SZENT ISTVÁN UNIVERSITY
FACULTY OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

ESTABLISHING THE SCIENTIFIC BACKGROUND OF RED-FOOTED FALCON (*FALCO VESPERTINUS*) CONSERVATION MANAGEMENT

Thesis of PhD dissertation

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Gödöllő
2012

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1. Background and aims

1.1. Background

Several, high conservation value avian species were added to the Annex I[1]. of the EU's Birds Directive as Hungary joined the European Union. One of these species is the Red-footed Falcon (*Falco vespertinus*), a strictly[2] protected small raptor, which experienced a dramatic 50% decline in the national breeding population (TÓTH & MARIK 1999). This phenomena was not unique for Hungary, thus the species was categorized as „near threatened"[3] in International Union for Conservation of Nature's[4] Red List (IUCN 2008).

An international project titled „Conservation of F. vespertinus in the Pannonian Region" was implemented in 2006-2009 with the financial aid of the EU's LIFE Nature fund and the Hungarian Ministry of Environment and Water. One of the overall objectives of the project was to synchronize and coordinate scientifically based conservation management of Red-footed Falcons. Together with the experts of Körös-Maros National Park Directorate and the staff on MME/BirdLife Hungary, we initiated a long-term research project within the scope of this project that may help answer crucial questions concerning the conservation management of the target species. The data analysed within this thesis derive from the implementation period of the project (2006-2008).

[1] Directive on the conservation of wild birds, Annex I. 79/409/EEC
[2] 13/2001. (V. 9.) KöM rendelet, 4. melléklet
[3] Near Threatened
[4] IUCN - International Union for Conservation of Nature

1.2. General aims

The quality of foraging areas around breeding sites is known to influence survival and fitness of adult birds (MARTIN 1987). The degradation of habitats is thought to have a considerable role in the decline of Red-footed Falcons throughout the world (BURFIELD 2008). In general, the largest demand for energy is in the second half of the breeding period (hatching to fledging), thus this is when foraging habitat quality may have the largest impact on an avian life cycle (COLLOPY 1984).

Therefore, to describe Red-footed Falcon habitat preference we analysed the habitat use of adult birds in the second half of the nestling period to meet the following research objectives.

- *What is the foraging area extent of Red-footed Falcons?*
- *What general habitat types do the falcons prefer for foraging?*
- *What parameters define foraging investment and efficiency?*

2. Material and Methods

2.1. The study area

All analyses were carried out in the Körös-Maros National Park Directorate's Kardoskúti Fehér-tó unit. The area has been protected since 1995, constitutes the Vásárhelyi- and Csanádi-puszták SPA, and is one of the most beautiful places in the Great Plains of Hungary. The area holds approx. 20% of the Hungarian Red-Footed Falcon population (PALATITZ et al. 2010b). For the site of the research we drew a 10x10km square with the oldest falcon colony (Ficsér, C2) as the centroid (*Figure 1.*). A total of 55-95 pairs were breeding in colonies and a total of 10-19 solitary pairs were breeding in the area during the study period of 2006-2008.

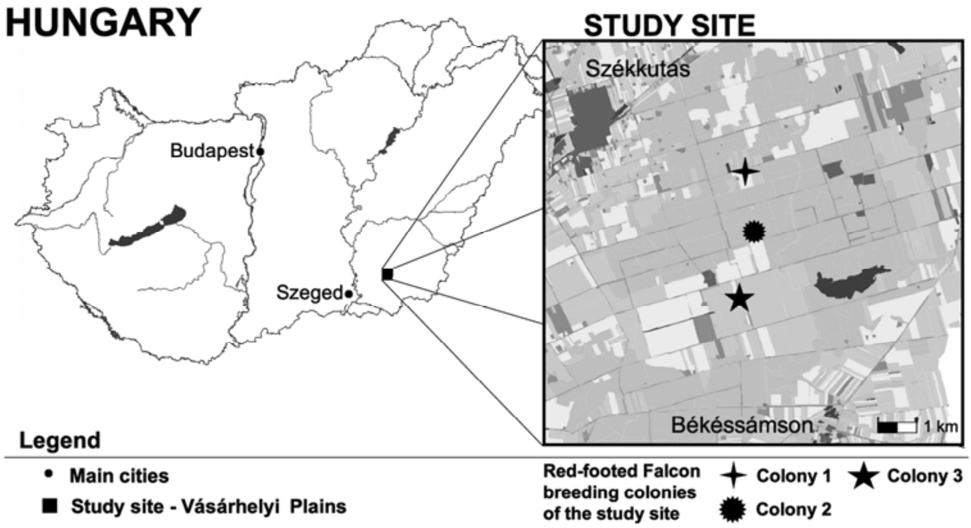

Figure 1. **General location of the study area in the country and the monitored Red-footed Falcon colonies within the study area.**

The first study year (2006) was characterized by cold and rainy periods in the breeding season coupled with low field vole (*Microtus arvalis*) densities. The following two years were highly similar, with dry early summer period, higher average daily temperatures and abundant field vole presence (FEHÉRVÁRI et al.

