

## NUTRITION-BIOLOGICAL INVESTIGATION INTO THE RED FOX POPULATION LIVING IN THE FLOOD PLAIN OF THE TISZA—MAROS

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*(Received 6 May 1978)*

### Abstract

I am summarizing my investigations performed until now in the flood-plain of the rivers Tisza and Maros in connection with the nourishment-biology of the red fox, as follows:

The relative proportion and frequency of the single kinds of prey in the gastric contents is changing. It depends upon the season and mainly upon the degree of inundations. In the stomachs, the prey participation in mammals, birds and carcasses is the largest, in respect both of total weight and relative content. The other vertebrates and invertebrata as well as plants, do not form any considerable proportion.

The rodents, occurring frequently in the investigated area, occur in the prey, too, more frequently. The rarer ones occur in the prey, to, more rarely. But from among the non-domesticated bird species, living in this area, only the pheasant may be found in the list of preys with great frequency. The other bird species, in however large number they live in the area, can be met with in the list only sporadically and with low frequency. This otherwise agrees with the results of the nourishment-biological investigations in the southern part of Hungary (Erdei, 1977).

After analyzing the problem of advantage and damage, it may be ascertained that its damaging is expressly of game-economical direction. 63 percent of the gastric content can be regarded as originating from a harmful activity, 26 percent is useful because of destroying harmful rodents, 11 percent of the gastric content is indifferent. Taking into consideration that in Winter the majority of the pheasant cases are cocks — sex can easily be established on the basis of feather from the pectoral region —, this cannot be considered as a pure damage because these are mostly wounded cocks.

Taking all things into consideration, I consider the fox as a useful constituent of the bio-coenosis in the flood-plain. Apart from destroying harmful rodents, it also performs an important hygienic role which has remained exclusively its task. It replaces the role and activity of the birds of prey and fur-bearing predatory animals, exterminated or becoming less frequent in the meantime. So far this is possible at all under the changed conditions. (Cf. Graph 2).

The red fox is our most frequent home rapacious mammalian species. It has been hunted in this country from time immemorial because this sport was always liked by the Hungarian hunters. Fox-hunting is variegated, full of trick and stratagem. It is sniped or killed from stalking, with deceptive whistle, in driving, beaten off with dogs or dug out of its burrow, even today, it is often caught with different snares and traps. Of late, it is frequently destroyed with poison and gas. In spite of all these, it is the unique one of all the home fur-bearing beasts of prey which was able to accommodate itself to the changed natural-environmental conditions. The red fox takes, therefore, an outstanding place among the home mammalian rapacious species and thus deserves a particular attention.

This is the situation not only in Hungary but in several other States of Europe, as well. Some Western European scientists pay particular attention to the red fox. The high level of the fox-research there, the method with which the sphere of problems connected with the red fox and its single components are investigated, are generally known. PETZSCH (1966), as well as KOENAN (1952) also ponder over the points of view of usefulness and deleteriousness what is an important direction of investigation in this country, too. BEHRENDT intensively examines (1955) the composition of food and the percentage of the main constituents. SPITTLER (1972) analyzes the connections between the density of population, as well as rabies and the stock of small game. STUBBE (1974) also deals *in extenso* with population-biology, including the causes of mortality, as well. ENGLUND investigates (1965) in detail the composition of gastric content which changes, in his opinion, constantly and dynamically, depending upon place, season, period, the number of preys and red foxes, as well as upon several other factors.

### Material and method of the investigation

The aim of my research work is: to obtain data of what the role of red fox is in the habitat most-approaching the sometime natural conditions, in the flood plain of the Tisza-Maros, in the order of biocenosis. How the way of life, the radius of motion, and the density of population are influenced by inundations. In what its economic damage and use are realized.

The research area was the flood plain of the Tisza from Mártély to the mouth of the Maros, as well as the flood-plain of the Maros as far as the confines of the town Makó -together 7600 ha. This area consists in 50 percent of forests, in 35 percent of agricultural areas (mainly meadow, pasture, in a smaller proportion plough-land, orchard), in 15 percent of other areas (open water, flat bog-peats, reedy part). This area is a particular dash of colour in the more and more modernized aspect of the region. Its fundamentals in game economy are excellent.

