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HABITAT SELECTION BY THE SHORT-EARED OWL (*ASIO FLAMMEUS*) IN AGRICULTURAL LANDSCAPE OF MOSCOW REGION

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Abstract. The Short-eared Owl inhabits open landscapes, including agricultural lands. Relationship between habitat composition and probability of territory occupation by owls was assessed by dividing the study area into a grid of cells. Principal habitat types were assigned ranks based on their fraction within each cell. Habitat selection and spatial distribution of Short-eared Owls was studied during 1996–2007. The portion of regularly occupied cells was higher in years with low density of owls. Never inhabited by owls cells and inhabited at least once differed significantly by higher level of anthropogenic load at the former, higher portion of arable land, lower portion of meadow, and higher development of wooded areas. The Short-eared Owl occupied territories in a non-random manner from year to year, with some territories preferred and others avoided. Selection of breeding territories by owls depends on prevailing habitat: the probability of territory occupation correlates positively with meadow area and negatively with the area of arable land. Nesting density of the Short-eared Owl decreased with increase of shrub coverage in the area. Owls preferred habitat patches with higher number of species and higher small mammal's abundance.

Key words: habitat composition, spatial distribution, territory occupation, prey abundance, land abandonment.

Выбор местообитаний болотной совой (*Asio flammeus*) в агроландшафте Московской области. - С.В. Волков, Т.В. Свиридова. - Беркут. 22 (1). 2013. - Болотная сова населяет открытые местообитания, в том числе сельскохозяйственные: многолетние луга, пастбища, охотно селится на заброшенных полях. Изучение биотопического распределения проводилось в 1996–2007 гг. на севере Московской области в заказнике «Журавлиная родина» (56º45′ N, 37º45′ E), на стационаре площадью 48 км^2. Часть территории постоянно обрабатывалась, начиная по крайней мере с середины XVI ст., однако более трети площади вплоть до середины XX ст. была заболоченной и в сельскохозяйственный оборот включена только после мелиорации в 1970–1980 гг. В настоящее время в структуре местообитаний стационара преобладают сенокосные луга (60%), пастбища (6%), лесные и закустаренные участки (16%), остальная территория занята обрабатываемыми землями (14%), поселками и дорогами (4%). Экономический кризис привел к забрасыванию значительных территорий, который начали зарастать кустарником и мелколесьем. Регулярность заселения участков в пределах площадки достоверно связана с доминированием конкретных местообитаний. Преобладание луговых биотопов и заброшенных земель положительно влияет на вероятность заселения участка болотными совами. Наличие пахотных земель, лесных участков снижает вероятность заселения участка совами и плотность гнездования. Участки с высоким уровнем антропогенной активности мало пригодны для вида, имеющего продолжительный инкубационный и выводковый период. Забрасывание ранее обрабатываемых земель привело к росту доступных для гнездования болотных сов участков и, соответственно, численности.

Ключевые слова: структура местообитаний, пространственное распределение, занятие территорий, обилие добычи, заброшенные земли.

INTRODUCTION

Habitat selection can influence composition and structure of avian community, as well as adult survival and reproductive performance (Martin, 1988, 1998; Fuller et al., 1995; Penteriani et al., 2002; Sergio, Newton, 2003; Rodriguez et al., 2006; Ortego, 2007). Habitat selection also deals with the consequences of these decisions for the distribution and density of individuals (Ward, Gutierrez, 1998; Penteriani et al., 2002; Thomson, 2006; Arlt, 2007). Habitats differ in availability of food resources, nest site protection, microclimate and predator faunas (Söderström et al., 1998; Koks et al., 2007). Many researchers have demonstrated that site selection was active and definitely adaptive since individuals inhabiting preferred habitats had higher breeding success.

Large areas of natural habitats have been lost in Europe, where many species of birds have become increasingly dependent on farmland habitats (Tucker, Evans, 1997; Newton, 2004). In recent decades many bird populations, including birds of prey and owls, have declined on agricultural lands in Europe and worldwide (Norris, Pain, 2002; Birds in Europe, 2004). This issue has become particularly challenging since the end of the previous century due to technological development of the farming industry, increasing land use intensity and land productivity (Pain, Pienkowski, 1997; Donald et al., 2001). Thus, the assessment of the influence of different factors on the distribution of endangered species in agricultural landscapes has both theoretical and conservational significance. Habitat selection by land-nesting birds in heavily transformed agricultural landscapes is of special interest, because these habitats prevail in Europe. Owls and birds of prey are especially important as indicator species for landscape and habitat management because of their position on top of food chains and related fundamental role in ecological processes. Thus, raptorial birds can serve as bio-indicators of environmental stability.