2011, PALATITZ et al. 2010a). Nestling diet composition within these years also reflected vertebrate prey availability (BÖDE 2008). Presumably, these factors had a major role in shaping clutch size, and fledging success rates in these years (FEHÉRVÁRI et al. 2011). Similar patterns were observed in breeding success rates throughout the whole population of the country (PALATITZ et al. 2010b).

2.2. Habitat mapping

To create precise habitat availability maps we initially acquired two Ikonos-2 satellite images in 2006, and a hyperspectral aerial image in 2007, and 2008. The imagery were used to define habitat types within the study site by a team of remote sensing specialists (Dóra Neidert, and Dr. Dániel Kristóf), therefore the methodology used is not part of the current thesis. The habitat types defined are in accordance with that used in the agri-environmental schemes, thus are as follows; „woods", „grassland and fallow", „cereals", „intertilled crops", „alfalfa", „reed-beds", „water surfaces" and „artificial surfaces". The identification of each habitat type was done based on the spectral reflectance values of the satellite and areal images. Grasslands and fallow habitat types were grouped together due to methodological restraints in differentiating them based on spectral data (KRISTÓF et al. 2007). We also defined **habitat patches** as the smallest unit of homogenous habitat types surrounded with visible linear structures like roads, channels or field edges. All patches received a unique ID number and were later used in field and during the analyses.

2.3. Radio-telemetry

We trapped a total of 40 Red-footed Falcon individuals in 2006-2008 (10,13,17, respectively) from three colonies (C1,C2, C3) and from solitary breeding sites (S1, S2). All birds were fitted with 3.5 gram conventional VHF radio-transmitters (2.5% and 2% of mean body mass of males and females, respectively). The tags were placed on one of the central retrixes (KENWARD

2001) and seemingly did not alter individual behaviour, similarly to Lesser Kestrels (HIRALDO et al. 1994). We used 4 receiver units with Yagi antennas, and two 2x4 vehicles to aid individual relocations.

In the initial year of the study we tested triangulation methods to acquire relocations, however the high speed with which the falcons move and the relative measurement error of the technique resulted in unreliable data (KENWARD 2001). Therefore, we used an alternative approach where the radio signal is used as a tool to guide visual relocation (TELLA et al. 1998). We also assessed the minimum observation time necessary to obtain accurate estimate of home range size through a simulation procedure on the data of the first year. We used a standard 4 hour time window (**session**) to conduct all observations of the tagged birds. Two types of sections were pre-defined; a) morning (4 a.m.-6 a.m.) and evening (5 p.m. -9 p.m.). At least two observation teams equipped with spotting scopes and receivers were assigned to a single individuals section.

The first team stayed in the vicinity (100-200m) of a given birds nest and recorded all events within the section on a 1 minute scale. Once the bird initiated a **foraging bout** (i.e. all events happening away from the nest site) the second team immediately responded and used a car to track the individual until visual contact was made. Apart from the location of foraging, the time the bird entered the foraging patch (**hunting time**), the foraging type (hover hunt, perch hunt) the number of hoverings, the number of strikes, the prey type (vertebrate, invertebrate) were all recorded by the following team. We defined the term **hunting event**, as all foraging activities within a given foraging patch. We considered individual **foraging investment** as the total time spent within a foraging patch. Most of the observations were made using simultaneous teams, therefore we could maximize the amount of data collected in a given section. All birds were tracked for at least 6 (3 morning and 3 evening), maximum 10 sessions. Randomly distributed 6 sessions in the second half of the breeding stage seemed to sufficient for estimating foraging habitat use extent, as previous simulations have showed.

2.4. Data analyses

We used QGIS 1.7.3 'Wroclaw' (QUANTUM GIS DEVELOPMENT TEAM 2011) and R 2.13.1 (CALENGE 2006; R DEVELOPPMENT CORE TEAM 2011) for all conducted analyses.

