

**INTERSPECIFIC TERRITORIAL VOCAL
ACTIVITY OF THE URAL OWL (*STRIX
URALENSIS*) TOWARDS TAWNY OWL (*STRIX
ALUCO*), SYMPATRIC OWL COMPETITOR: A
PLAYBACK EXPERIMENT**

MEDVRSTNA TERITORIALNA VOKALNA
AKTIVNOST KOZAČE (*STRIX URALENSIS*) PROTI
LESNI SOVI (*STRIX ALUCO*), SIMPATRIČNI
KOMPETITORICI: POSKUS S POSNETKOM

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ABSTRACT

Interspecific territorial vocal activity of the Ural Owl (*Strix uralensis*) towards Tawny Owl (*Strix aluco*), sympatric owl competitor: A playback experiment

Territoriality in birds is more often displayed as vocal communication than as aggressive attack, so playback experiments are commonly used approach in studying territorial interactions. We tested the interspecific territoriality of the Ural Owl (*Strix uralensis*) towards closely related and smaller sympatric owl competitor, the Tawny Owl (*Strix aluco*). We performed playback experiments on 28 territories of Ural Owls on Mt. Krim (central Slovenia) during spring and autumn between years 2003 and 2005. We measured the response rate of the Ural Owl on the broadcast territorial song of the male of the Ural, Tawny, and Great Grey Owl (*Strix nebulosa*). The last is playback of allopatric species used as a control and was considered as a non-territorial response versus conspecific playback of the Ural Owl considered as a territorial response. Ural Owl territorial vocal activity was very low since response rate reached only 34%. However, in the analysis we confirmed that Ural Owl was interspecific territorial towards Tawny Owl since the level of response of the Ural Owl to the Tawny Owl playback was as similar as to the conspecific playback. Therefore we are concluding that interspecific territoriality is a very important mechanism in spatial segregation of these two highly competitive species.

Key words: Interspecific territoriality, predators, competition, birds, Aves.

IZVLEČEK

Medvrstna teritorialna vokalna aktivnost kozače (*Strix uralensis*) proti lesni sovi (*Strix aluco*), simpatrični kompetitorici: poskus s posnetkom

Teritorialnost ptice pogosteje izražajo z akustično komunikacijo kot pa z agresivnimi napadi, zato je v študijah teritorialnih interakcij uporaba poskusa s posnetkom (playback experiment) pogosta. V delu smo testirali medvrstno teritorialnost kozače (*Strix uralensis*) proti lesni sovi (*Strix aluco*), manjši in ozko sorodni simpatrični kompetitorici. Spomladi in jeseni med leti 2003 in 2005 smo poskus izvajali na 28 teritorijih kozače na gori Krim (osrednja Slovenija). V poskusih smo merili odzivnost kozač na predvajani posnetek kozače, lesne sove in bradate sove (*Strix nebulosa*). Bradata sova je alopatrična vrsta, ki v Sloveniji ne živi, zato smo ta posnetek uporabili kot kontrolo poskusa, odziv pa obravnavali kot neteritorialen odziv. Odziv na posnetek kozače je bil nasprotno smatran kot teritorialen odziv. Vokalna aktivnost kozače je bila zelo nizka, saj je bila odzivnost na sovrstni posnetek zgolj 34 %. Kljub temu smo dokazali, da je kozača medvrstno teritorialna tudi proti simpatrični lesni sovi, saj je bil odziv kozače na posnetek lesne sove zelo podoben odzivu na istovrstni posnetek. Na podlagi tega zaključujemo, da je medvrstna teritorialnost zelo pomemben mehanizem v prostorskem ločevanju teh dveh zelo kompetitivnih vrst.

Ključne besede: medvrstna teritorialnost, plenilci, kompeticija, ptice, Aves.