The Short-eared Owl (*Asio flammeus*) inhabits open landscapes, including agricultural lands: meadow, low-intensity pastures, wetlands, and particularly abandoned fields (Clark, 1975; Mikkola, 1983; Volkov et al., 2005). Areas with high intensity of land use are avoided due to prolonged periods of incubation and brood-raring in this species. Numbers of the Short-eared Owl have decreased in many European Union countries with high intensity of agriculture. The same tendency was also recorded in European Russia since the end of the last century (Birds in Europe, 2004). Currently numbers of the Short-eared Owl have increased in many regions of European Russia due to the wide-spread abandonment of agricultural lands (Sviridova et al., 2006; Vengerov, 2007).

STUDY AREA AND METHODS

Our study was carried out during 1996–2007 in the north of the Moscow region (48 km^2, 56º 45′ N, 37º 45′ E). Habitat selection and spatial distribution of Short-eared Owls was studied as a part of the broader research project «Birds in agricultural landscape» aiming on development of the management plan on sustainable existence of birds and the local community.

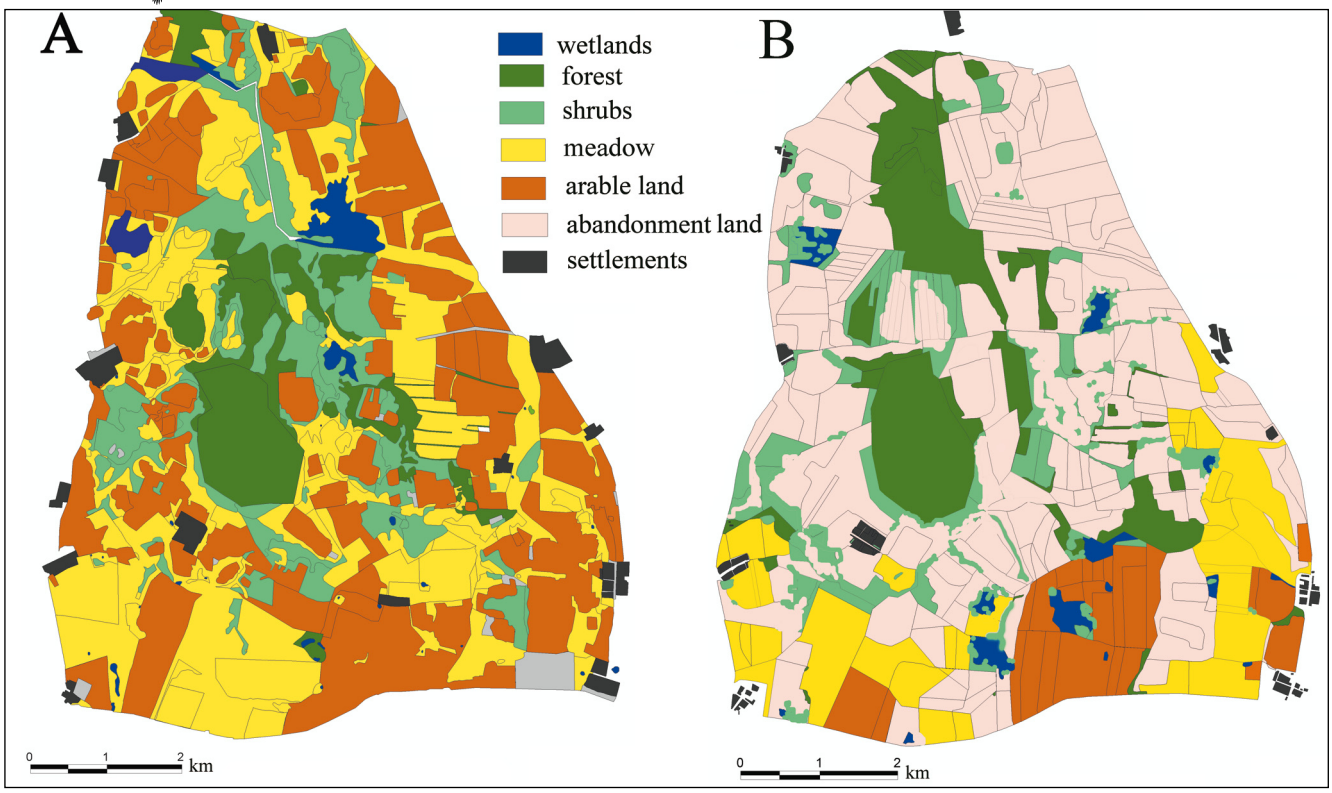

Fig. 1. Habitat changes within study area from 1960s (**A**) to 2005–2007 (**B**).
Рис. 1. Изменение структуры местообитаний в районе исследований с 1960 (**A**) до 2005–2007 (**B**) гг.