Foraging habitat extent was measured with 100% Minimum Convex Polygons (MCP). Global Manly Selectivity Measures were used in a design III. type analyses to explore population level **habitat preference** (MANLY et al. 2002). To reveal partition the variance in habitat preference we used the Eigenanalysis of selection ratios (CALENGE et al. 2005).

We modelled the duration of **foraging bouts** (frequency and duration) using Linear Mixed Effects (LME) and Generalized Mixed Effect Models (GLMM) where the identity of the birds were used as random factors in all cases (PINHEIRO & BATES 2000; FARAWAY 2006).

We also used Decision Trees (CART) to describe **foraging investment** and **efficiency.** The latter variable was calculated as the function of obtained biomass/minute.

3. Results

3.1. Foraging area extent

A total of 18 individuals, 143 sessions comprising 572 hours of observations were used in the analyses. The **median MCP** size was **838 ha** (**range: 38–3467**). The number of hunting events correlated with the number of observed sessions (Pearson correlation coef: 0.63, p= 0,0046), but did not correlate with MCP size (Pearson correlation coef:: -0.15, p= 0,565).

Even though the number of females was low (N=3), we were able to show that **foraging area extent is sex dependent** (GLM: β=-1,56; p=0,03;) as **females had smaller foraging home ranges** (N= 3, median= 186; Min.: 38, Max.: 322) **compared to males** (N= 15, median= 1213; Min.: 310, Max.: 3467).

Males, breeding in **the largest and most dense colony** (N= 7, median= 1589; Min.: 900, Max.: 3467) had significantly (GLM: β=1,04; p<0,01) **larger foraging areas compared to males from other colonies and solitary pairs** (N=4, median=452,5 Min.: 310, Max.: 838 for C1, N=2, median=713 Min.: 190, Max.: 1236 for Solitary males).

3.2. Habitat preference

All observed Red-footed Falcons significantly avoided intertilled crops, water surfaces, reed-beds, forests, and artificial surfaces. However, we found large variance in preference towards grasslands, cereals and alfalfa (*Figure 2.*)**.** The Eigenanalysis of selection ratios showed that the large individual **variance is governed by cereal preference**, and to a lesser extent is defined by actively seeking alfalfa.

