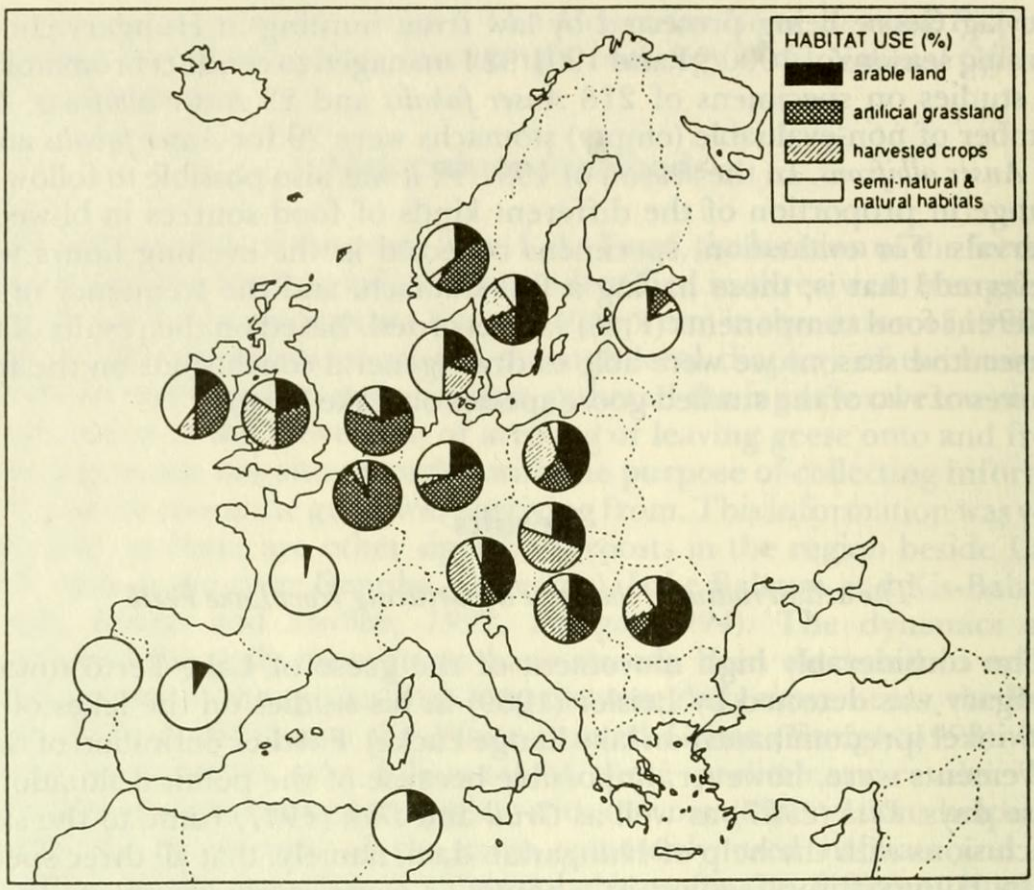
Greylag Goose being protected by law from hunting in Hungary. In the hunting seasons of 1990/91 and 1991/92 I managed to conduct bromatological studies on specimens of 218 *Anser fabalis* and 23 *Anser albifrons*. The number of non-evaluable (empty) stomachs were 29 for *Anser fabalis* and 3 for *Anser albifrons*. In the season of 1991/92 it was also possible to follow the change in proportion of the different kinds of food sources in bi-weekly intervals. For evaluation, specimens collected in the evening hours were preferred, that is, those having a full stomach, and the frequency of the different food components (Fr%) was recorded. Based on the results of two consecutive seasons we were able to draw general conclusions on the food sources of two of the studied goose species on Lake Fertő.

Results

The action radius of the geese departuring from Lake Fertő

The considerably high movement of the geese of Lake Fertő towards Hungary was detected by Leisler (1969) in his studies on the lakes of the Seewinkel (predominantly on lake Lange Lacke). Further definition of these movements were, however, impossible because of the political situation in those days. *Dick (1987)* as well as *Grüll* and *Dick (1987)* came to the same conclusions with the help of Hungarian data, namely, that all three species fly to Hungary for feeding in a south or souteasterly direction. In the autumn of 1989 Austrian colleagues managed to trace their geese moving eastwards towards Hungary, and they gathered important information in this way. It was a surprise to learn that Greylag Geese applied different strategies in terms of selecting the feeding grounds. Some of them used feeding grounds near their roosts while others flew as far as 23 km for the same purpose. This phenomenon was regarded as a quick reaction to the changing food supply based on the „information centre" hypothesis *(Dick* and *Grüll, 1990). Sterbetz (1979)* measured a 6 km average between the roosting and feeding grounds of White-fronted Geese on the Hungarian Great Plain.

The difference in the distance between the sleeping and feeding grounds of the three abundant species in the vicinity of Lake Fertő has been known for some time. The Bean Goose and the White-fronted Goose cover fairly long distances between the lake surface roosts and the daytime dwelling grounds. This traditional movement was only emphasized by rather than caused by the feeding opportunities resulting from the appearance of the monocultural large-scale farming industry with maize production systems. The dominant plant of the farms south of the lake was, and almost the only plant of the area of Uraiújfalu (cca. 50 kms) is, indeed, maize. An explanation for why the geese fly longer distances for food despite the excellent food supply of the areas which exist between the roosting and feeding grounds must lie in deeper, traditional causes. The topographical



Map 1: Feeding grounds of wild geese in western Hungary
1. térkép: A vadludak táplálkozóterületei Nyugat-Magyarországon

distribution of the feeding grounds (Map 1) shows that geese from Lake Fertő and the Seewinkel have an action radius of 60–70, sometimes 100 km during their feeding movements. From an ecological aspect this corresponds with the cultivated areas of the Little Plain of Hungary. The geese of Lake Fertő, Lake Balaton and those from Kis-Balaton meet each other in the flood-plain of the River Rába or in the flat areas around the north-western slopes of the Bakony Hills. They practically set up the north-western part of Transdanubia between each other. Feeding areas may even overlap with each other in the Tapolca basin, moreover, an intermediate migration may occur between the two areas with the involvement of this region. A similar dismigration was detectable before the period of deflection of the Danube between the Seewinkel and around Szigetköz, but this occurred however to a small extent. The River Rába is a natural border between the south-western part of the area involved in the studies and the mainly wooded areas situated south from the river, but it may lead smaller goose flocks into the area of the wooded Őrség as a feature of terrain that helps migration.

It is probably the line of the Danube that keeps the geese on the corridor connecting Lake Fertő with the Öreg-tó at Tata during migration. All the

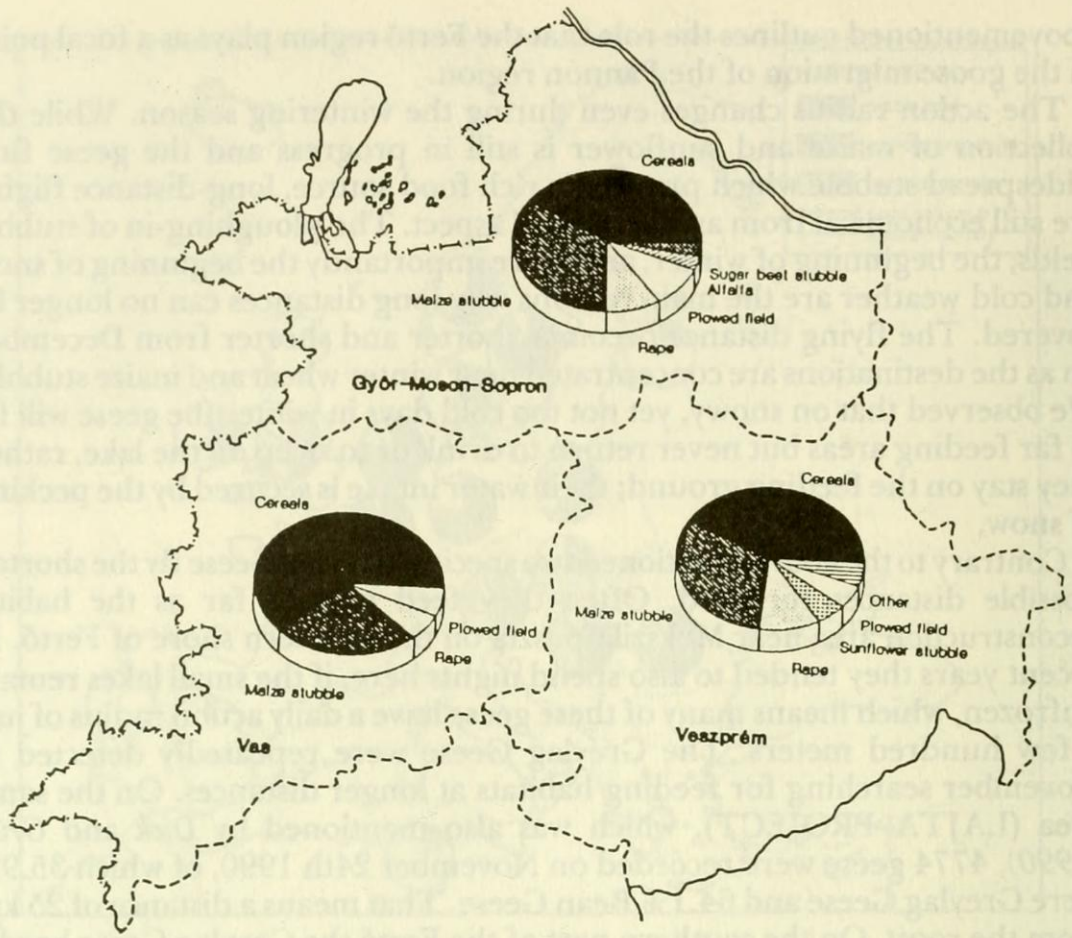
abovementioned outlines the role that the Fertő region plays as a focal point in the goose migration of the Pannon region.