The method of investigation contains the following:

- (1) The analysis of the frequency of preys on the basis of gastric remains.
- (2) Establishment of the relative content of the investigated stomachs.
- (3) Calculation of the total gastric content (biomass).
- (3) Calculation of the total gastric content (biomass).
- (4) Frequency of the occurrence of some preys, as compared with the number of stomachs.
- (5) Species-list of prey animals, on the basis of gastric contents.
- (6) The analysis of the frequency of some kinds of prey on the basis of some remains and excreta found on the ground.
- (7) A list of prey animals on the basis of some remains and excreta found on the ground.

### Results

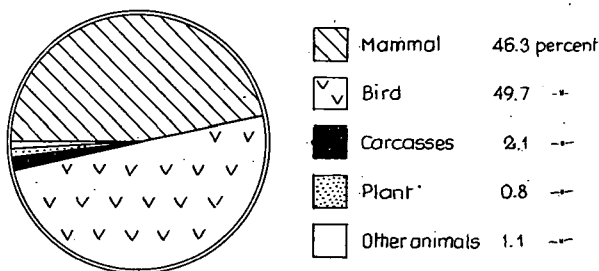
The different remains, findings found in the stomachs were divided into six groups: (1) mammals, (2) birds, (3) other vertebrates, (4) invertebrata, (5) carcasses and garbage, (6) plants. These are the main kinds of prey.

(1) I have ascertained on the basis of analysing frequency that, in the area investigated, the mammals occurred the most frequently (52.4 percent). These are followed by the invertebrata (23.1 percent) and birds (19.2 percent). The frequency of the other kinds of prey is insignificant. (Cf. Table 1).

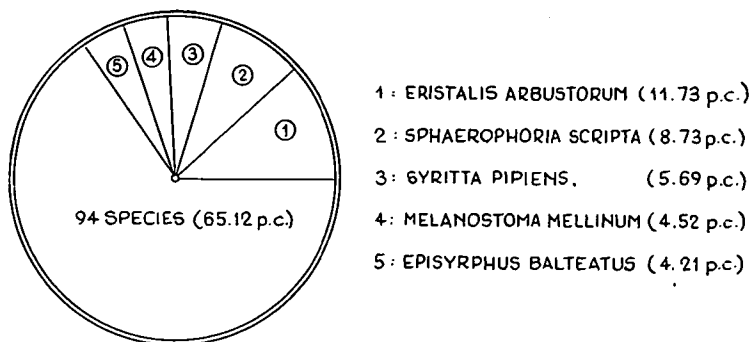
Table 1. Analysis of the frequency of certain kinds of prey on the basis of the gastric contents (1974-1977)

|                              | Pieces of prey | Percentage of occurrence |
|------------------------------|----------------|--------------------------|
| (1) <i>Mammals</i> (a+b+c)   | 109            | 52.4                     |
| (a) <i>brown hare</i>        | 11             | 5.2                      |
| (b) <i>small rodents</i>     | 92             | 44.3                     |
| mice                         | 16             | 7.7                      |
| field-voles                  | 73             | 35.1                     |
| sousliks                     | 3              | 1.5                      |
| (c) <i>insectivores</i>      | 6              | 2.9                      |
| (2) <i>Birds</i>             | 40             | 19.2                     |
| useful wild-fowl             | 26             | 12.5                     |
| domestic fowl                | 1              | 0.5                      |
| other birds (+eggs)          | 13             | 6.2                      |
| (3) <i>Other Vertebrates</i> |                |                          |
| amphibia                     | 1              | 0.5                      |
| (4) <i>Invertebrata</i>      | 48             | 23.1                     |
| molluscs                     | 2              | 1.0                      |
| insects                      | 46             | 22.1                     |
| (5) <i>Carcasses</i>         | 4              | 1.9                      |
| (6) <i>Plants</i>            | 6              | 2.8                      |

(2) The relative gastric contents are generally in no correlation with frequency. The gastric-content percentage of some main kinds of prey (i.e. their weight percent) considerably departs from the frequency percent. Thus the relative percentage of the main kinds of prey in the gastric content is the following: the percentage of the largest birds is 49.7, that of mammals is 46.3, that of the carcasses and garbage is 2.7, all the other relative percentages are insignificant, not more than 1.9 percent. (Cf. graph 1).