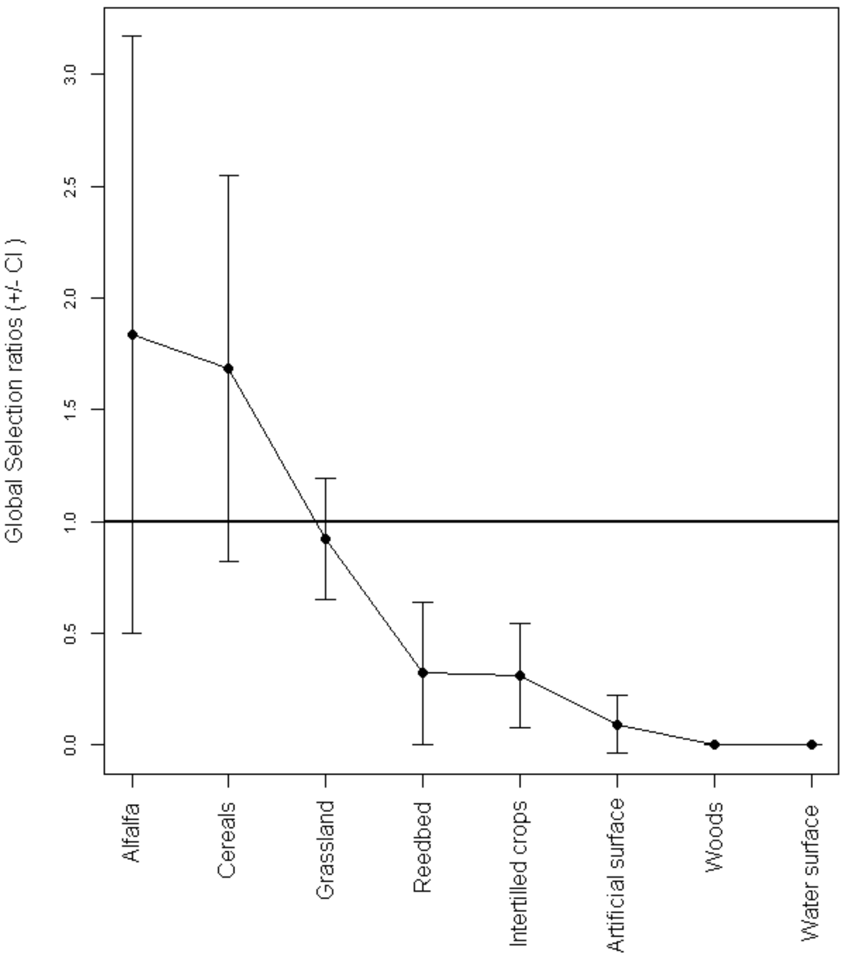

Figure 2. **Global selection rates of habitat types by radio tracked Red-footed Falcons**
(*CI*= confidence interval)

3.3. Foraging bouts

Male Red-footed Falcons spent approx. ¾ of their measured time foraging (N= 15, median= 75,1%, Min.: 32%, Max.: 91%), while on the other hand, females only spent a q ¼ of their time hunting (N= 4, median= 27,5%, Min.: 1%, Max.: 69%). Despite the low sample size in case of females, we were able to show **significant sex specific difference in time allocation** GLMM: β= -

1,49, p= 0,0017) as **females spend less time with foraging.** However, the **frequency** of foraging bouts **did not differ amongst the sexes** (LME: β= -0,14; p= 0,44). **The frequency of foraging bouts in case of males of the largest colony** (C1) was **significantly lower** compared to birds from other colonies or from solitary breeding sites (LME: β= -0,335; p= 0,0235). **Male MCP** size showed a **significant positive effect on the temporal length** of foraging bouts (LME: β=0,.0002; p=0,0268).

3.4. Foraging investment and efficiency

Altogether 88,2% (N=602) of all hunting events took place on habitat types with low vegetation cover (mowed or grazed grasslands, fallow, harvested cereal fields, alfalfa) while only **11,8% was observed in habitat types with tall cover(grasslands, alfalfa, intertilled crops etc.)**. The difference is highly significant (χ^2= 85,5385; df= 1; p< 0,001). While non-harvested cereal fields where absolutely avoided (no observed hunting event), 25,7% of hunting events in grasslands was carried out in non-managed (i.e. not mowed or grazed) fields. The mean length of perch hunting (N= 200, median= 6,5 Min.:1; Max.: 69 min.) was significantly longer compared to active hunting (N= 484, median= 3 min.; Min.:1; Max.: 23 min.).

When considering only active, hover hunting, we found a significant (p= 0,04) **difference between males breeding colonially** (median= 2 min. N= 447, Min.:1; Max.: 23 min.) **and solitarily** (median=3 min N = 37, Min.:1; Max.: 10 min.). Colonial males allocated equal time for perch and active hunting while solitary males spent significantly more time perch hunting (LME: β= -1,026; p= 0,0476).

We also found significant (p= 0,008) **difference in foraging efficiency between habitat types** as the biomass/minute parameter was 1 (Min.: 0,125; Max.: 22, N=88) for cereals and 0,5 in case of alfalfa and grasslands (Min.: 0,08; Max.: 20; N= 102). The distance of the foraging patches from a given birds nest also proved to have an effect on efficiency as the biomass/min parameter was 0,75 (N=58, Min.: 0,125; Max.: 22) for patches in the vicinity (Max.: 1 km) compared to patches in medium (Min.: 1 km) distances (biomass/min=4,5, N=30, Min.: 0,14; Max.: 20). The reason of this remarkable difference is that in patches further from the nest, falcons caught vertebrate prey in 66% of the cases while only 17% of the prey caught in the vicinity of the colonies resulted in vertebrate prey (*Figure 3*).