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INTRODUCTION

Interspecific competition is one of the main interactions between ecological similar species in natural communities (ODUM 1971). It can be expressed when two species are competing for the same resource, i.e. exploitation competition, or when two species performed strong agonistic interactions, i.e. interference competition (BEGON et al. 1996). Among species of higher trophic levels, e.g. predators, the interference competition is more common (e.g. KORPIMÄKI 1986). To avoid aggressive interactions non-overlapping pattern in distribution is developed. In case of territorial birds this can lead into interspecific territoriality (ORIAN & WILLSON 1964, CODY 1969, PIANKA 1981). Territorial behaviour in birds is performed as acoustic communication rather than as direct aggressive interaction (e.g. SORJONEN 1986, COCY 1978, REED 1982, MØLLER 1992). Therefore playback experiments were very frequently used in studies of birds' territoriality and vocal communication (e.g. REED 1982, MØLLER 1992, APPLEBY et al. 1999, CATCHPOLE & SLATER 2000).

Between predatory birds the habit of feeding on exclusive areas is very widespread (SCHOENER 1968), thus territoriality is very important for spacing of individuals. In our study we considered a large owl species, the Ural Owl (*Strix uralensis*), which inhabits forests in sympatry with smaller and closely related owl competitor, the Tawny Owl (*Strix aluco*) (VREZEC 2003). In general, owls are very territorial species vigorously defending their territories with vocal displays (KÖNIG et al. 1999). In interspecific interactions large species are usually dominant (BROWN & MAURER 1986) and therefore dictating the distribution pattern of smaller competitors (SERGIO et al. 2003), what is most likely the case in Ural and Tawny Owl (VREZEC & TOME 2004). However, there are several kinds of interactions in which aggression of larger competitor against smaller can be performed among which the territoriality is one. The main goal of our study is to test if the Ural Owl is territorial against sympatric Tawny Owl, and to describe some characteristics of Ural Owl territorial activity.

STUDY AREA, MATERIALS AND METHODS

Study Area

The study was carried out at Mt. Krim (14°25'55'' E, 45°58'15'' N), 10 km south of Ljubljana city (central Slovenia). The area is 140 km², 77% of which is covered with large forest complex. Mt. Krim is a medium height mountain in the North Dinaric Alps with elevations ranging from 290 to 1108 m asl. The slopes of Mt. Krim are covered predominantly with mixed forest. The dominant tree species are Beech (*Fagus sylvatica*) and Silver Fir (*Abies alba*). Most of the forest is in an old growth phase, what provides enough suitable natural nest tree holes for hole nesting birds, e.g. for owls. At least three typical forest owl species were confirmed breeding in sympatry in the area, the Ural Owl, the Tawny Owl and the Tengmalm's Owl (*Aegolius funereus*) (FURLAN 1988, VREZEC 2003, SLOVENIAN FOREST SERVICE unpubl.).

Materials and Methods

We performed the playback experiment in selected occupied Ural Owl territories. At each experimental trial we broadcast the playback tape from the same point in the territory. The tape was played for 10 minutes, followed by 5 minutes waiting for any response in silence. If the owl did not respond in this period, the result was recorded as 'no response'. We conducted playback experiments in good weather conditions, without wind and precipitations in clear and calm nights only.

In the experiment design, we used playbacks of male territorial song of three closely related owl species (according to KÖNIG et al. 1999): Ural Owl as a conspecific playback, Tawny Owl as a heterospecific playback, and Great Grey Owl (*Strix nebulosa*) as a control playback. The Great Grey Owl does not breed or regularly occur in Slovenia, e.g. allopatric species, so there are no potential competitive or territorial interactions of the considered Ural Owls expected. Therefore, the response to Great Grey Owl was considered as a non-territorial response, only as a response to the acoustic disturbance. On the contrary, the response to the conspecific Ural Owl playback was considered as a territorial response to the male intruder. Our hypothesis therefore was that the difference in the response rate to Ural and Great Grey Owl playbacks should be significant since owls are expressing their territoriality with vocal displays. Afterwards we tried to confirm interspecific territorial activity of the Ural Owl towards Tawny Owl. We tested, if heterospecific response is showing the pattern of territorial or non-territorial behaviour. For statistical analysis we used univariate χ^2 test (Yates correction used where necessary).

RESULTS

We performed playback experiment on 28 Ural Owl territories in the area of Mt. Krim during spring and autumn between years 2003 and 2005. The intraspecific vocal response was relatively low as the territorial owls responded only in 34% of all 44 experimental tries using conspecific Ural Owl playback. The average response was recorded within 10 minutes, but the owls responded in the range of 2 to 14 minutes mostly in the close vicinity of the broadcasted playback. At least seven different call types of the Ural Owl were recorded during our study, and the most common was the male territorial song. Although males responded more frequently the difference between male and female response rate was not significant ($\chi^2=2.43$, ns, df=1).