Graph 1. Relative percentage of the main kinds of prey in the gastric contents Tisza-Maros flood plain (1974-1979)



Graph 2. Advantage and disadvantage on the basis of the relative gastric contents Tisza-Maros flood-plain (1974-1977).

(3) After summarizing all gastric contents, I have got 10,522 g total gastrict content (biomass) in the area investigated, during the period of investigations. The weight of the average content, falling on a single stomach, was 148.2 g, it did not reach, therefore, 15 decagrammes.

(4) It is important to compare the frequency of the occurrence of the single kinds of prey with the number of stomachs because, in this way, it can concretely be established, in how many stomachs the single kinds of prey occur. And this is very interesting from the point of view of game economy, as well. 20 stomachs have for instance contained only mammals and in 11 of these there were only brown hares. Pheasants were found in 25 stomachs and in 21 of these, apart from pheasants, there was nothing else. From these I have concluded that the red fox, after stuffing itself with pheasant or hare, takes but rarely any other food.

(5) The species list of prey animals on the basis of the gastric contents is as follows:

| Mammals   | Pieces |
|---|--------|
| (a) brown hare ( <i>Lepus europaeus</i> )   | 11     |
| (b) small rodents   |        |
| wood mouse and field mouse ( <i>Apodemus sylvaticus</i> , <i>Mus spicilegus</i> ) | 12     |
| harvest mouse ( <i>Micromys minutus</i> )   | 3      |
| brown rat ( <i>Rattus norvegicus</i> )  | 1      |
| field vole ( <i>Microtus arvalis</i> )  | 54     |
| subterraneous vole ( <i>Pitimys subterraneus</i> )                                | 16     |
| water vole ( <i>Arvicola terrestria</i> )   | 2      |
| ondata ( <i>Ondatra zibethicus</i> )  | 1      |
| souslik ( <i>Citellus citellus</i> )  | 3      |
| (c) insectivores  |        |
| forest shrew ( <i>Sorex araneus</i> )   | 6      |
| <b>Birds</b>  |        |
| pheasant ( <i>Phasianus colchicus</i> )   | 25     |
| mallard ( <i>Anas platyrhyncha</i> )  | 1      |
| domestic fowl ( <i>Gallus domestica</i> )   | 1      |
| jay ( <i>Garrulus glandarius</i> )  | 1      |
| turtle-dove ( <i>Streptopelia decaocto</i> )                                      | 1      |
| turtle ( <i>Turtur turtur</i> )   | 1      |

|   |    |
|---|----|
| starling ( <i>Sturnus vulgaris</i> )                              | 1  |
| black-headed gull ( <i>Larus ridibundus</i> )                     | 1  |
| peewit ( <i>Vanellus vanellus</i> )                               | 1  |
| common coot ( <i>Fulica atra</i> )                                | 1  |
| non-determined species  | 1  |
| eggs  | 5  |
| <i>Other Vertebrates</i>  |    |
| frog (non-determined in detail)                                   | 3  |
| <i>Invertebrata</i>   |    |
| snail (non-determined in detail)                                  | 2  |
| common dung-beetle ( <i>Geotrupes mutator</i> )                   | 2  |
| eastern maybeetle ( <i>Anoxia orientalis</i> )                    | 5  |
| grasshoppers ( <i>Tettigonioidea</i> ) (non-determined in detail) | 31 |
| non-determined insects  | 8  |
| <i>Carcasses</i>  |    |
| deer ( <i>Capreolus capreolus</i> )                               | 1  |
| non-determined species  | 3  |
| <i>Plants</i>   |    |
| dewberry ( <i>Rubus caesius</i> )                                 | 3  |
| non-determined species  | 3  |