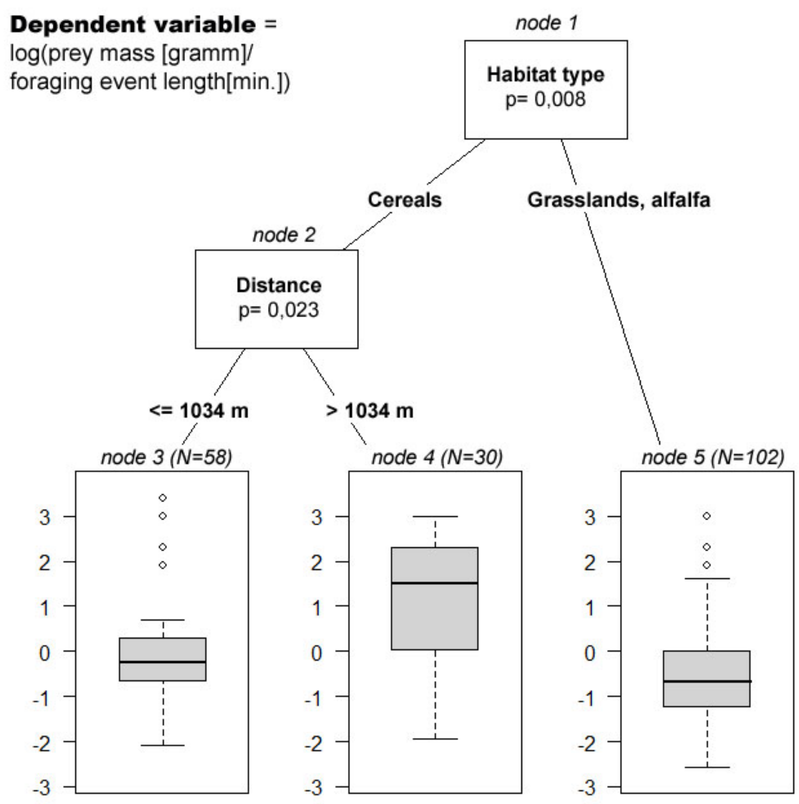

Figure 3. **Decision tree on the foraging efficiency (measured as biomass/min)**

When **only** considering hunting events resulting in **invertebrate prey**, the **foraging efficiency** of the tracked birds was **highe**r for **cereals and alfalfa** compared to grasslands. Moreover *Figure 4* shows a decision tree fitted on the number of successful hunting events in space and time.

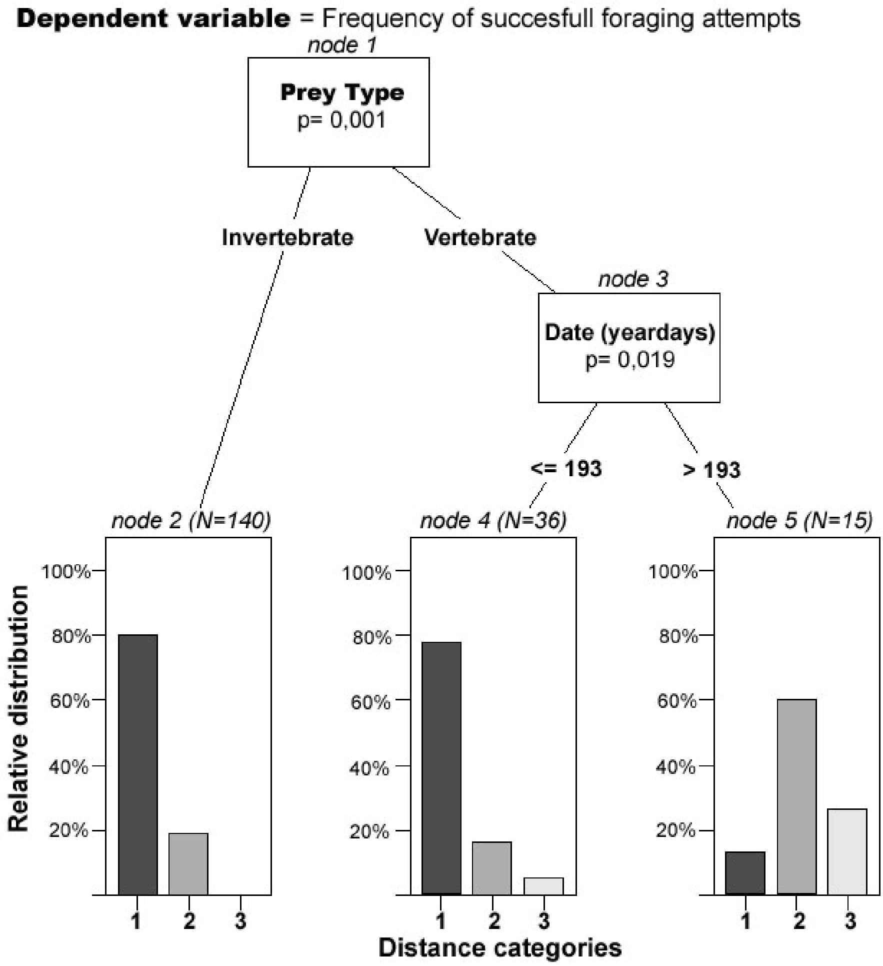

Figure 4. **Successful hover hunting frequency of tracked birds as a function of prey type, date and distance from the nest site.**

(*Distance categories*: 1= in the vicinity of the nest <1 km; 2= medium distance 1–2,5 km; 3= large over 2,5 km-foraging patches)

While most of the invertebrate prey is caught in the vicinity of the colonies, vertebrate prey are more likely further from the nest sites. We also found a temporal pattern in prey type, as vertebrate prey from further sites are more likely preyed in the later stages of breeding.