We confirmed that Ural Owl responded significantly more intensively to conspecific playback than to the playback of Great Grey Owl ($\chi^2=5.22$, $p<0.05$, df=1). Ural Owls responded to the playback of the Great Grey Owl only in 11% out of 45 experimental tries. When comparing the conspecific response rate of the Ural Owl with the response to Tawny Owl playback, we found no significant differences ($\chi^2=0.21$, ns, df=1) since Ural Owls responded in 40% out of 45 experimental tries. This indicates that Ural Owls responded territorial towards sympatric owl competitor Tawny Owl.

DISCUSSION

We confirmed some previous studies (e.g. HOLMBERG 1974, MIKKOLA 1983) that Ural Owl vocal activity is relatively low, although its repertoire is one of the largest among owls (reviewed in OBA 1996). Even when provoking territorial owls with the male territorial song playback in the period of 10 minutes as suggested by ZUBEROGOITIA & CAMPOS (1998) for owl censuses, the response rate reached only 34%. For comparison, the closely related Tawny Owl is responding to playback with much higher response rate, between 40 to 100% (REDPATH 1994, ZUBEROGOITIA & CAMPOS 1998, APPLEBY et al. 1999, VRH 2005). We speculate that the response rate degree is inversely proportioned to the territory size, which is much greater in the Ural (450 ha) than in the Tawny Owl (100 ha; MIKKOLA 1983). The audibility of the playback is therefore at least proportionally greater over smaller Tawny than over larger Ural Owl territories. The telemetry studies (e.g. PROUDFOOT et al. 2002) are needed here to find out at what distance the territorial owl replies to the playback.

In closely related or ecological similar species the distribution ranges are usually geographically separated because of strong competitive interactions (SCHOENER 1982), but when living in sympatry these species are highly interspecific territorial (COCY 1969, SORJONEN 1986). In our study we found relatively high response rate of the Ural Owl towards Tawny Owl playback indicating a high degree of interspecific territoriality in Ural Owl. Distribution ranges of the Ural and Tawny Owl are mostly geographically separated, but there are overlap areas in central and south European mountain ridges (Dinaric Alps, Carpathians), Fennoscandia, and W Russia (Mts. Ural, W Siberia; according to KÖNIG et al. 1999, VREZEC 2004). In further studies it would be interesting to test, if Ural Owls in other areas of sympatry are also interspecific territorial towards Tawny Owls, and if there is a lack of interspecific territoriality in non-overlapping range areas, e.g. in Japan, most part of Siberia, Northern Scandinavia (KÖNIG et al. 1999, VREZEC 2004). It would be also important to evaluate the possible additional impact of intraguild predation and if the Tawny Owl, as an inferior competitor, is also performing interspecific territoriality towards superior Ural Owl. With such data it would be possible to evaluate the intensity and the direction of interactions between closely related Ural and Tawny Owl that are highly segregated in space, when living in sympatry (VREZEC & TOME 2004).

REFERENCES

- APPLEBY, B.M., YAMAGUCHI, N., JOHNSON, P.J. & MACDONALD, D.W., 1999: Sex-specific territorial responses in Tawny Owls *Strix aluco*.- *Ibis*, 141, 91-99.
- BEGON, M., HARPER, J.L. & TOWNSEND, C.R., 1996: Ecology – individuals, populations and communities. 3rd ed.- London: Blackwell Science.
- BROWN, J.H. & MAURER, B.A., 1986: Body size, ecological dominance and Cope's rule.- *Nature*, 324, 248-250.
- CATCHPOLE, C.K. & SLATER, P.J.B., 2000: Bird song.- Cambridge: Cambridge University

Press.