The action radius changes even during the wintering season. While the collection of maize and sunflower is still in progress and the geese find widespread stubble which provides a rich food source, long-distance flights are still economical from an energetical aspect. The ploughing-in of stubble fields, the beginning of winter, and more importantly the beginning of snow and cold weather are the main reasons why long distances can no longer be covered. The flying distance becomes shorter and shorter from December on as the destinations are concentrated near winter wheat and maize stubble. We observed that on snowy, yet not too cold days in winter the geese will fly to far feeding areas but never return to drink or to sleep on the lake, rather they stay on the feeding ground; their water intake is secured by the pecking of snow.

Contrary to the above-mentioned two species, Greylag Geese fly the shortest possible distances for food. Often they feed only as far as the habitat reconstruction area near Mekszikópuszta on the southern shore of Fertő. In recent years they tended to also spend nights here, if the small lakes remain unfrozen, which means many of these geese have a daily action radius of just a few hundred meters. The Greylag Geese were repeatedly detected in November searching for feeding habitats at longer distances. On the same area (LAJTA–PROJECT), which was also mentioned by *Dick* and *Grüll (1990)*, 4774 geese were recorded on November 24th 1990, of which 35.9% were Greylag Geese and 64.1% Bean Geese. That means a distance of 25 km from the roost. On the southern part of the Fertő the Greylag Geese hardly ever fly distances longer than 3–5 km. The individuals which stay in the neighbourhood of the lake seem to belong to the breeding population, while individuals with a higher mobility arrive from the northern. The geese leaving the lake visit the nearby fields of stubble, newly sown crops and grass, and after having spent a few hours feeding they return to the habitat reconstruction areas or to the lake to drink and this is often repeated in the afternoon hours. The majority of the Greylag Geese leave the Fertő area by the end of the year, they move south and they return only with the end of the cold period *(Faragó, 1994)*.

Habitat use of wild geese in western Hungary

Only Austrian studies have been published on the geese of Lake Fertő. *Leisler (1969)* mentions the use of cultivated agricultural lands far from the lake only in the case of Bean Geese. They almost never occurred on natural alkali steppes. Contrary to the previous species, White-fronted Geese preferred to stay on pastures, possibly on its wetter, Puccinella spots, however they frequented cultivated lands, too. The distance of fly-outs was so short that they often stayed together with Greylag Geese. Based on the evaluation of the periods 1984/85–1986/87 *Grüll* and *Dick (1987)* found that the most important autumn habitats of Bean Geese was maize stubble

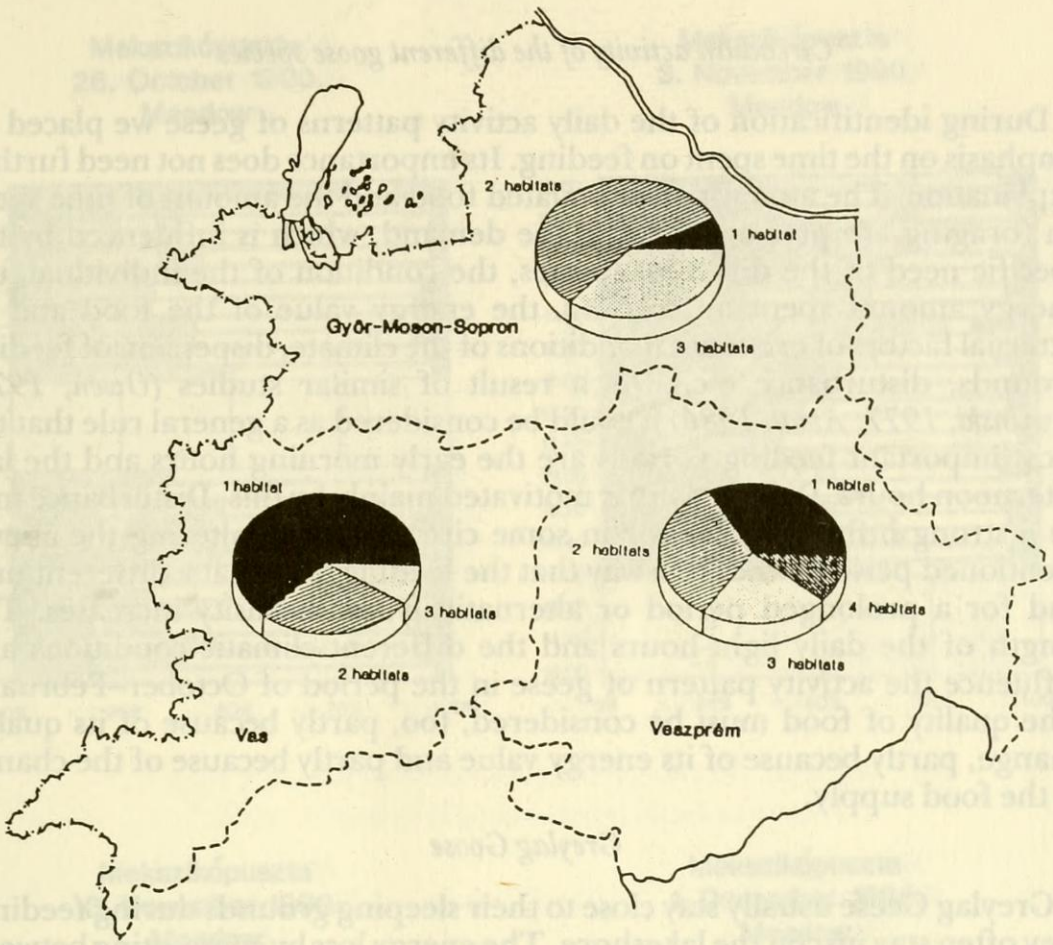


Map 2: The proportion of different habitats used by geese (mainly Bean Goose) in western Hungary

2. térkép: A vadludak (főként vetési lúd) által használt habitatok aránya Nyugat-Magyarországon

(almost 85%) followed by winter crops, while winter crops were the most important habitats in the spring (cca. 90%). Winter crops dominated both in autumn (60%) and in spring (100%) in the case of White-fronted Geese, although they also occurred on maize stubble (25%) and rape in the autumn. Cultivated plants made up 75% of the habitats of Greylag Geese both in the autumn and in the spring. Maize dominated in the autumn beside winter crops and rape, winter crops dominated in the spring beside maize stubble. The remaining 25% was made up of meadows, pastures and reedbeds. *Dick (1988)* found that Greylag Geese occur mostly on winter crops, maize stubble, meadows and pastures during the migration and wintering periods (October–March).

Surveys made in three counties in western Hungary did not give the same results due to the different ecological circumstances and hence different sowing structure, but cereals led in all places (Map 2), by 40–42% in county Győr–Moson–Sopron and Veszprém, by 63% in county Vas. Rape also played an important role, this showed up as a novelty to some extent. Its



Map 3: The proportion of numbers of different feeding habitats used by geese (mainly Bean Goose) in western Hungary
3. térkép: A vadludak (főként vetési lúd) által használt habitatok számának aránya Nyugat-Magyarországon

frequency value reached 6–11% (9% at average). The remaining habitats always contained the ploughed land of winter crops (7% on average), sometimes lucerne, sugar beet stubble and sunflower stubble.

In respect to the number of agricultural habitats visited by geese in the different hunting districts the use of two habitats was characteristic (57%) and the proportion of geese visiting three different habitats was also noticeable (36%). Geese specialized to one single habitat dominated in county Vas (64%), and two different habitats were used in 27% of the cases.

Close to equal numbers of geese used one or two habitats (33–33%) in county Veszprém, but another 22% used three habitats. In 11% of the cases the use of four different habitats was detected here.

To summarize, the majority of the geese searching for feeding grounds in western Transdanubia – almost exclusively Bean Goose during the period of our studies – used two habitats, and one third (32%) of the birds used one habitat. The remaining one quarter of the birds used three (24%) or four (3%) habitats (Map 3).