3.5. New scientific results

1. I showed that Red-footed Falcons in the studied population avoid foraging in intertilled crops, reed-beds, and forests and above open water surfaces, while there is a highly variable preference towards cereals, grasslands, and alfalfa.
2. I proved the importance of low vegetation cover in the foraging habitat choice of Red-footed Falcons, and presented evidence on the importance of arable fields in the foraging efficiency of hunting individuals.
3. I determined the foraging area extent of Red-footed Falcons during the nesting season, and provided evidence that the foraging of prey types with different profitability have a marked spatio-temporal pattern.
4. I showed that male Red-footed Falcons breeding in the larger colony, have larger foraging home ranges, have less frequent foraging bouts, and the mean foraging bout is longer, compared to males in smaller colonies or solitary pairs.
5. I showed that the foraging investment of solitary male Red-footed Falcons is lower compared to colonial males, and predominantly use alternative foraging strategies.
6. I showed that despite the low sample size, there is a significant difference in foraging area extent and foraging bout length between male and female Red-footed Falcons, however there is no marked difference in habitat selection or efficiency.

4. Discussion and conclusions

Our data show that Red-footed Falcons rarely forage further than 4 km from their nest site. The order of magnitude in foraging area extent is similar to that of colonial Lesser Kestrels (*F. naumanni*, TELLA et al. 1998), however it is considerably larger compared to territorial Kestrels (*F. tinnunculus*, PEERY 2000). Foraging behaviour seems to be divided into three concentric zone categories measured from the nest as follows: near (<1km), medium (1–2,5 km), and far (>2,5 km). These results can be used in a wide array of planned habitat management practices however, their application has to consider geographical constraints.

The foraging habitat preference analyses of Red-footed Falcons show that birds avoid high vegetation habitat types and artificial surfaces, which is accordance with expectations for an emblematic steppe species. Surprisingly, the selection ratio of grasslands is not significant, nor is the hunting efficiency remarkable in this typical Red-footed Falcon foraging habitat. The surprisingly large variance in habitat preference may be attributed to highly individual strategies in using arable habitats, especially cereal fields and alfalfa. Foraging was more efficient in the latter two habitat types when hunting for invertebrates, compared to grasslands. In case of cereals, all fields used for foraging were harvested, thus prey detectability was high, meanwhile alfalfa fields may have larger prey densities compared to grasslands. Moreover, vertebrate foraging was more successful in cereal fields, causing the large gap in hunting success compared to other habitat types.

The falcons predominantly foraged in the vicinity of their nest sites in the beginning of the study, and the foraging area extent gradually increased with time. Presumably, prey densities around the nest sites, where predatory pressure is high early in the period, decreased, hence birds had to forage further away from the nest sites for profitable prey. Ephemeral, spatial heterogeneous and variable quality food patches may have a significant role in the evolution of avian coloniality (JACOB & BROWN 2000; DANCHIN & WAGNER 1997).

However, our research focus was to describe and understand foraging behaviour from a conservation biology perspective. Nonetheless, our results demonstrating differences in foraging area extent between colonies, the different foraging strategies of colonial versus solitary pairs seem to support assumptions of well known published theories. Our future plans consist of conducting further studies in the topic.

Generally, parental care roles are markedly divided in case of raptors, therefore it is hardly surprising that despite the low sample size, we were able to show sex-specific differences in foraging pattern. The smaller foraging home ranges measured for females, coupled with their shorter foraging bouts and overall less time allocated for foraging indicate that their parental care role may restrict their hunting activity to the surrounding of the nest.

Our results have to be handled with caution as the data was collected at a single site, and from two high vole years. Despite these constraints, the presented results show in detail how Red-footed Falcons may depend on non-natural habitat types at specific periods of their reproduction stage in a Central-European habitat. The knowledge presented allows establishing conservation management practices for Red-footed Falcons, without conflicting the interests of other high conservation value, yet more natural habitat specific species. The published data also allows us to build further analysis in the topic.