The smaller portion of the study area has been regularly cultivated at least since the middle of the 18th century; however, over one-third of the area was occupied by bogs until the middle of the 20th century, and was involved in the agricultural turnover only after melioration measures in the 1970s–1980s. At present, the study area includes meadow (60%), arable land (14%), pasture (6%), and forest areas (16%). Economic crisis in the agriculture of Russia in the 1990s resulted in the abandonment of wide areas of farmland, the reduction of grazing pressure and wheat production. The portion of arable land, pasture and meadow gradually decreased in 1996–2007 in the study area (Fig. 1), and considerable portion of the farmland became overgrown with shrubs. The overall portion of abandoned land in the study area increased by a factor of 2.3 from 1996 to 2007.

The abandonment of previously cultivated lands resulted in expansion of habitats suitable for nesting and, hence, an increase in numbers and density of some ground-nesting birds (Sviridova et al., 2006), including the Short-eared Owl. However, the absence of grazing and mowing during 7–10 years has resulted in decrease of grassland suitability as nesting habitats for many species of meadow birds. Aging of meadows is associated with loss of habitat diversity and degree of fragmentation.

Data on types and duration of farm operations within the study area were mapped at a 1:2000 scale. Annual distribution of breeding territories of Short-eared Owls was reflected on detailed maps (Bibby et al., 1993). Territory boundaries were determined by mapping aggressive interactions of neighbouring pairs of owls, as well as of owls with other raptorial birds or corvids, and by locating owl roosting sites and nests.

Relationship between habitat composition and probability of territory occupation by owls was assessed by dividing the study area into a grid of cells (n = 217) 500 × 500 m large (0.25 km^2). Principal habitat types (arable land, meadow, pasture, wetlands, abandoned areas (unmown meadows, pastures and arable lands unused for many years), wooded areas (shrubs and forest) were assigned ranks based on their fraction within each cell. Ranking was conducted on a scale of 5 : 1 = 0–10% of cell areas, 2 = 11–25%, 3 = 26–50%, 4 = 51–75%, 5 > 75%. Anthropogenic load was characterized by an index derived as a combination of 4 main threats: distances to roads, settlement, arable land or early mowing meadow. The data were analyzed using GIS MapInfo 8.5. Values of variables were compared between samples of cells never inhabited by owls, inhabited at least once and at least 3 times.

Small mammals are a principal prey of owls, and accordingly abundance of them can affect distribution of owl nesting territories and the choice of feeding habitats. Small mammal's surveys were conducted in 2003–2007 with view of assessing their habitat distribution, dynamics of numbers and influence on distribution and numbers of birds. Trapping of small mammals (vole and shrews) was carried out at the start and after termination of bird breeding season. The index of prey abundance was obtained from the results of trapping on lines of 50 traps with bait at a distance of 5 m from each other. The trapping of small mammals was conducted simultaneously at territories inhabitated by Short-eared and Long-eared (*Asio otus*) Owls and unoccupied areas.

Mean values of landscape attributes were compared between occupied and unoccupied cells using two-sample t-test, linear regression and Mann-Whitney U-test (for data

with non-normal distributions). Abundance of small mammals at territories of Short-eared Owls and surrounded areas was compared using χ^2-test.

RESULTS

Only 135 of 217 cells of the study area (62.2%) were occupied by Short-eared Owls at least once in 1996–2007. Of these 135 cells 60 (44.4%) were occupied during a single year and 28 (20.7%) during 3 or more years.

The portion of regularly occupied cells was higher in years with low density of owls ($r = -0.78$, $n = 12$, $p = 0.008$) and lower in years with high density (Fig. 2B). The portion of rarely occupied cells increased in years with higher bird densities ($r = 0.78$, $n = 12$, $p = 0.008$), and accordingly the probability of cell occupancy declined with increasing density ($r = 0.82$, $n = 12$, $p = 0.001$, Fig. 2A).

Habitat composition of cells and intensity of their utilization

Never inhabited by owls cells and inhabited at least once differed significantly by higher level of anthropogenic load at the former (Mann-Whitney U-test: $z = 4.13$, $p < 0.0001$), higher portion of arable land (Mann-Whitney U-test: $z = 5.05$, $p < 0.0001$), lower portion of meadow (Mann-Whitney U-test: $z = -3.72$, $p = 0.0009$) and higher development of forest vegetation (Mann-Whitney U-test: $z = 3.0$, $p < 0.0001$). The proportion of wetlands and pasture did not differ significantly between occupied and unoccupied cells ($p = 0.14$ and 0.61, respectively).