Circadian activity of the different goose species

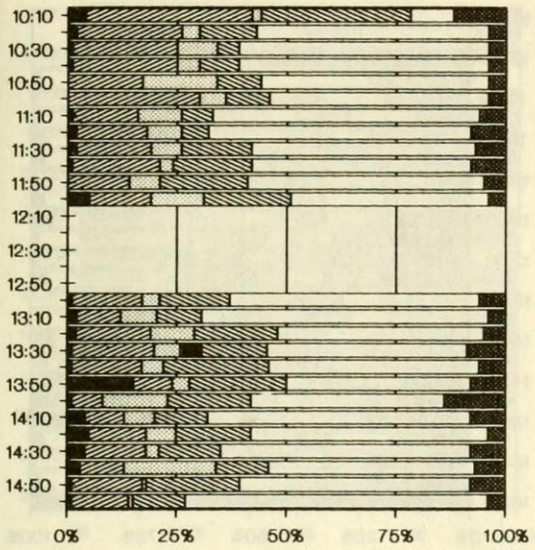
During identification of the daily activity patterns of geese we placed an emphasis on the time spent on feeding. Its importance does not need further explanation. The amount of assimilated food and the amount of time spent on foraging are proportionate to the demand, which is influenced by the specific need of the different species, the condition of the individual, the energy amount spent on feeding, the energy value of the food and by external factors of existence (conditions of the climate, dispersion of feeding grounds, disturbance etc.). As a result of similar studies *(Owen, 1972) Fruzinski, 1977; Amat, 1986)* it could be considered as a general rule that the most important feeding periods are the early morning hours and the late afternoon hours. Daily activity is motivated mainly by this. Disturbance may be a strong influencing factor in some circumstances, altering the above-mentioned period either in a way that the feeding occurs at a different time and for a prolonged period or alternatively, its intensity increases. The length of the daily light-hours and the different climatic conditions also influence the activity pattern of geese in the period of October–February. The quality of food must be considered, too, partly because of its quality change, partly because of its energy value and partly because of the change in the food supply.

Greylag Goose

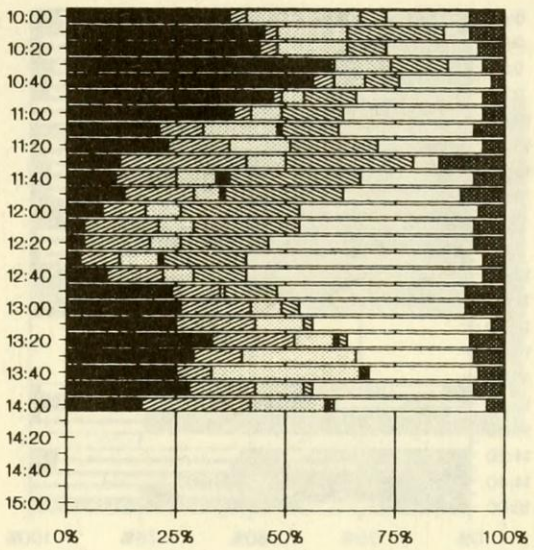
Greylag Geese usually stay close to their sleeping grounds during feeding, they often stay just on the lakeshore. The energy loss by commuting between the two grounds is therefore negligible in their case. This is the reason why their feeding activity is relatively low when the external climatic circumstances are also beneficial (Figure 1: October 28 1990, December 1 1990, November 30 1991). According to our observations, wind is the meteorological element that most influences feeding activity. The classical morning and afternoon peaks in feeding activity were detected only once (Figure 1: November 3 1990), but during the similarly cold weather the following week the intensity of feeding was almost steady during the daytime. The results of our observations made on November 2 1991 proved to be most interesting. Two flocks at a distance of 500 meters from each other showed totally different activity patterns while the feeding conditions were the same. The time spent on feeding and vigilance was proportionately high in one of the flocks, while passive behavioural patterns were predominating in the other one. Such differences may result from one flock being a resident one for the area with smaller energy need whilst the other is on migration with a higher urge for energy assimilation. This latter, migratory hypothesis is supported by the relatively high number of alert individuals that could have resulted from being in an unknown place.

We were not able to support the findings of many others (cit. Amat, 1986) about Greylag Geese spending 80–90% of the day feeding on grasslands. This value ranged between 10–35% in our results.