5. Publications related to the topic of the dissertation

5.1. Publications in peer-reviewed international journals with impact factor:

1. PALATITZ P., FEHÉRVÁRI P., SOLT S., KOTYMÁN L., NEIDERT D. & HARNOS A. (2011): Exploratory analyses of foraging habitat selection of the Red-footed Falcon (Falco vespertinus). *Acta Zoologica Academiae Scientiarum Hungaricae*, **57** (3) 255–268. p.
2. FEHÉRVÁRI P., SOLT SZ, PALATITZ P., BARNA K., ÁGOSTON A., NAGY A., NAGY K., HARNOS A. (2012) Allocating active conservation measures using species distribution models: a case study of Red-footed Falcon breeding site management in the Carpathian Basin. *Animal Conservation*, under review, 2nd phase
3. FEHÉRVÁRI P., SOLTÉSZ Z., BAKONYI T., BARNA M., SZENTPÁLI-GAVALLÉR K., SOLT SZ., PALATITZ P., LÁZÁR B., KOTYMÁN L., DÁN Á., PAPP L., HARNOS A., ERDÉLYI K. (2012) Evidence for vertical transmission of maternal antibodies of WNV in Red-footed Falcons (Falco vespertinus). *Vector-Borne and Zoonotic Disesases*, under review, 1st phase
4. FEHÉRVÁRI P., PALATITZ P., SOLT SZ., LÁZÁR B., NAGY A., PROMMER M., NAGY K., HARNOS A. (2012) PRE-MIGRATION ROOST SITE USE AND TIMING OF POST-NUPTIAL MIGRATION OF RED-FOOTED FALCONS (FALCO VESPERTINUS) REVEALED BY SATELLITE TRACKING, *Journal of Ornithology*, under review, 1st phase
5. PALATITZ P., FEHÉRVÁRI P., SOLT SZ., KOTYMÁN L, HARNOS A. (2012) Foraging time and energy allocation of breeding Red-footed Falcons (Falco vespertinus). In Prep.
6. PALATITZ P., FEHÉRVÁRI P., SOLT SZ., KOTYMÁN L., HARNOS A. (2012) Foraging efficiency of a typical steppe raptor species in a seminatural lanscape of Central Europe. In Prep.

5.2. Publications in peer-reviewed journals:

1. FEHÉRVÁRI P., HARNOS A., NEIDERT D., SOLT SZ. AND PALATITZ P. (2008): Modelling habitat selection of the Red-footed falcon (Falco vespertinus): a possible explanation of recent changes in breeding range within Hungary. *Applied Ecology and Environmental Research* **7** (1) 59-69. p.

5.3. Hungarian publications:

1. PALATITZ P., SOLT S. ÉS LEHOCZKI R. (2004): A Különleges Madárvédelmi Területeken fészkelő kék vércse állomány becslésének módszere. *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évkönyve, 28. p.
2. PALATITZ, P., SOLT, S. ÉS FEHÉRVÁRI, P. (2007): Kékvércse-védelmi Munkacsoport beszámolója-2005 . *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évkönyve, 12-17. p.

3. SOLT, S., PIGNICZKI CS., UTASSY T., FEHÉRVÁRI, P., ÉS PALATITZ, P. (2007) Kiskunsági kék vércse kitekintő. *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évk. 67-71. p.

4. PALATITZ, P., SOLT, S., FEHÉRVÁRI, P., NEIDERT D. ÉS BÁNFI P. (2008): Kékvércse-védelmi Munkacsoport 2006. évi beszámolója. *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évkönyve, 16-24. p.

5. FEHÉRVÁRI, P., NEIDERT D. SOLT, S., KOTYMÁN L., SZÖVÉNYI G., SOLTÉSZ Z. ÉS PALATITZ, P. (2008): Kék vércse élőhelypreferencia vizsgálat – egy tesztév eredményei. *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évkönyve, 51-59. p.

6. PALATITZ, P., SOLT, S., FEHÉRVÁRI, P., EZER, Á. ÉS BÁNFI P. (2009): Kékvércse-védelmi Munkacsoport 2007. évi beszámolója. *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évkönyve 13-17. p.

7. PALATITZ, P., SOLT, S., FEHÉRVÁRI, P., ÉS EZER, Á. (2010): Kékvércse-védelmi Munkacsoport 2008. évi beszámolója. *HELIACA*, MME Ragadozómadár-védelmi Szakosztály Évkönyve 13-17. p.