- CODY, M.L., 1969: Convergent characteristics in sympatric species: a possible relation to interspecific competition and aggression.- *Condor*, 71, 223-239.
- CODY, M. L., 1978: Habitat selection and interspecific territoriality among the sylviid warblers of England and Sweden.- *Ecol. Monogr.*, 48, 351-396.
- FURLAN, I., 1988: Primerjalne raziskave zoocenoze karabidov (Carabidae, Coleoptera) v različnih variantah rastlinske združbe Abieti-Fagetum dinaricum. Graduation thesis, Ljubljana: University of Ljubljana, BF, Dep. of Biology.
- HOLMBERG, T., 1974: A study of the voice of the ural owl *Strix uralensis*.- *Vår Fågelvärld*, 33, 140-146.
- KÖNIG, C., WEICK, F. & BECKING, J.H., 1999: Owls, a Guide to the Owls of the World.- Sussex: Pica Press.
- KORPIMÄKI, E., 1986: Niche relationships and life-history tactics of three sympatric *Strix* Owl species in Finland.- *Ornis Scand.*, 17, 126-132.
- MIKKOLA, H., 1983: Owls of Europe.- London: T & A D Poyser.
- MØLLER, A.P., 1992: Interspecific Response to Playback of Bird Song.- *Ethology*, 90, 315-320.
- OBA, T., 1996: Vocal Repertoire of the Japanese Brown Hawk Owl *Ninox scutulata japonica* with Notes on its natural history.- Chiba: Natural History Museum and Institute.
- ODUM, E.P., 1971: Fundamentals of Ecology. 3rd ed.- Philadelphia: W.B. Saunders Company.
- ORIAN, G.H. & WILLSON, M.F., 1964: Interspecific territories of birds.- *Ecology*, 45, 736-745.
- PIANKA, E.R., 1981: Competition and Niche Theory.- In: MAY, R.M. (Ed.): *Theoretical Ecology. Principles and Applications*.- Oxford: Blackwell Scientific Publications, pp. 167-196.
- PROUDFOOT, G.A., BEASOM, S.L., CHAVEZ-RAMIREZ, F. & MAYS, J.L., 2002: Response distance of Ferruginous Pygmy-Owls to broadcasted conspecific calls.- *J. Raptor Res.*, 36 (3), 170-175.
- REDPATH, S.M., 1994: Censusing Twny Owls *Srix aluco* by the use of imitation calls.- *Bird study*, 41, 192-198.
- REED, T.M., 1982: Interspecific territoriality in the Chaffinch and Great tit on islands and the mainland of Scotland: playback and removal experiments.- *Anim. Behav.*, 30, 171-181.
- SCHOENER, T.W., 1968: Sizes of feeding territories among birds.- *Ecology*, 49, 123-141.
- SCHOENER, T.W., 1982: The Controversy over Interspecific Competition.- *American Scientist*, 70, 586-595.
- SERGIO, F., MARCHESI, L. & PEDRINI, P., 2003: Spatial refugia and the coexistence of a diurnal raptor with its intraguild owl predator.- *Journal of Animal Ecology*, 72, 232-245.
- SLOVENIAN FOREST SERVICE, unpubl.: Legend to the phytocenological map of Krim-GE Rakitna and GE Borovnica, Ljubljana.

- SORJONEN, J., 1986: Mixed singing and interspecific territoriality—consequences of secondary contact of two ecologically and morphologically similar nightingale species in Europe.- *Ornis Scandinavica*, 17, 53-67.
- VREZEC, A., 2003: Breeding density and altitudinal distribution of the Ural, Tawny, and Boreal Owls in North Dinaric Alps (central Slovenia).- *J. Raptor Res.*, 37 (1), 55-62.
- VREZEC, A., 2004: Medvrstni odnosi med gozdnimi sovami (Strigidae).- Ph.D. Thesis, Ljubljana: University of Ljubljana, BF, Dep. of Biology.
- VREZEC, A. & TOME, D., 2004: Altitudinal segregation between Ural *Strix uralensis* and Tawny Owl *S. aluco*: evidence for competitive exclusion in raptorial birds.- *Bird Study*, 51, 264-269.
- VRH, P., 2005: Medvrstna teritorialnost med kozačo (*Strix uralensis*) in lesno sovo (*Strix aluco*).- Graduation thesis, Ljubljana: University of Ljubljana, BF, Dep. of Biology.
- ZUBEROGOITIA, I. & CAMPOS, L.F., 1998: Censusing owls in large areas: a comparison between methods.- *Ardeola*, 45, 47-53.