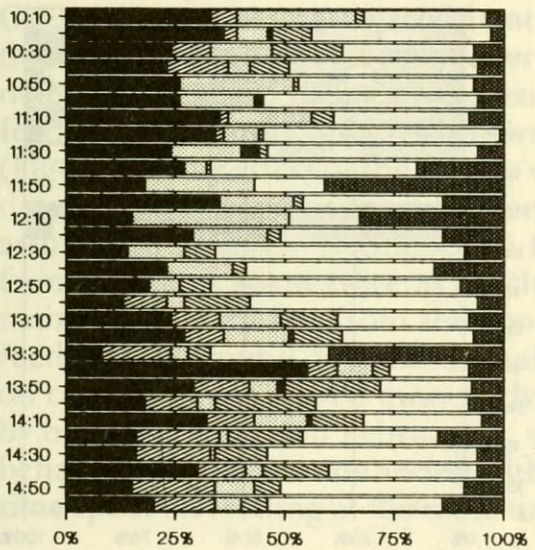
Mekszikópuszta
28. October 1990.
Meadow



Mekszikópuszta
3. November 1990.
Meadow



Mekszikópuszta
10. November 1990.
Meadow



Mekszikópuszta
1. December 1990.
Meadow

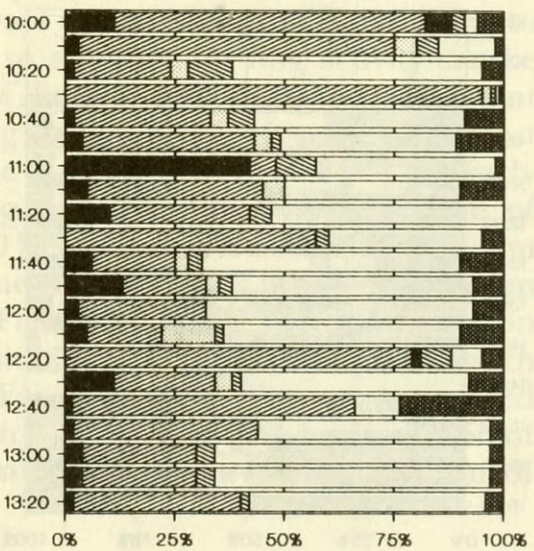


Figure 1
1. ábra

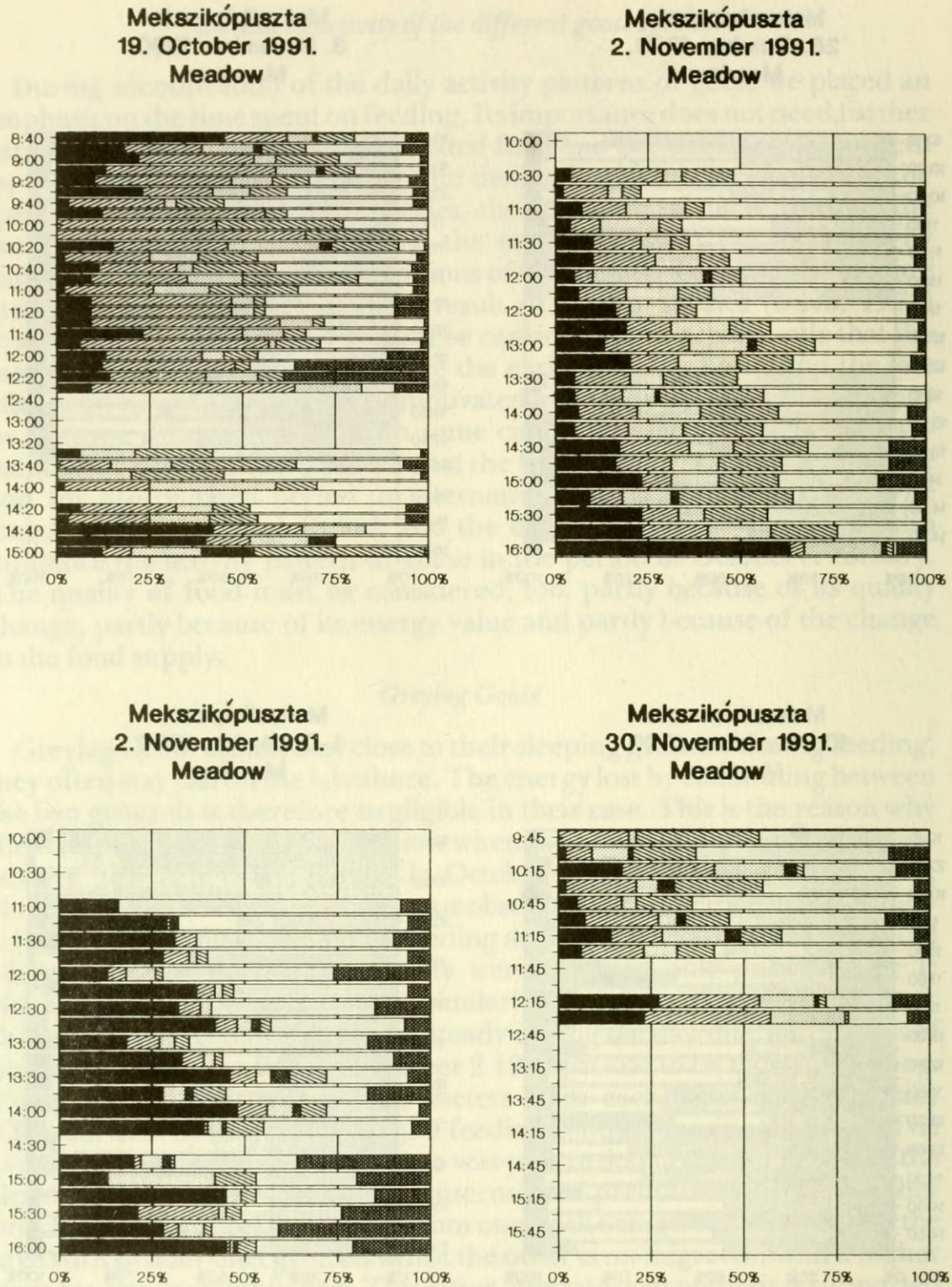


Figure 1
1. ábra

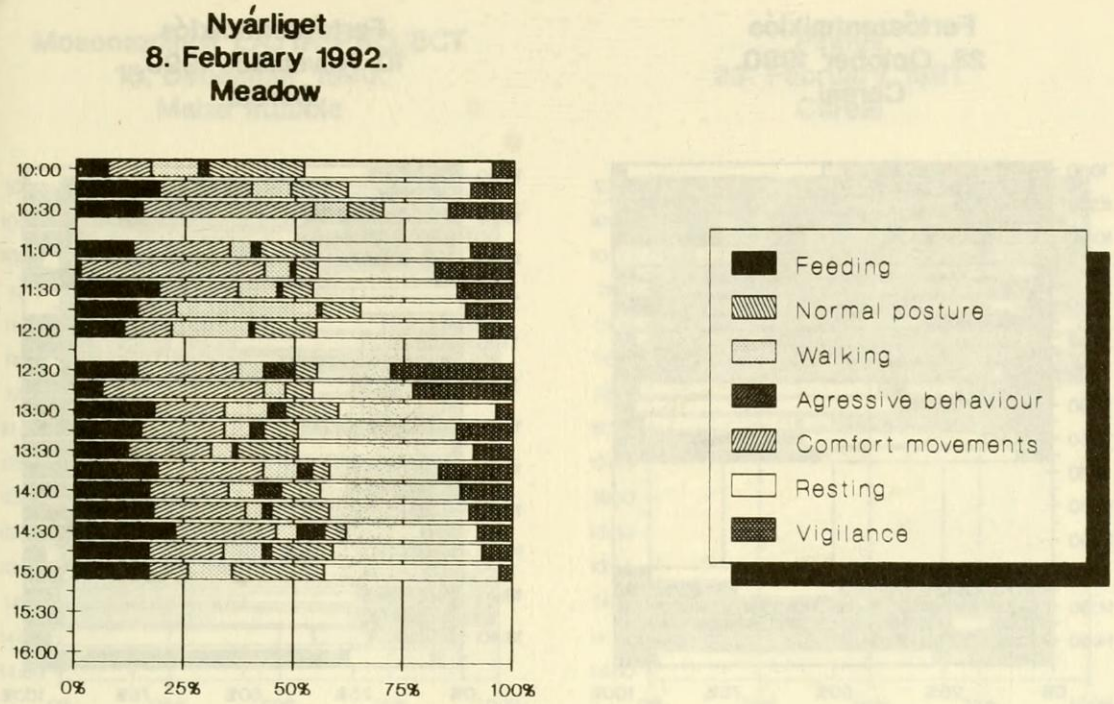


Figure 1: Changes in the daily activity of Greylag Geese
1. ábra: A nyári lúd napi aktivitásának változása

Bean Goose

A morning and an afternoon activity peak could also be sensed for Bean Geese, these peaks however did not always exactly show up. Commuting to the feeding grounds requires energy, so a higher feeding activity can be detected on a given day in the case of Bean Geese flying out to distant feeding grounds as opposed to Greylag Geese staying close to their roost (Figure 2). The effect of the energy value of the food of Bean Geese is clearly detectable in the frequency of feeding and therefore in the amount of assimilated food. On December 15 1990 Bean Geese on a cereal field 13 km from the roost spent twice as much time on feeding as those observed on maize stubble 25 km from the roost (Figure 2). While the time spent on feeding was around 30% on the maize stubble, this value was twice as much on cereals. Geese moved away early in February 1992. This was supported by our observation on February 8, when we recorded a high proportion of behavioural patterns connected with restlessness, and a small proportion of time spent on feeding at the same time.

White-fronted Goose

Relatively small numbers of White-fronted Geese were on the Hungarian side of Lake Fertő during the period of our studies. They were sometimes absent for months, ant thus we were able to collect only a few data on this

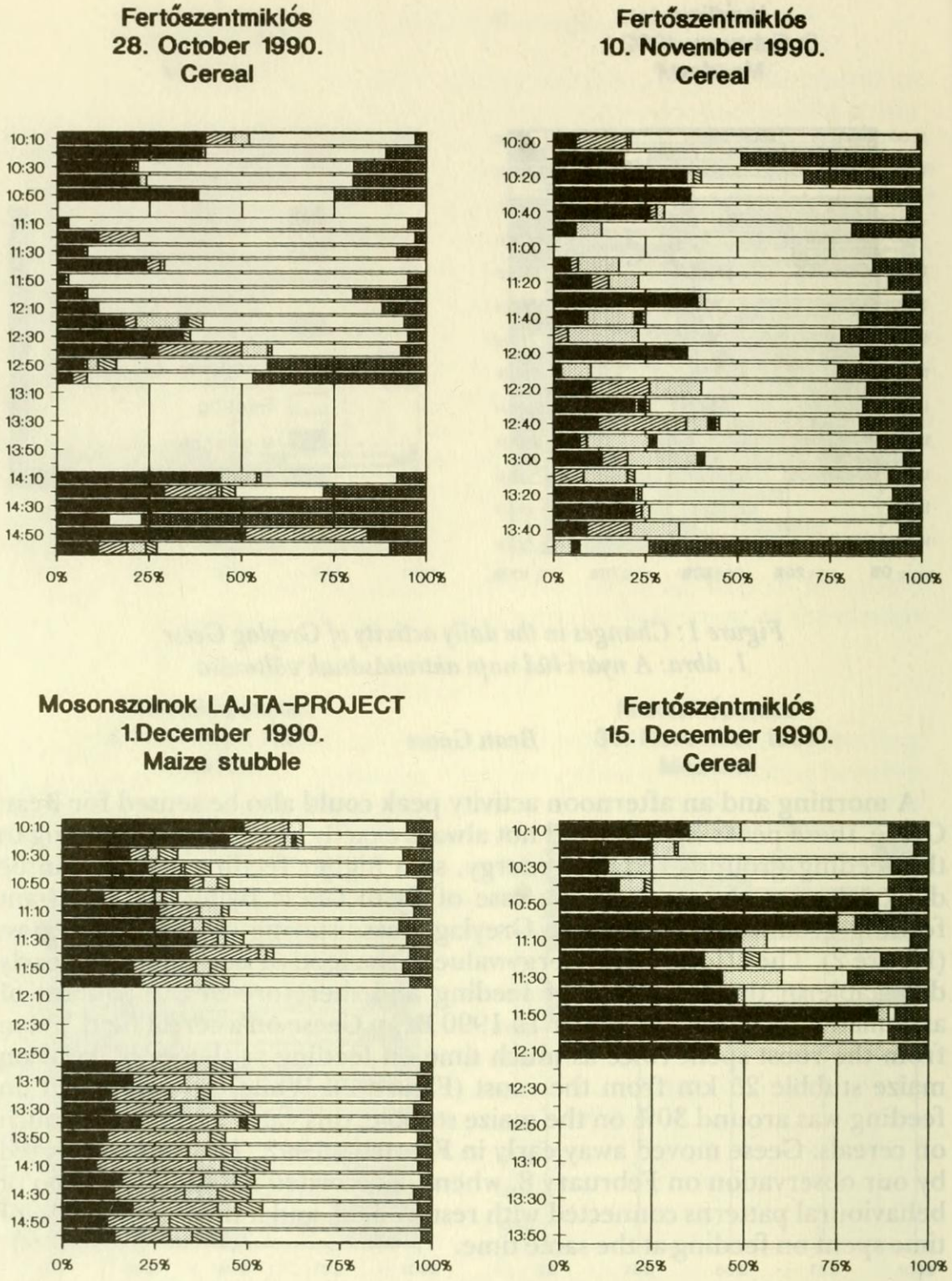
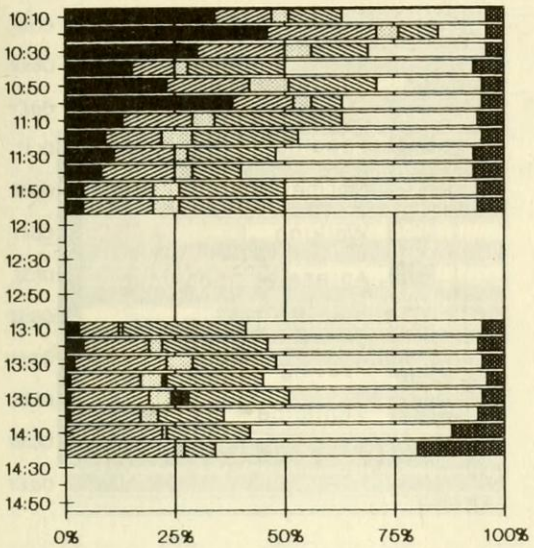
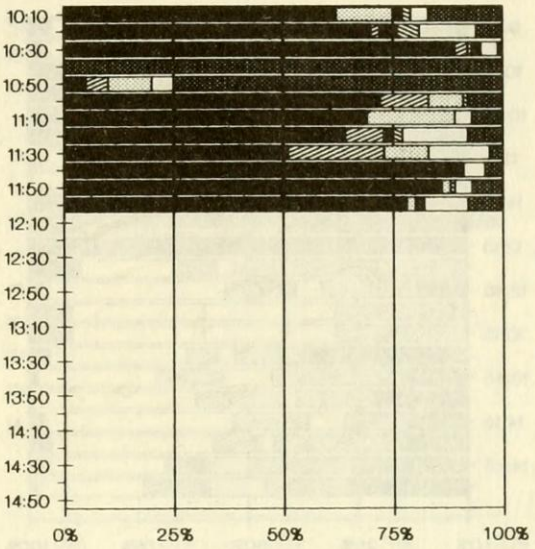