Forested area was minimal within cells occupied during three and more years (REGOC) compared with both unoccupied (UNOC) and irregularly occupied (IROC) cells. The difference is strongly significant between unoccupied cells and cells with different degree of occupancy (IROC vs UNOC: $r = 0.29$, $p = 0.0002$; REGOC vs UNOC: $r = 0.34$, $p = 0.001$), and marginally significant for REGOC and IROC ($r = 0.16$, $p = 0.059$), that corresponds well to the general trend.

Selection of breeding territories by owls depends on prevailing habitat: the probability of territory occupation correlates positively with meadow area and negatively with the area of arable land (Table 1). Area covered by shrubs and/or forest is also a significant factor, although its effect is not linear, because Short-eared Owls avoid both patches with well developed forest and open areas without shrubs. The level of anthropogenic load affects negatively the probability of cell occupation.

Changes in composition of farmlands and habitat selection by owls

Changes in composition of agricultural lands due to their abandonment resulted in changes in patterns and intensity of utilization of different habitats by Short-eared Owls and other meadow birds. The area of mown meadow decreased by 1/3, however, the number of pairs selecting this habitat for breeding increased, and, accordingly, breeding densities increased by a factor of 2.7. Increasing areas of unmown meadow initially resulted in increase in the number of pairs of Short-eared Owls selecting this habitat. However, after 5–8 years of the abandonment the number of pairs occupying these areas decreased, and the breeding density of owls on unmown meadow has recently decreased by a factor of 1.6 compared with the mid 1990s. In contrast to the tendency observed on unmown meadow, breeding density of the Short-eared Owl on abandoned pasture was increasing more rapidly than the area of respective habitat (Fig. 3)

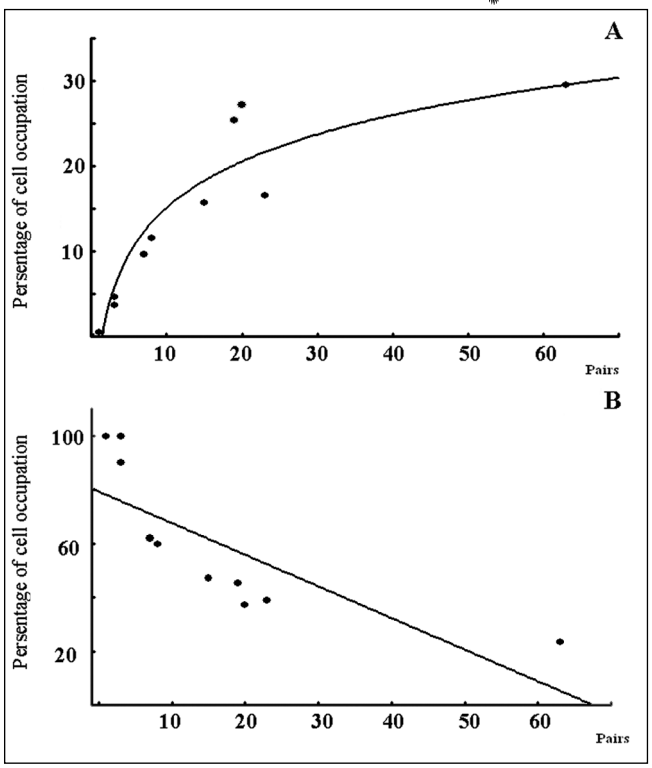

Fig. 2. Cell occupancy (%) in relation to density of the Short-eared Owl (pairs/km^2) in 1996–2007. **A** – all cells ($n = 217$), **B** – regularly occupied cells ($n = 28$). Each point represents one year of study.

Рис. 2. Степень занятости квадратов в зависимости от плотности гнездования болотных сов в 1996–2007гг. **A** – все квадраты ($n = 217$), **B** – регулярно занимавшиеся квадраты ($n = 28$). Каждая точка соответсвует одному году исследований.