(6)–(7) The remains of food found in a stomach may be brought into connection with a certain date. In the vicinity of burrows some food-remains including a longer period can be found. It is a characteristic of bone, feather, chitin remains, hair and of various other things to be found in the excrements, too, that the remain, in contradistinction to the perishable part of remains (e.g. flesh), do remain for a comparatively long time. The remains found in the burrows, resp. on the ground, cannot replace the prey and species list prepared on the basis of exposing the stomach. But they complete research and may draw the attention to certain problems. The remains of small rodents (e.g. field-voles, mice, etc.) can less be found on the ground than those of the mammals of a larger body, resp. birds of a larger body. In the area investigated, there were found 63 bird remains, 10 brown hare, 4 sousliks and only 30 mouse- and vole-remains. (Cf. Table 2).

Table 2. Analysis of the frequency of certain kinds of prey on the basis of prey remains found on the ground (1974–1977)

|                                | Pieces of prey | Percentage of occurrence |
|--------------------------------|----------------|--------------------------|
| (1) <i>Mammals</i> (a + b + c) | 48             | 29.1                     |
| (a) <i>brown hare</i>          | 10             | 6.1                      |
| (b) <i>small rodents</i>       | 34             | 20.6                     |
| mice                           | 11             | 6.7                      |
| field-voles                    | 19             | 11.5                     |
| sousliks                       | 4              | 2.4                      |
| (c) <i>insectivores</i>        | 4              | 2.4                      |
| (2) <i>Birds</i>               | 63             | 38.2                     |
| useful wild-fowl               | 41             | 24.9                     |
| domestic fowl                  | 4              | 2.4                      |
| other birds (+ eggs)           | 18             | 10.9                     |

|                                  |    |      |
|----------------------------------|----|------|
| (3) <i>Other vertebrates</i>     |    |      |
| fish                             | 5  | 3.0  |
| reptiles                         | 1  | 0.6  |
| (4) <i>Invertebrata</i>          |    |      |
| mollusks                         | 3  | 1.8  |
| insects                          | 28 | 17.0 |
| (5) <i>Carcasses and garbage</i> |    |      |
| carcasses                        | 3  | 1.8  |
| garbage                          | 6  | 3.7  |
| (6) <i>Plants</i>                | 8  | 4.8  |

The number of red foxes can already be influenced only by the man today. That the red fox should not be overmultiplied it is in the interest not only of the man but of the fox, as well. In the area investigated, the number of populations is above the tolerable one. One individual falls to 0.2–0.3 piece/sq. km, i.e. 500–300 hectares. It survives the spring inundations, going quite simply to the protected side and transferring there the sphere of its movement. In this case, the density of population here increases. As a result of the more frequent movement and increased contact connected with mating (rutting) in the late Winter, resp. with raising the progeny, rabies manifests itself annually. The vehemence of this annually changes. Of late, the most rabies cases were observed this year (1978).

After the retirement of water red foxes return to the covered flood-plain, providing for a good covert lair. On this occasion, in Spring, it is customary to drive back the number of foxes. The burrow is explored and one tries to destroy the suckler (vixen) together with the youngs. One of the ways of decreasing the number of red foxes is poisoning. But poisoned morsels and eggs make the least damage in the red fox itself. On the other hand, the protected and very rare birds of prey very often perish for these. Gassing is much more effective than this and is already generally used. But as a practising sports-hunter and a biologist, I do not approve of this method.

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# Tisza—Maros hullámterében élő rókapolulációk táplálkozásbiológiai vizsgálata

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## Kivonat

A Tisza—Maros folyók hullámterében a róka táplálkozásbiológiájával kapcsolatos eddigi vizsgálataimat a következőkben foglalom össze.

Egyes zsákmányfélések relatív aránya és gyakorisága a gyomortartalmakban változó. Az évszaktól és főleg az előntések mértékétől függ. A gyomrokban mind az összszúlyt, mind a relatív tartalmat illetően az emlős, madár és dög zsákmány-részesezés a legnagyobb. Egyéb gerinces és gerinctelen állatok, valamint a növények nem képeznek jelentős részarányt.