Figure 2
2. ábra

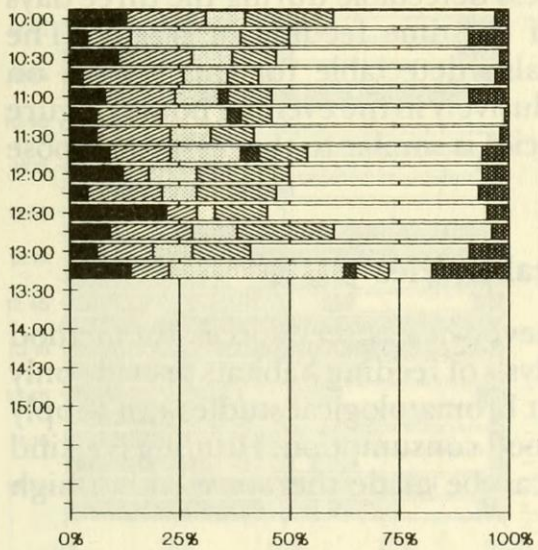
Mosonszolnok LAJTA-PROJECT
15. December 1990.
Maize stubble



Pinnye
23. February 1991.
Cereal



Mosonszolnok LAJTA-PROJECT
16. November 1991.
Maize stubble



Mosonszolnok LAJTA-PROJECT
30. November 1991.
Cereal

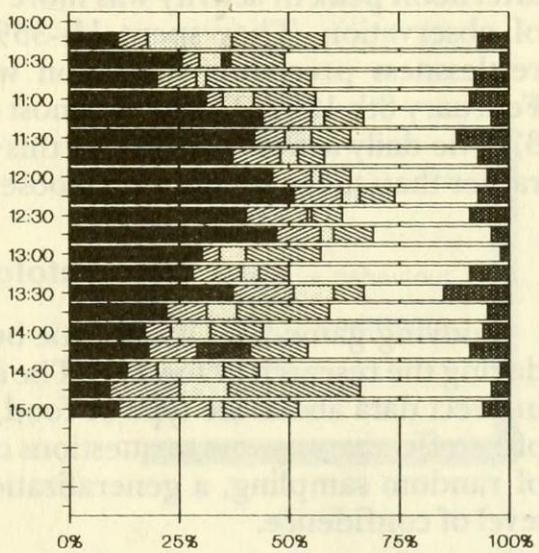


Figure 2.
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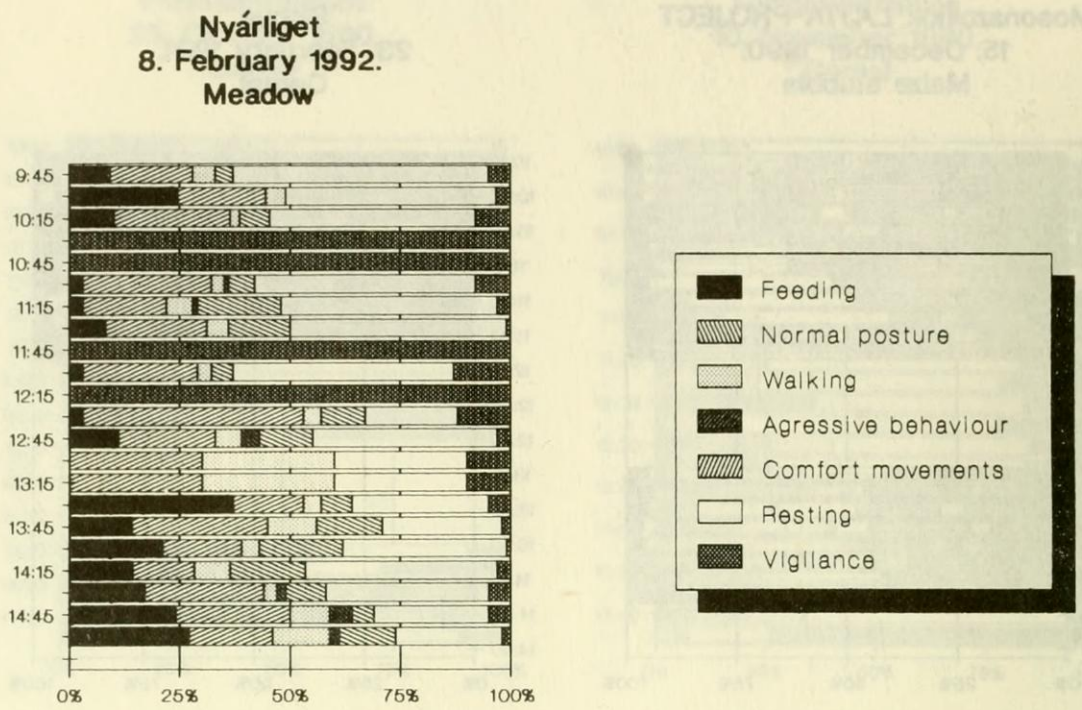


Figure 2: Changes in the daily activity of Bean Geese
2. ábra: A vetési lúd napi aktivitásának változása

species. They often behaved nervously, indeed, out of the three species only in case of White-fronted Geese did we detect a behavioural pattern consisting almost exclusively of feeding or vigilance. A morning and afternoon peak in activity was more or less detectable during the three days of observation. They spent 15–35% of the time feeding in cereals. The restlessness preceding migration was also detectable for this species on February 8th 1992. They fed almost exclusively in the evening hours (Figure 3). The daily activity rhythm of this species is similar to that of Bean Goose rather than to that of Greylag Goose.

Bromatological studies

Studying game-bags is a drastic but nevertheless very successful method during the research of feeding. The analysis of feeding habitats provide only indirect data about the type of food, but bromatological studies can supply often effective answers to questions on food consumption. Hunting is a kind of random sampling, a generalization can be made therefore with a high level of confidence.

Bean Goose

The food repertoire of Bean Geese was identified by *Sterbetz (1979a)* based on 175 specimens collected between 1952 and 1976 from around the whole country. He most frequently found the leaves of winter wheat (54.9 Fr%),