Table 1

The influence of habitat composition on probability of area utilization by owls

Влияние структуры местообитаний на их использование болотной совой

Habitat variables	r_s	p
arable land, %	– 0.42	< 0.0001
meadow, %	0.35	< 0.0001
pasture, %	– 0.11	0.123
wetlands, %	0.045	0.513
shrub and forest, %	– 0.23	0.0008
anthropogenic load	– 0.36	< 0.0001

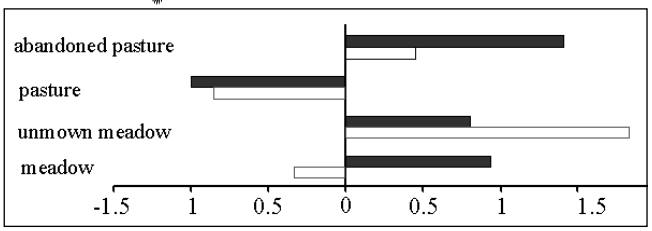

Fig. 3. Trend of changes in habitat availability (black bars) and abundance of the Short-eared Owl (white bars) within the study area in 1996–2007.
Рис. 3. Тенденции изменения доступных для гнездования площадей местообитаний и их использование болотной совой в 1996–2007 гг.

The difference between trends on abandoned pasture and those on unmown meadow and abandoned lands in general is, probably, due to the different degree of farming intensity in the period foregoing the economic crisis, which had resulted in different levels of habitat degradation of pasture and hays in the 1980s – early 1990s. At the recent time habitat restoration has been asynchronous at sites with different levels of prior degradation, and has resulted in high degree of local habitat diversity.

Spatial distribution of territorial pairs of owls changed considerably in the second half of the period of observations (2001–2007). Still used for farming areas of meadow were inhabited by birds at a higher density, while abandoned land was populated at a lower density (mean distance to five nearest neighbours on meadow was 0.749 ± 0.39 km, and on abandoned land 1.16 ± 0.49 km, ANOVA: $F = 13.8$, $p = 0.00041$).

The influence of prey abundance and distribution on site selection by owls

Numbers of small mammals ranged within the study area from 0.25 to 17.32 animals/100 trap-nights. The principal owl prey, the Common Vole (*Microtus arvalis*), represented on average 41.8 ± 14.8% of the total population of small mammals, with numbers of this species ranging from 0.15 to 7.24 animals/100 trap-nights. The dominancy of the Common Vole in population of small mammals resulted in prevalence of this species in diet of most rodent-specialists. Year-to-year fluctuations in numbers are characteristic for the Short-eared Owl (Mikkola, 1983; Korpimäki, Norrdahl, 1991; Volkov et al., 2005). In 2003–2007 their numbers positively correlated with the normalized abundance of small mammals ($r = 0.98$, $p = 0.001$) and the abundance of the Common Vole ($r = 0.94$, $p = 0.019$).

The abundance of *Apodemus* mice, *Clethrionomys* voles and shrews increased at territories overgrown with shrubs and forest, while numbers of preferred by rodent-specialists *Microtus* voles significantly decreased (Delattre et al., 1996; De la Pena et al., 2003; More, Gadal, 2008).

The results of the trapping of rodents during 5 years indicated that Short-eared Owls preferred habitat patches with higher number of species (Mann-Whitney U-test: $z = 2.25$, $p < 0.03$) and higher abundance of small mammals ($\chi^2 = 17.81$, $df = 4$, $p = 0.0013$, Table 2). The territories of Long-eared Owls had significantly fewer species of potential prey compared with the territories of Short-eared Owls ($\chi^2 = 26.5$, $df = 4$, $p = 0.00003$), which was particularly evident in years of high vole abundance. The abundance of small mammals in the territories of Short-eared Owls was significantly higher than in the territories of Long-eared Owls ($\chi^2 = 35.96$, $df = 4$, $p < 0.000001$), both in years of low and high vole abundance. In contrast, overall abundance of potential prey in territories of the Long-eared Owl did not differ from that in adjacent areas ($\chi^2 = 6.22$, $df = 4$, $p = 0.18$).

The abundance in owl territories of the principal prey species, the Common vole, – differed from adjacent uninhabited by owls areas in neither the Long-eared Owl ($\chi^2 = 1.55$, $df = 4$, $p = 0.82$), not the Short-eared Owl ($\chi^2 = 7.36$, $df = 4$, $p = 0.12$).

Table 2

Number of species and abundance of small mammals (rodents and shrews) in breeding territories of the Short-eared and Long-eared Owls
Обилие и видовое разнообразие мелких млекопитающих (грызуны и землеройки) на гнездовых участках ушастой и болотной сов

Year	Number of species		Abundance, ind./100 traps-nights	
	Asio flammeus	*Asio otus*	*Asio flammeus*	*Asio otus*
2003	6	4	13.8	8.2
2004	6	5	22.0	7.6
2005	–	–	–	–
2006	5	4	7.8	3.6
2007	6	3	23.2	22.5

DISCUSSION

Habitat selection by birds evidently belongs to one of the most important issues of the current ornithology. The Short-eared Owl occupied territories in a non-random manner from year to year, with some territories preferred and others avoided. A long-term period of observations of the patterns of farmland use allows to suggest a reasonable interpretation of the influence of occurring changes on the patterns of spatial distribution in local populations of various bird species, their numbers and dynamics of habitat selection. Areas regularly inhabited by owls were subject to lesser anthropogenic load, had lower proportion of forested habitat and higher proportion of meadow compared with uninhabited areas and, to a lesser extent, with irregularly inhabited areas.