8. PALATITZ, P., SOLT, S., FEHÉRVÁRI, P., EZER Á. ÉS BÁNFI P. (2010) Az MME Kékvércse-védelmi Munkacsoport beszámolója – a LIFE projekt (2006-2009) főbb eredményei. HELIACA, MME Ragadozómadár-védelmi Szakosztály Évkönyve, 14-23. p.

5.4. Book chapter (English):

1. *PALATITZ, P., FEHÉRVÁRI, P., SOLT, S. AND BAROV, B. (2009)* European Species Action Plan for the Red-footed falcon Falco vespertinus. 49 p. *Published online by the European Commission DG Environment:* *ec.europa.eu/environment/nature/conservation/wildbirds/action_plans/per_species_en.htm*

Book chapter (Hungarian)::

1. HARASZTHY, L. ÉS PALATITZ, P. (2009): Kék vércse. IN: CSÖRGŐ, T., KARCZA, ZS., HALMOS, G., MAGYAR, G., GYURÁCZ, J., SZÉP, T., BANKOVICS, A., SCHMIDT, A. ÉS SCHMIDT, E. (SZERK.) Magyar madárvonulási atlasz. Budapest, Kossuth Kiadó: 242-243. pp.

2. BAGYURA J. ÉS PALATITZ P. (2004) Kék vércse *(Falco vespertinus) KvVM Természetvédelmi Hivatal Fajmegőrzési Tervek pp. 38.* Kiadó(online): KvVM *www.termeszetvedelem.hu/_user/downloads/fajmegorzesi%20tervek/K%E9k%20v%E9rcse.pdf*

5.5. Other publications:

1. PALATITZ, P. ÉS MÁTÉ B. (2009) Tollas váltótársak. *National Geographic Magazine Magyarország* **7** (4) 116-127.

2. BÉLTEKINÉ, G. A., SOLT, SZ. ÉS PALATITZ, P. (2009) Közös fészek. *Vadon – a Göncöl Alapítvány és a Fővárosi Állat- és Növénykert folyóirata* **16** (2) 16-19.

5.6. Oral presentations in international conferences:

1. PALATITZ, P., SOLT, S., NAGY, K., BÁNFI, P. AND FEHÉRVÁRI, P., (2007): Red-footed Falcon Population Estimates between 1950-2006 in Hungary: The Interpretation of Results. Bird Numbers 2007: 17th International Conference of the European Bied Census Council, Chiavenna, Italy. April 17-22, 2007.

2. ERDÉLYI, K., BAKONYI, T., DÁN, Á., FEHÉRVÁRI, P., GYURANECZ, M., JUHÁSZ, T., KOTYMÁN, L., PALATITZ, P. AND SOLT, SZ. (2008) DISEASE AND MORTALITY IN RED-FOOTED FALCON (FALCO VESPERTINUS) NESTLINGS - ORDEALS FACING A LONG DISTANCE MIGRANT SPECIES AT IT'S BREEDING HABITAT. PROCEEDINGS OF THE 8TH MEETING OF THE EUROPEAN WILDLIFE DISEASE ASSOCIATION, 2-5. OCTOBER 2008, ROVINJ, CROATIA.

3. FEHÉRVÁRI, P., HARNOS, A., LANG, ZS., SOLT, SZ., SZÖVÉNYI, G. AND PALATITZ, P. (2009) The effects of grassland mowing on the density of prey species and hunting efficiency of Red-footed Falcons. 7th conference of the European Ornithologists' Union, Zürich (Switzerland) August 21-26. 2009

4. PALATITZ, P., FEHÉRVÁRI, P. SOLT, SZ. AND BAROV, B. (2009) Red-footed Falcon in Europe- review of avalaible informations for the Species Action Plan. International Red-footed Falcon Conservation Workshop, 9-11 September 2009, Szarvas , Hungary

5. PALATITZ, P., FEHÉRVÁRI, P. SOLT, SZ. AND EZER, Á. (2009) Red-footed Falcon in Hungary. International Red-footed Falcon Conservation Workshop, 9-11 September 2009, Szarvas , Hungary

6. FEHÉRVÁRI, P. SOLT, SZ. KOTYMÁN, L. AND PALATITZ, P., (2009) Red-footed Falcon – Knowledge summary. International Red-footed Falcon Conservation Workshop, 9-11 September 2009, Szarvas , Hungary

5.7. Oral presentations in Hungarian conferences:

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