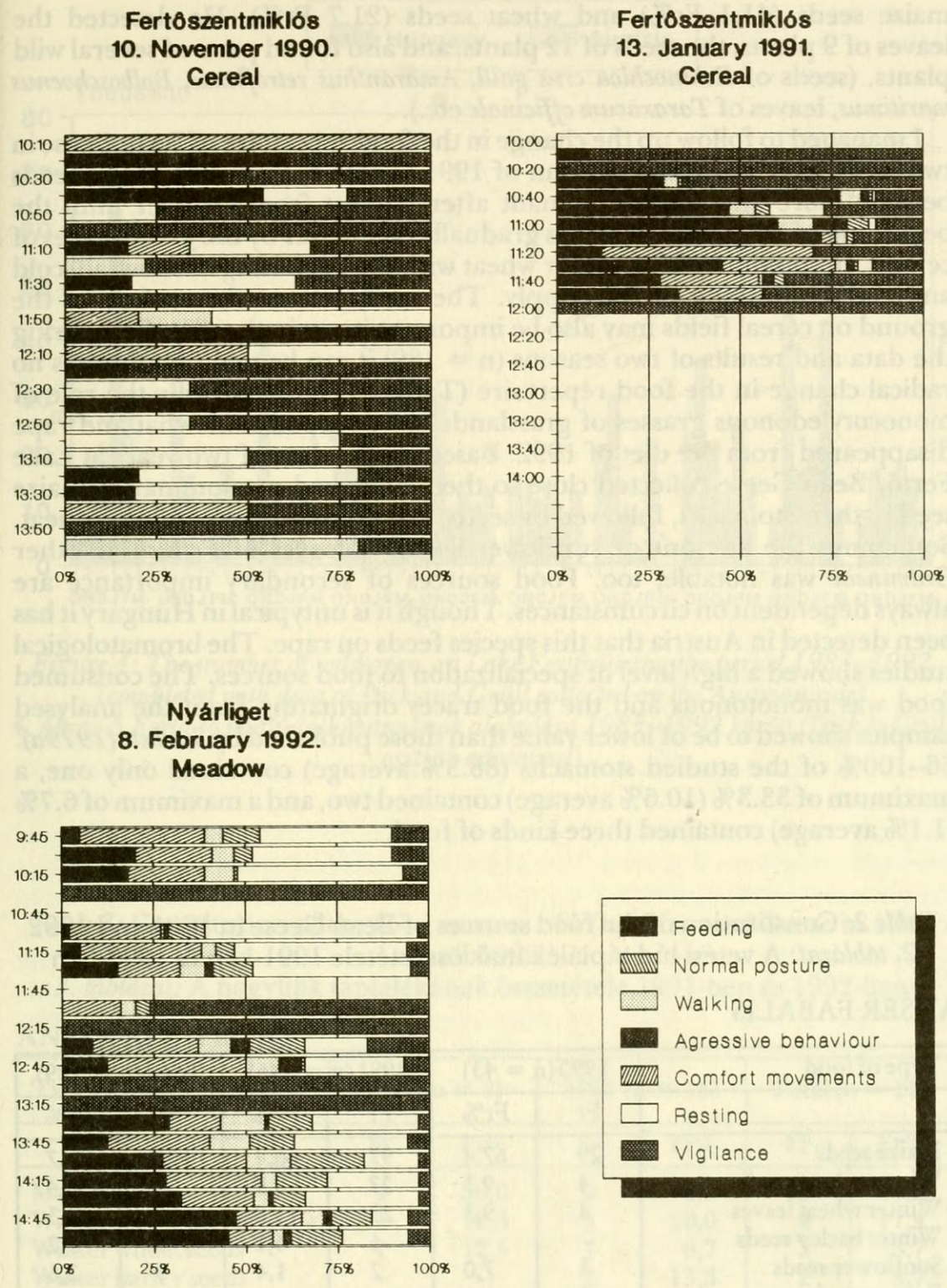


Figure 3: Changes in the daily activity of White-fronted Geese
3. ábra: A nagy lilik napi aktivitásának változása

maize seeds (41.1 Fr%) and wheat seeds (21.7 Fr%). He detected the leaves of 9 plants, the seeds of 12 plants, and also found parts of several wild plants, (seeds of *Echinochloa crus galli, Amaranthus retroflexus, Bolboschoenus maritimus,* leaves of *Taraxacum officinale* etc.).

I managed to follow up the change in the food repertoire of Bean Geese in two-week intervals in the autumn of 1991 (Table 1, Figure 4). Maize seeds become more and more dominant after harvest from October until the beginning of December, which is gradually taken over by the green leaves of cereals, predominantly of winter wheat with the beginning of snowfall, cold and the diminishing of the supply. The seeds left on the surface of the ground on cereal fields may also be important items in the diet. Comparing the data and results of two seasons (n = 189) it can be said that there is no radical change in the food repertoire (Table 2, Figure 5), only the role of monocotyledonous grasses of grasslands has dropped somewhat and rape disappeared from the diet of 1992. Based on the data of two years at Lake Fertő, Bean Geese collected close to their roost had predominantly maize seed in their stomachs, followed by seeds, leaves and spears of winter wheat. Sometimes the amount of sunflower seed, or leaves of *Festuca* or other *Gramineae* was notable, too. Food sources of secondary importance are always dependent on circumstances. Though it is untypical in Hungary it has been detected in Austria that this species feeds on rape. The bromatological studies showed a high level of specialization to food sources. The consumed food was monotonous and the food traces originating from the analysed samples showed to be of lower value than those published by *Sterbetz (1979a).* 66–100% of the studied stomachs (88.3% average) contained only one, a maximum of 33.3% (10.6% average) contained two, and a maximum of 6.7% (1.1% average) contained three kinds of food.

Table 2: Constitution of the food sources of Bean Geese in 1991 and 1992
2. táblázat: A vetési lúd táplálékának összetétele 1991-ben és 1992-ben

ANSER FABALIS

Type of food	1990 (n = 43)		1991 (n = 146)		Total (n = 189)	
	Fr	Fr%	Fr	Fr%	Fr	Fr%
Maize seeds	29	67,4	97	66,4	126	66,7
Winter wheat seeds	4	9,3	27	18,5	31	16,4
Winter wheat leaves	4	9,3	23	15,8	27	14,3
Winter barley seeds	–	–	6	4,1	6	3,2
Sunflower seeds	3	7,0	2	1,4	5	2,6
Festuca sp. leaves	5	11,6	–	–	5	2,6
Gramineae leaves	1	2,3	3	2,1	4	2,1
Rape leaves	2	4,7	–	–	2	1,1
Winter barley leaves	–	–	1	0,7	1	0,5

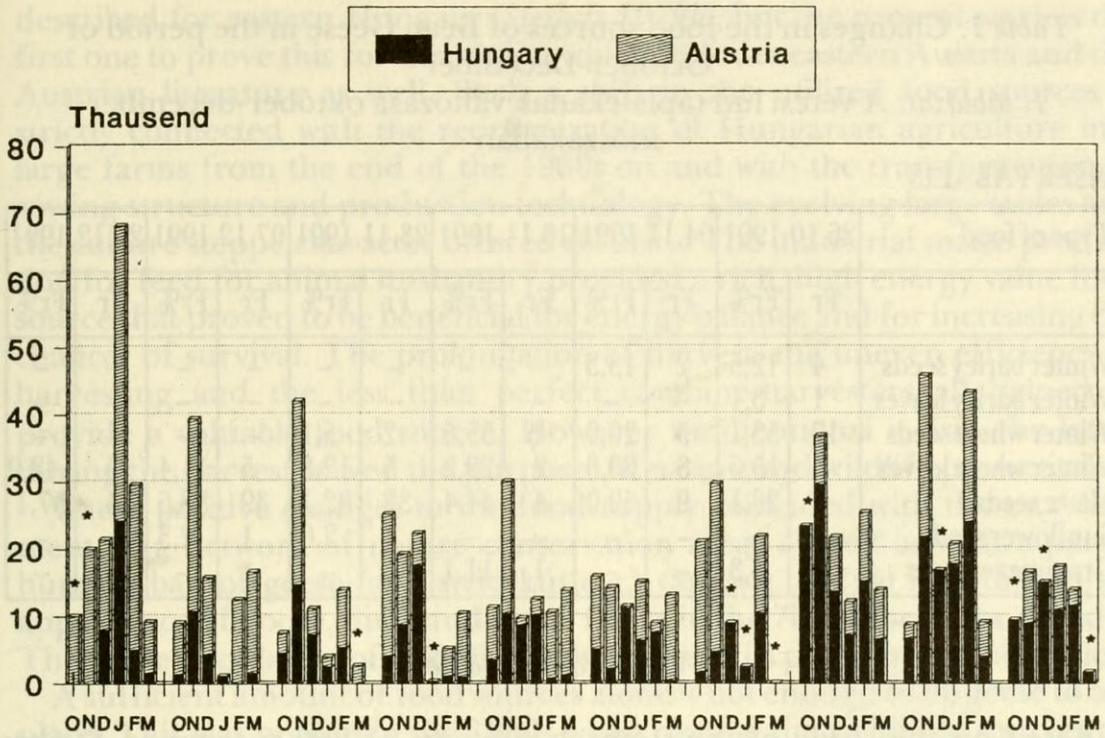


Figure 4: The number of wild geese on Lake Fertő during the period 1983–1992 (completed with data of Dick and Grüll collected on the Austrian side)
4. ábra: A Fertő-tó vadlúdállományának alakulása 1983–1992 között (Dick és Grüll osztrák adataival)

Table 3: Constitution of the food sources of White-fronted Geese in 1991 and 1992
3. táblázat: A nagylilik táplálékának összetétele 1991-ben és 1992-ben

ANSER ALBIFRONS

Type of food	1990 (n = 8)		1991 (n = 15)		Total (n = 23)	
	Fr	Fr%	Fr	Fr%	Fr	Fr%
Maize seeds	4	50,0	9	60,0	13	56,5
Winter wheat leaves	1	12,5	3	20,0	4	17,4
Winter wheat seeds	1	12,5	1	6,7	2	8,7
Winter barley seeds	–	–	2	13,3	2	8,7
Winter barley leaves	1	12,5	–	–	1	4,3
Rape leaves	1	12,5	–	–	1	4,3
Gramineae leaves	1	12,5	–	–	1	4,3

Table 1: Changes in the food sources of Bean Geese in the period of October-December

1. táblázat: A vetési lúd táplálékának változása október-december időszakában

ANSER FABALIS

Type of food	26.10.1991		04.11.1991		10.11.1991		23.11.1991		07.12.1991		21.12.1991	
	Fr	Fr%	Fr	Fr%	Fr	Fr%	Fr	Fr%	Fr	Fr%	Fr	Fr%
Winter barley seeds	4	12,5	2	13,3	–	–	–	–	–	–	–	–
Winter barley leaves	1	3,1	–	–	–	–	–	–	–	–	–	–
Winter wheat seeds	17	53,1	3	20,0	5	55,5	2	5,1	–	–	–	–
Winter wheat leaves	5	15,6	3	20,0	2	22,2	5	12,8	5	11,4	3	42,9
Maize seeds	9	28,1	9	60,0	4	44,4	32	82,1	39	88,6	4	57,1
Sunflower seeds	–	–	–	–	–	–	1	2,6	1	2,3	–	–
Gramineae leaves	2	6,3	–	–	1	11,1	–	–	–	–	–	–

White-fronted Goose

Based on the study of the stomach contents of 260 specimens, *Sterbetz (1979a)* found maize seed *(71.9 Fr%)*, the leaves of *Festuca pseudovina* (60.4 Fr%), the leaves (33.8 Fr%) and seeds (18.8 Fr%) of winter wheat and seeds of rice (18.5 Fr%) to be the commonest food of White-fronted Geese. White-fronted Geese fed on the leaves of 9 plants and the seeds of 11 taxa. 6 taxa of animal origin also occurred in their diet, mainly snails (they served possibly as gastrolites) and a cricket *(Gryllus sp.)* in one case. These samples collected between 1952–1976 may be misleading, however. The potential food spectrum is well covered due to the long interval, but it does not reflect the changes resulting from the appearence of the monocultural large farm production. Later studies show this very well *(Sterbetz, 1979b)*, where maize seeds are mentioned as the almost exclusive food source of the species. The results of the analysis of a far less numerous number of stomach contents (1990 n = 8, 1991 n = 15, 23 total) stand the closest to these latter data (Table 3, Figure 6).