Areas with a wider range of characteristics were inhabited in years of high owl numbers, however, these areas were not inhabited regularly and belonged to suboptimal habitats. Protection features of an area are, probably, of the primary importance in the site selection process, given a prolonged period of 2.5 months

from the start of egg-laying to fledging in the Short-eared Owl. The sufficient time is not available for birds at intensively used farmland.

The abandonment of lands being formerly used for intensive farming was the general changing trend in agricultural landscapes in our study area during the last two decades that on first stages contributed to increase in species diversity and abundance. However, the long-term abandonment of farmland leads to considerable habitat change and corresponding changes in composition of communities of small mammals in the area. Long-term low grazing or mowing intensity and land abandonment favoured increasing rate of forest restoration and associated rapid reduction of meadow, decrease in landscape and species diversity. High and dense vegetation (i) complicates hunting for birds of prey; (ii) leads to changes in microclimate (Farley et al., 2005; Nosetto et al., 2007), which becomes wetter, with longer period of snowmelt in spring, followed by accumulation of water and loss of attractiveness to ground-nesting birds; (iii) results in changes in composition of communities of small mammals (Delattre et al., 1996; De la Pena et al., 2003; More, Gadal, 2008), when the Common vole is replaced by other species of voles and mice (*Apodemus*, *Clethrionomys*, *Sylvaemus*), less accessible to most rodent-specialists. Nesting density of the Short-eared Owl decreased with increase of shrub coverage in the area. The remaining patches of low-intensity grazing or irregularly mown meadows has become more attractive for the species which resulted in decrease of mean distance to five nearest neighbours and increase of nesting density. Abandoned lands have been still used by many species of ground-nesting birds in the brood-raring period, including Short-eared Owls moving there after leaving nests by chicks.

The Short-eared Owl, a territorial species, selects areas with potentially more diverse fauna and higher abundance of small mammals. Strict territoriality and protection of nest site by owls potentially provides for availability of sufficient food resources for adult birds and their brood. Reproductive effort of the Short-eared Owl is realized more efficiently in years of high rodent numbers compared with the Long-eared Owl, because the latter species does not protect territories, and selection of nest site in these birds is, probably, independent of the rodent abundance (e.g., van Manen 1992; our data). It is interesting that landscape variables had no significant effect on the placement of Long-eared Owl nest-sites: the type, average size of and average distance to the nearest open patch was similar for Long-eared Owl nest-sites and randomly chosen sites (Rodriguez et al., 2006). Lesser dependence of the Long-eared Owl on the habitat quality suggests that territorial labiality allows individuals to respond faster to catastrophic changes in both spatial distribution of prey and its abundance, thus utilizing the most favourable strategy in unstable conditions with unpredictable changes in environment.

Although human disturbance such as burning, mowing or intensive grazing generally has a negative effect on the Short-eared Owl, periodic disturbance can be necessary to maintain suitable habitat (Dechant et al., 2003). Abandoned lands and old meadow (grassland) with tall and dense cover of grasses and young shrubs require mowing every 2–5 years to maintain suitable habitat for Short-eared Owls and their prey, small mammals, the Common vole in particular. Higher farming intensity leads to sporadic nesting of the Short-eared owl. The same effect on abandoned lands presumably results from changes in composition of prey species.

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REFERENCES

Arlt D. (2007): Habitat Selection: Demography and Individual Decisions. - Doctoral thesis. Swedish University of Agricultural Sciences. Uppsala.

Bibby C.J., Burgess N.D., Hill D.A. (1993): Bird Census Techniques. Acad. Press.

Birds in Europe: population estimates, trends and conservation status. Cambridge: BirdLife International, 2004 (BirdLife Conservation Series No 12). 1-374.

Clark R.J. (1975): A field study of the Short-eared Owl, *Asio flammeus* (Pontoppidan), in North America. - Wildlife Monographs. 47: 1-67.

Dechant J.A., Sondreal M.L., Johnson D.H., Igl L.D., Goldade C.M., Nenneman M.P., Euliss B.R. (2003): Effects of management practices on grassland birds: Short-eared Owl. Northern Prairie Wildlife Research Center, Jamestown, ND.

