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PROJEKT I. Monitoring of protected and threatened species

Aim: Monitoring of protected species, fulfilling international reporting obligations (directives, agreements, OECD)

Mammals: European Ground Squirrel (EGS) (*Spermophilus citellus*)

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1. Questions

Monitoring of European Ground Squirrel (in what follows: ground squirrel) populations as populations of a protected species, diagnose trends direction and speed (project I.).

Nationwide ground squirrel monitoring can be linked to 6 other project as: II. Monitoring of wetland habitats and their communities, III. Surveying, mapping and monitoring of habitat types in Hungary, VIII. Monitoring of saline habitats, IX. Monitoring of dry grasslands, X. Monitoring of montane meadows, and XI. Monitoring of species and habitats of community importance (Natura 2000).

2. Sample sites

Data collection is carried out at permanent sites. Sampling sites have been selected to represent the distribution of the species (Váczi, 2006). The sites are as follows:

ID	Name	NPD
	Grassy airports	
R1	Békéscsaba	KMNP
R2	Budakeszi-Farkashegy	DINP
R3	Budaörs	DINP
R4	Dunakeszi	DINP
E5	Dunaújváros	DINP
R6	Esztergom	DINP
R7	Gödöllő	DINP
R9	Hajdúszoboszló	HNP
R10	Hármashatárhegy	DINP
R11	Jakabszállás	KNP
R12	Kecskéd	DINP
R13	Kiskunfélegyháza	KNP

R14	Miskolc	BNP
R15	Öcsény	DDNP
R16	Pécs-Pogány	DDNP
R17	Pér	FHNP
R18	Siófok-Kiliti	BFNP
R19	Szeged	KNP
R20	Szentes	KMNP
R21	Szolnok-Szandaszőlős	KNP
R22	Szombathely	FHNP
R23	Szentkirályszabadja	BFNP
R24	Csákvár	DINP
R25	Nyíregyháza	HNP
R26	Sármellék	BFNP
R27	Debrecen	HNP
R28	Fertőszentmiklós	FHNP
R29	Balatonfüred - Tótvázsony	BFNP
R31	Kecskemét	KNP
R32	Székesfehérvár Börgönd	DINP
R33	Maklár	BNP

Other sites

E1	Körösladány, Kis-rét Vermes	KMNP
E2	Garancsi-tó környéke	DINP
E3	Újlengyel, Demeter-tanya legelő	DINP
E4	Dunakeszi Lóversenypálya	DINP
E5	Sárkeresztúr	DINP
E6	Dejtár	DINP
E7	Tóalmási legelő	DINP
E9	Hajdúszoboszló, Gargóc	HNP
E10	Bp. Vöröskővár	DINP
E11	Bugac Öttömösi legelő	KNP
E12	Németkér Hardi legelő	DDNP
E13	Bugac Pásztor múzeum	KNP
E14	Tiszakeszi	BNP
E15	Paksi ürge-mező	DDNP
E16	Vajszló, Feketevíz töltés	DDNP
E17	Kenyeri	ÖNP

E18	Balatonendréd	BFNP
E19	Szalmári halastavak	KNP
E20	Kállósemjén, Honcsokos	HNP
E21	Pilis Monori erdő	DINP
E22	Kaposújlak	DDNP
E23	Szentkirályszabadjától K-re	BFNP
E24	Csákberényi legelő, Csákberénytől DK-re	DINP
E25	Guszev teleptől D-re (Nyíregyháza lőtér)	HNP
E26	Látrány	BFNP
E27	Sárándtól nyugatra, Városréti legelő	HNP
E28	Ürgedomb	FHNP
E29	Öcsi legelő	BFNP
E31	Harkakötöny-Tázlár, Szabó-sík	KNP
E32	Sárréti Tk. Bagódomb	DINP
E33	Nagykálló, Harangod	HNP
E34	Lófej-völgy	ANP

3. Sampling frequency

One sample per year is appropriate for the ground squirrel because it has only one litter per year. Synchronous monitoring events are carried out on Earth Day every year. Only adult ground squirrels are present in the field during this period of the year.

4. Methods

Unified, quick ground squirrel density estimation based on hole counting

The aim of the scientists of the Department of Ethology, ELTE was to develop a ground squirrel density estimation method which is appropriate for even small population densities. It was important to develop a quick, standardized method, which could be used by volunteers for synchronous estimation in numerous localities. A crucial aspect of this method is to strictly follow the orders and definitions. (Also, see data sheet in the appendix.)

Definitions

European ground squirrel burrow entrance: Natural, round-shaped hole dug into the soil with no less than 4 cm (2 fingers fit in) diameter. The approximate direction of the burrow axis is at a right angle to the surface (at least 30°) and has no junction immediately after the entrance. Holes with dead end or that are covered with spider webs are excluded from the estimation.

Vole-burrow (to separate from ground squirrel holes): small burrow entrance (less than 4 cm diameter) with nearly horizontal burrow axis (less than 30° to the surface) and connected to many other similar holes by track-net.

Hole counting method

The total length of the counting path is 1000 m with a 1 m width on each side. Use five 200 m long (approximately 230 steps) parallel pathways with 50 m distance from each other around the center of the area. Please register the number of recognized European ground squirrel burrow entrances (see definition above) for each 200 m long pathway.

Additional information

The following additional information should be noted during data collection: **date** of estimation (date, time of the beginning and ending of estimation), **name** of data collector, **availability**, estimated **average height of vegetation** (by sight in 5 cm increments), **size of the area**, average **elevation**, **soil type** (if available), **number of ground squirrels by sight** in coarse categories, **water table level** in coarse categories, **raptors presence** (if available), **raptor size** in coarse categories, distances of nearest smaller and larger wood patches as 5 ha, distance of nearest **ground squirrel occurrence**, distance of nearest **settlement** and **remarks** about data collecting.

5. Variables used

Basic variables are the average and standard deviation of hole numbers within the five estimation routes for each site. Additional data, mainly locality (in EOVS or WGS84 coordinates), vegetation height and water table level are also important data for the analyses.

6. Derived variables

Ground squirrel density can be calculated from holes counted at estimation routes as follows:

$$d = h \cdot \frac{c \cdot l}{T},$$

where d is ground squirrel density, h is the correction coefficient of vegetation height, c is the ratio of the number of holes/individuals at the given period of the year, l is the counted number of holes and T is the size of the counting area (in our case, $T = 0.02$ ha per route).

7. Effort estimation

Number of permanent sites	63
Number of sites per year	63
Sampling units per site	5
person-day in a site	1
person-day per year – data collection	63
person-day per year – data recording	10

8. Changes, preliminaries

New, tested programme from 2000.

9. Analyses

Spearman rank correlation is used to analyze relation between ground squirrel density and background variables. ANOVA is used to compare ground squirrel density of different sites, years and land use categories (airport and other). Trend analysis is used to demonstrate the ground squirrel density changes over time. GIS analysis is used to demonstrate spatial relationships.

10. Summary

Site No.	Site No. / year	Sample/ site	Person- day/site	Person- day/year - field	Person- day/year - lab
63	63	5	1	63	10

Literature

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