A vizsgálati területen előforduló gyakori rágcslók a zsákmányban is gyakrabban fordulnak elő, a ritkábbak pedig a zsákmányban is ritkábban. De az itt vadon élő madárfajok közül zsákmánylistán csak a fácán található nagy gyakorisággal. A többi madárfaj, bármilyen nagy létszámban is éljen a területen, csak kis gyakorisággal vagy elvétve fordul elő. Ez egyébként megegyezik a dél-magyarországi táplálkozásbiológiai vizsgálatok eredményeivel ERDEI (1977).

A haszon és kár kérdését elemezve, megállapítható, hogy károkozása kifejezetten vadgazdálkodási irányú. Káros tevékenységéből eredőnek tekinthető a gyomortartalom 63%-a, hasznosnak a káros rágcslók pusztítása miatt 26%, közömbös gyomortartalom 11%. Ha figyelembe vesszük, hogy télen a fácskák többsége kakas — a melltájéki tollak alapján könnyen meg lehet állapítani a nemet —, akkor ez nem tekinthető tiszta kárnak, ugyanis ezek leginkább sebzett kakasok.

## Istraživanja biologije ishrane populacija lisice na plavnom području Tisza—Maros

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### Abstract

U radu su prikazani rezultati dosadašnjih ispitivanja biologije ishrane lisice na plavnom području reka Tisza—Maros. Na osnovu analize želudačnog sadržaja utvrđena je relativna razlika u kvalitetu i čestoci učešća plena u ishrani. Kako kvantitet tako i relativni sadržaj plena u želucu je predstavljen učešćem sisara, ptica i strvine. Ostali kičmenjaci, beskičmenjaci kao i hrana biljnog porekla ne predstavljaju značajnu komponentu.

Učešće pojedinih vrsta glodara u ishrani lisice je u pravoj srazmeri sa njihovom brojnošću. Od ptica se najčešće javlja fazan, dok je učešće u ishrani ostalih predstavnika ornitofaune istraživanog područja, čak i pored visoke brojnosti minimalan ili sporadičan. Ovi podaci se poklapaju sa rezultatima istraživanja biologije ishrane lisice iz južne Madjarske, ERDEI (1977).

Analizirajući korisnost i štetnost, može se konstatovati da se lisica javlja kao lovoprivredna štetočina. Želudačni sadržaj u 63% ukazuje na njenu štetnost. U 26% njena korisnost se ispoljava tamanjenjem štetnih glodara, dok su želuci sa neutralnim sadržajem zastrupljeni u 11%. Štetnosat lisice se umanjuje ako polazimo od činjenice da u zimskom periodu u njenoj ishrani u odnosu na fazane uglavnom učestvuju ranjeni petlovi.

## Исследование биологии питания популяций лисицы, живущих в пойме р. Тиса-Марош

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### Резюме

Проведенные нами исследования относительно биологии питания лисицы в пойме рек Тиса-Марош можно подытожить следующим образом.

Анализ содержания желудка показывает, что соотношение отдельных видов добычи и частота изменяются в зависимости от времени года и, главным образом, от размера затопления. Как по общему весу, так и по относительному содержанию большую долю составляют млекопитающие, птицы и падаль. Прочие по звончные и беспозвоночные животные представлены в очень незначительном количестве.

Чаще встречаются в качестве добычи такие грызуны, которые являются более распространёнными на исследуемой территории, менее редкие, соответственно, и как добыча реже. Что касается живущих здесь птиц (диких), в списке добычи часто встречается лишь фазан. Остальные виды птиц, в каком бы большом количестве они здесь не встречались, лишь очень редко попадают в добычу. Это соответствует полученным ранее результатам относительно биологии питания лисиц в южной части страны (Эрдеи, 1977).

Анализируя вопрос о пользе и причиняемом вреде, можно установить, что вред имеет исключительно направление — против охотничества. К вредной деятельности можно отнести 63% содержимого желудка, к полезной деятельности — уничтожение вредных грызунов — 26%, к безразличной — 11%. Если принять во внимание, что зимой фазан, обнаруживаемый в желудке лисицы, чаще всего фазан-петух, что нетрудно обнаружить по перьям груди, это нельзя считать чистым вредом, так как это в основном раненные петухи.