De la Pena N.M., Butet A., Delettre Y., Paillat G., Morant P., Le Du L., Burel F. (2003): Response of small mammals community to changes in western French agricultural landscapes. - Landscape Ecology. 18: 265-278.

Delattre P., Giraudoux P., Baudry J., Quere J.P., Fichet E. (1996): Effect of landscape structure on Common Vole (*Microtus arvalis*) distribution and abundance at several space scales. - Landscape Ecology. 11: 279-288.

Donald P.F., Green R.E., Heath M.F. (2001): Agricultural intensification and the collapse of Europe's farmland bird populations. - Proc. Royal Soc. London. Ser. B. 268: 25-29.

Farley K.A., Jobbagy E.G., Jackson R.B. (2005): Effects of afforestation on water yield: a global synthesis with implications for policy. - Global Change Biology. 11: 1565-1576.

Fuller R.J., Gregory R.D., Gibbons D.W., Marchant J.H., Wilson J.D., Baillie S.R., Carter N. (1995): Population declines and range contractions among lowland farmland birds in Britain. - Conservation Biology. 9: 1425-1441.

Koks B.J., Trierweiler C., Visser E.G., Dijkstra C., Komdeur J. (2007): Do voles make agricultural habitat attractive to Montagu's Harrier *Circus pygargus*? - Ibis. 149: 575-586.

Korpimäki E., Norrdahl K. (1991): Numerical and functional responses of Kestrels, Short-eared Owls, and Long-eared Owls to vole densities. - Ecology. 72: 814-826.

van Manen W. (1992): Territorium- en nestkeuze bij de Ransuil *Asio otus*. - Limosa. 65 (1): 1-6.

Martin T.E. (1988): On the advantage of being different: nest predation and the coexistence of bird species. - Proc. Nat. Acad. Sci. 85: 2196-2199.

Martin T.E. (1998): Are microhabitat preferences of coexisting species under selection and adaptive? - Ecology. 79: 656-670.

Mikkola H. (1983): Owls of Europe. London: T. & A.D. Poyser.

More D., Gadal S. (2008): Benefits of habitat restoration to small mammal diversity and abundance in a pastoral agricultural landscape in mid-Wales. - Biodiversity and Conservation in Europe. 7: 301-315.

Newton I. (2004): The recent declines of farmland bird populations in Britain: an appraisal of casual factors and conservation actions. - Ibis. 146: 579-600.

Norris K., Pain D.J. (2002): Conserving bird biodiversity. Cambridge: Cambridge University Press.

Nosetto M.D., Jobbagy E.G., Toth T., Di Bella C.M. (2007): The effects of tree establishment on water and salt dynamics in naturally salt-affected grasslands. - Oecologia. 152: 695-705.

Ortego J. (2007): Consequences of Eagle Owl nest-site habitat preference for breeding performance and territory stability. - Ornis Fennica. 84: 78-90.

Pain D.J., Pienkowski M.W. (1997): Farming and Birds in Europe. London: Academic Press.

Penteriani V., Gallardo M., Roche P. (2002): Landscape structure and food supply affect eagle owl (*Bubo bubo*) density and breeding perform-

ance: a case of intra-population heterogeneity. - J. Zool. (London), 257: 365-372.
Rodriguez A., Garcia A.M., Cervera F., Palacions V. (2006): Landscape and anti-predation determinants of nest-site selection, nest distribution and productivity in a Mediterranean population of Long-eared Owls *Asio otus*. - Ibis. 148: 133-145.
Sergio F., Newton I. (2003): Occupancy as a measure of territory quality. - J. Anim. Ecol. 72: 857-865.
Söderström B., Pärt T., Ryden J. (1998): Different nest predator faunas and nest predation risk on ground and shrub nest at forest ecotones: an experiment and a review. - Oecologia. 117: 108-118.
Sviridova T.V., Volkov S.V., Greenchenko O.S., Zubakin V.A., Kontorschikov V.V., Konovalova T.V., Koltsov D.B. (2006): [Impact of farming intensity on birds of agricultural landscapes in the north of Moscow Region]. - [Development of modern ornithology in Northern Eurasia]. Proc. of XII Intern. Orn. Confer. Stavropol. 71-398. (In Russian).
Thomson R.L. (2006): Breeding habitat selection and its consequences in boreal passerines. Using the spatial dispersion of predators and heterospecifics as a source of information. - Academic Dissertation. Acta Univ. Oul. A 456.
Tucker G.M., Evans M.I. (1997): Habitat for Birds in Europe. A Conservation Strategy for the Wider Environment. - BirdLife Conservation Series No. 6. BirdLife International, Cambridge, UK.
Vengerov P.D. (2005): [Birds and low-intensity agricultural land of Voronezh Region]. Voronezh. (In Russian).
Volkov S.V., Sharikov A.V., Ivanov M.N., Sviridova T.V., Greenchenko O.S. (2005): [The distribution and numbers of owls in Moscow Region]. - [Owls of the Northern Eurasia]. Moscow. 163-186. (In Russian).
Ward J.P., Gutierrez R.J. (1998): Habitat selection by northern Spotted owls: the consequence of prey selection and distribution. - Condor, 100: 79-92.