The food spectrum in 1991 was somewhat simpler (4 types of food), and the geese were eating 6 types of food. Maize was the commonest in both years (50.0% and 60.0% respectively, 56.5 Fr% average). This was followed by the green parts of winter wheat (17.4 Fr% average), wheat seed and barley seed (8.7–8.7 Fr%, respectively). The consumption of rape leaves could be detected for White-fronted Geese, in the same way as in the case of Bean Geese.

Conclusions

The studies of habitat use and food repertoire showed that geese migrating and wintering at Lake Fertő are strictly dependent on food sources offered by agricultural land. This phenomenon has already been

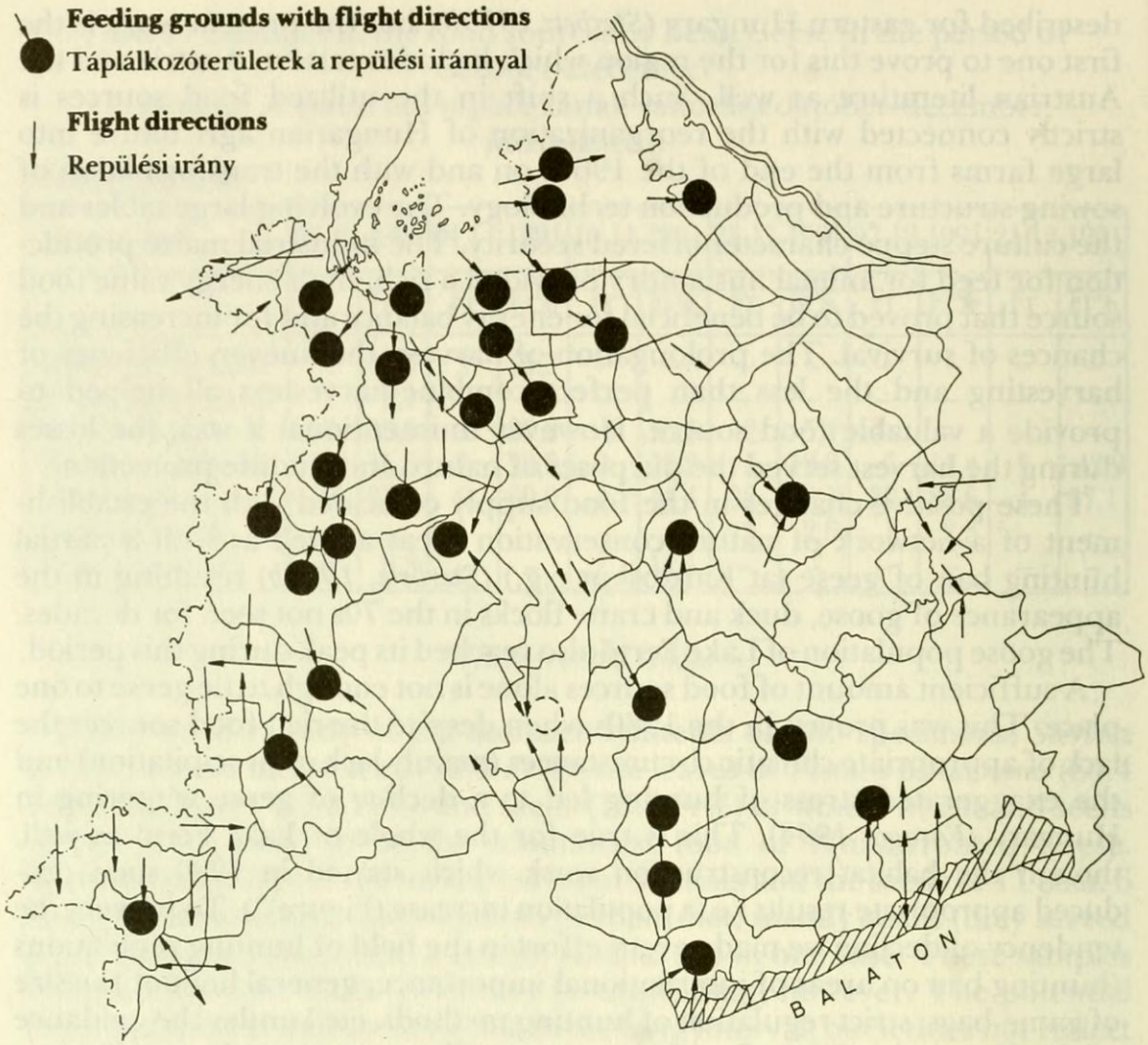
described for eastern Hungary *(Sterbetz 1979b)*, but the present work is the first one to prove this for the region which includes eastern Austria and the Austrian literature as well. Such a shift in the utilized food sources is strictly connected with the reorganization of Hungarian agriculture into large farms from the end of the 1960s on and with the transformation of sowing structure and production technology. The evolving large tables and the culture steppe character offered security. The industrial maize production for feed for animal husbandry provided a rich, high energy value food source that proved to be beneficial for energy balance and for increasing the chances of survival. The prolongation of harvest, the uneven efficiency of harvesting and the less than perfect combine-harvesters all helped to provide a valuable food source. However unintentional it was, the losses during the harvest served the purposes of nature and wildlife protection.

These positive changes in the food supply coincided with the establishment of a network of nature conservation areas as well as with a partial hunting ban of geese (at Kardoskút e.g.) *(Sterbetz, 1979b)* resulting in the appearance of goose, duck and crane flocks in the 70s not seen for decades. The goose population of Lake Fertő also reached its peak during this period.

A sufficient amount of food sources alone is not enough to tie geese to one place. This was proven in the 1980s when despite the rich food sources the lack of appropriate climatic circumstances (mainly lack of precipitation) and the exaggerated stress of hunting led to a decline of geese wintering in Hungary *(Faragó, 1994)*. This is true for the whole of Lake Fertő as well, though the habitat reconstruction work which started in 1990 soon produced appropriate results i.e. a population increase (Figure 7). To prevent the tendency of decline we made every effort in the field of hunting regulations (hunting ban on areas of international importance, general limit of the size of game-bags, strict regulation of hunting methods, etc.) under the guidance of the Hungarian Waterfowl Management Plan to protect the population. These steps were badly needed, because the privatisation of land in Hungary may result in the decline of monocultural large farm management and industrial maize production with a related diminishing, and perhaps locally even disappearing, supply of food sources for geese.

Geese migrating and wintering in the Pannon region could not survive a decline in food supply together with a prolonged dry period and increased hunting pressure.

Privatisation will in the future raise the question of damage caused by geese. This was an issue that was hardly ever raised in the period of large state farm agriculture *(Faragó, 1992)*. As the geese are dependent on cultivated plants in the whole of Eastern Europe (Map 4, *Madsen, 1992*), changes in ownership may see more frequent conflicts of interest, with disturbance perhaps denying food sources for the geese, which would no doubt be followed by the geese abandoning the Pannon region as they did in the 1980s due to prolonged dry weather. The prevention of all these threats needs the active intervention of wildlife and nature conservation bodies, under the coordination of the Hungarian Waterfowl Management Plan.



Map 4: Relative habitat use of geese (all species) in Europe (Madsen, 1992)
4. térkép: A vadludak relatív habitat használata (összes faj) Európában (Madsen, 1992)

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A FERTŐ–TÓRÓL KIHÚZÓ VADLIBÁK HABITAT HASZNÁLATA, NAPI AKTIVITÁSA ÉS TÁPLÁLKOZÁSA

Dr. Faragó Sándor

Bevezetés

A két ország határán fekvő Fertő tó a pannon régió egyik legfontosabb vadlúdgyülekező helye. A vadlúdra irányuló kutatások Ausztriában már az 1960-as években megkezdődtek, itthon az intenzív vizsgálatok csak az 1980-as évek elejéig vezethető vissza.

Mivel a tó, – függetlenül a határaktól –, egy ökológiai egység, szükségszerű volt az együttműködés az *Institut für Wildbiologie und Jagdwirtschaft* (BOKU, Wien) és a *Biologische Station Neusiedler See* (Illmitz) kutatóival. A magyar vadlúdkutató projectet a *KTM Természetvédelmi Hivatal Madártani Intézete* támogatja.

Anyag és módszer

A Fertő tóról kihúzó libák akciórádiuszát, a táplálkozóterületek helyét és a használt habitatokat 1990/91-es idényben három nyugat-magyarországi megye vadgazdálkodóinak kiküldött kérdőívek és saját megfigyelések alapján határoztuk meg.

A napi aktivitás vizsgálatokat 1990/91 és 1991/92 időszakában a három gyakori libafajra (nyári lúd, vetési lúd, nagy lilik) végeztük el. Igyekeztünk havi rendszerességgel dolgozni, olykor havonta több felvételt is készíteni. A kihúzásra vonatkozó vizsgálatok befejezése után kerestük fel a táplálkozóterületeket, s ott 10–15 vagy 10–16 óra között végeztünk felméréseket. A viselkedésminták rögzítése 10 illetve 15 percenként történt, melynek során figyelembe vettük *Amat (1986)* és *Schulz (1985)* munkáit. Az alábbi viselkedési formákat különítettük el: táplálékfelvétel, normál testtartás, mozgás (futás), agresszív viselkedés, komfortviselkedés, pihenés és őrzés. Rögzítettük minden esetben a zavaró tényezőket (emberi zavarás, őzek, ragadozó madarak stb.), ennek tényét az ábrán is jelöltük o jellel.

1990/91 és 1991/92-es szezonokban 218 *Anser fabalis* és 23 *Anser albifrons* gyomortartalom-vizsgálatát végeztem el. Utóbbi szezonban lehetőség volt a 2–2 hetes periodicitás szerinti táplálékváltozás nyomon követésére. Az este lőtt madarak esetében a táplálékkomponensek gyakoriságát (Fr%) állapítottuk meg.

Eredmények

A Fertőről kihúzó vadludak akciórádiusza

A fertői libák kihúzásáról már találunk korábban is adatokat *(Leisler, 1969)*, de a konkrét vizsgálatokat csak a politikai viszonyok módosulása tette lehetővé. Az együttműködés eredményeként *Dick (1987), Grüll* és *Dick (1987), Dick* és *Grüll (1990)* már közölték az osztrák ludak mozgására vontakozó adatokat. Nagy lilik esetében *Sterbetz (1979)* közöl átlagosan 6 km-es távolságot alföldi viszonylatban az éjszakázó- és táplálkozóterületek között.

A Fertő-tájon a vetési lúd és a nagy lilik napi 60–70, olykor 100 km-es akciórádiusszal járnak táplálkozni. Ez tulajdonképpen a Kisalföld mezőgazdaságilag művelt területeinek felel meg. A Fertő tó illetőleg a Balaton és a Kis-Balaton libái a Rába folyó

árterülete illetve a Bakony hegység ÉNY-i lábai térségében elhelyezkedő síkságon találkoznak (1. térkép). A Tapolcai-medencén keresztül köztes migráció is kialakulhat a két terület között. Ugyanez fennállt a Fertő-Duna relációban is. Az elmondottakból kitűnik az a szerep is, amelyet a Fertő-táj a pannon régió nyugati fele vadlúdvonulásának gócpontjaként betölt. A nyári ludak a lehető legkisebb távolságot teszik meg, s csak novembertől figyelhető meg nagyobb távolságú táplálkozóhabitat keresése.

Úgy tűnik, hogy a kis távolságban táplálékot keresők a fészkelő populáció tagjai, míg a mobilabb példányok a vendégek közül kerültek ki.

A vadludak habitathasználata Nyugat-Magyarországon

A három nyugat-magyarországi megyében az eltérő ökológiai adottságok miatt eltérő eredményeket kaptunk ugyan, de általánosságban elmondhatók, hogy mindenütt a gabonavetéseket használták a legnagyobb számban a libák (2. térkép).

A libák zöme a Nyugat-Dunántúlon két habitatot, harmada (32%) egy habitatot használt egy-egy vadászterületen. A fennmaradó negyedrész három (24%) illetve négy habitatot (3%) keresett fel (3. térkép).

A libafajok napi aktivitás vizsgálata

A napi aktivitásmintázat meghatározása során kiemelt szerepet tulajdonítottunk a táplálkozásra fordított időaránynak. Tehát a felvett táplálék mennyisége arányos a szükséglettel, melyet a fajok specifikus igénye, az egyedek kondíciója, a táplálékszerzésre fordított energiamennyisgé nagysága, a táplálék energiatartalma, a létfenntartási befolyásoló külső környezeti tényezők (pl. klimatikus viszonyok, táplálkozóterületek diszpergáltsága, zavartság stb.) határoztak meg. Általános törvényszerűségként fogalmazott meg hasonló vizsgálatok eredményeként *(Owen, 1972, Fruzinski, 1977, Amat, 1986)*, hogy a táplálkozási csúcsidőszakok a kora délelőtti és a késő délutáni órákra esnek.

Vetési lúd

A vetési lúdnál jól kimutatható a táplálék energiatartalmának hatása a táplálékfelvétel gyakoriságára és azon keresztül a táplálék mennyiségére. 1990. december 15-én az éjszakázóhelytől mintegy 13 km-re gabonavetésen tartózkodó vetés ludak kétszerannyi időt töltöttek táplálkozással, mint az éjszakázóhelyüktől 25 km-re, kukoricatarlón megfigyeltek (2. ábra)

Nagy lilik

A vizsgált időszakban viszonylag kevés nagy lilik tartózkodott a Fertő-tájon, ezért a megfigyelések száma is kisebb volt. Általában nagyon zavartan viselkedtek, csupán e fajnál volt megfigyelhető, hogy szinte csak táplálkoztak vagy őrködtek. (3. ábra)

Gyomortartalom-vizsgálatok

Vetési lúd

1991 őszén módunkban állt 2–2 hetes periódusban nyomon követni táplálék-összetételének változását (1. táblázat, 4. ábra). A kukorica betakarításának kezdetével október december eleje között a kukoricaszem abszolút domináns táplálékában. A

talajmunkák után, hótakaró kialakultával és a táplálékkészlet kimerülésével átveszi a vezető szerepet az őszi gabonák, főként az őszi búza levele-hajtása. Két szezon adatait összevetve (2. táblázat, 5. ábra) nem volt eltérés, nem következett be változás.

A táplálkozásvizsgálatok a táplálékforrások iránti nagyfokú specializációt mutatták ki. A megvizsgált gyomroknak 88,3%-ában csupán egyféle, 10,6%-ában kétféle, 1,1%-ában háromféle táplálék volt.

Nagy lilik

Sterbetz (1979a) már az alföldi vizsgálatokban is a kukoricát nevezte meg legfőbb nagy lilik tápláléknak.

Saját vizsgálatainkban (3. táblázat, 6. ábra) 56,5 gyakorisági %-ban (Fr%) ugyancsak a kukoricaszem dominált, ezt követte az őszi búza zöld része (17,4 Fr%), a búza és árpaszemek (8,7–8,7 Fr%).

Következtetések

Vizsgálataink kimutatták, hogy a Fertőnél telelő és vonuló libák szorosan kötődnek a mezőgazdasági területek kínálta táplálékforrásokhoz. A nagytáblás mezőgazdálkodás, a kultúrsztyepp jelleg a biztonságot jelenti a számukra. A betakarítási veszteségek 2–2,5 hónapra magas energiatartalmú, értékes táplálékforrást biztosítanak.

A táplálékbőség önmagában még nem elégséges a vadludak helyhez kötéséhez, ezt bizonyította az 1980-as évek tapasztalata. A fennálló táplálékbőség ellenére a megfelelő klimatikus viszonyok (főleg csapadék) hiánya és a túlzott vadászati leterhelés azt eredményezte, hogy a Magyarországon vonuló és telelő ludak száma megcsappant *(Faragó, 1994)*. A Fertőre is érvényesek e megállapítások, habár az 1990-ben megkezdett élőhely-rekonstrukciós munkálatok megfelelő eredményeket, ezzel együtt állománynövekedést hoztak (7. ábra).

A csökkenés megállítására elsősorban vadászati intézkedések történtek egy megvalósuló magyar vízivadgazdálkodási terv részeként. Megvalósult a nemzetközi jelentőségű területek vadászati tilalma, bevezetésre került a napi terítékkorlátozás, szigorították a vadászati módokat. Mindezekre azért volt szükség, hogy a privatizáció során előálló változások (nagytáblás gazdálkodás, iparszerű kukoricatermesztés megszűnte) elsősorban táplálékforrás-készletek csökkenése okozta negatív hatásokat kompenzáljuk.

A privatizáció a jövőben felveti a libák okozta károk kérdését is. Mivel a libák az egész közép-kelet-európai régióban a szántóföldi növénytermesztéshez kötődnek (4. térkép, *Madsen, 1992)*, a tulajdonváltás fokozódó konfliktusveszélyt, zavarásuk növekvő kártételt, rosszabb esetben táplálékhiányt, ezt követően a pannon régió elhagyását eredményezheti, mint azt az 1980-as évek szárazságai nyomán tapasztaltuk. Mindezek megelőzése aktív vad- és természetvédelmi beavatkozásokat kíván, melyhez megfelelő keret lesz a magyar vízivad-gazdálkodási terv létrehozása.