Замітки	Беркут	22	Вип. 1	2013	60

ВСТРЕЧИ ПТИЦ С НЕТИПИЧНОЙ ОКРАСКОЙ ОПЕРЕНИЯ В ПРУТ-ДНЕСТРОВСКОМ МЕЖДУРЕЧЬЕ УКРАИНЫ И НА СОПРЕДЕЛЬНЫХ ТЕРРИТОРИЯХ

Records of birds with atypical colouring of plumage in the Prut-Dnister interfluve of Ukraine and adjacent territories. - N.A. Smirnov, D.A. Smirnov. - Berkut. 22 (1). 2013. - Data about records of colour aberrations in 4 bird species are presented. [Russian].

Обыкновенный скворец (*Sturnus vulgaris*). 17.07.2004 г. птицу-альбиноса наблюдали из окна поезда в стае скворцов, состоящей из 40–60 особей, в окрестностях железнодорожной станции Завалье Снятинского р-на Ивано-Франковской обл.

Сойка (*Garrulus glandarius*). Практически полный альбинос (за исключением нескольких темных рулевых перьев) встречен 16.10.2007 г. в лесопосадке возле прудов Кицманского рыбхоза между г. Кицмань и с. Лашковка Кицманского р-на Черновицкой обл. Птица вела себя осторожно и не подпускала наблюдателя ближе, чем на 6–8 м. Определение произвели на основе общего габитуса, характера полета и голоса.

Грач (*Corvus frugilegus*). Осенью 2000–2001 гг. несколько птиц с одним–тремя белыми маховыми перьями периодически отмечали в г. Ямполь Винницкой обл.

Домовый воробей (*Passer domesticus*). 30.05.2003 г. в г. Ямполь Винницкой обл. наблюдали птицу очень светлого пепельного окраса. На голове, крыльях и хвосте у нее были видны коричневатые разводы. 19.07.2009 г. в центре г. Могилев-Подольский Винницкой обл. встретили самку-флависта. Птица активно искала корм на территории автостанции.

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ЗАЛІТ КАСПІЙСЬКОГО КРЯЧКА (*HYDROPROGNE CASPIA*) В ЗАКАРПАТСЬКУ ОБЛАСТЬ

Vagrant of the Caspian Tern (*Hydroprogne caspia*) in Transcarpathian region. - V.M. Gleba. - Berkut. 22 (1). 2013. - An adult bird was observed on a canal in the valley of Tisa river near the village of Esen on 5.09.2000 (48.23 N, 22.16 E). It was the first record of the species in Transcarpathian region of Ukraine. [Ukrainian].

5.09.2000 р. на невеликій водоймі каналу Чоронда в долині р.Тиса неподалік від с. Єсень (Яворове) Ужгородського р-ну (48.23 N, 22.16 E) ми зі студентом біофаку Ужгородського університету Т. Петровичем спостерігали дорослого каспійського крячка (*Hydroprogne caspia*). Птах був сфотографований. Це перша задокументована зустріч цього виду в області. Раніше на Закарпатті він не відмічався (Страутман, 1963; Талпош, 1969; Грабар, 1997). В анотованому списку птахів Закарпатської області подані не точні дані про строки спостереження (Потіш, 2009).

На озері гніздилися чорні крячки (*Chlidonias niger*), трималися малі білі чаплі (*Egretta garzetta*), малі (*Tachybaptus ruficollis*) та великі (*Podiceps cristatus*) норці, лиски (*Fulica atra*) й інші водно-болотяні птахи.

ЛІТЕРАТУРА

Грабар А. (1997): Птицы Подкарпатской Руси (Avifauna Carpathorossica). - Беркут. 6 (1-2): 91-102.
Потіш Л.А. (2009): Птахи Закарпатської області (анотований список). Львів. 1-124.
Страутман Ф.И. (1963): Птицы западных областей УССР. Львов: ЛГУ. 1: 1-200.
Талпош В.С. (1969): Птицы Закарпатской низменности. - Дис. ... канд. биол. наук. Кременец. 1-408.

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