

The birds atlas of the Paklenica National Park, Croatia

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Abstract

The Paklenica NP covers 9.500 ha in southern part of the Velebit mountain. Velebit is the greatest Croatian Nature park and covers 22.000 ha. The birds of the area of Paklenica National Park and its surroundings were observed in the plots of 1x1 km² during the period of 1996 till 2012. Totally 175 investigated plots were established in the area. The results show the precise spread area and their distribution for 250 birds species and 111 breeding birds species. Moreover, the distribution and number of breeding pairs in isolated nesting places of some rare and endangered species were found.

The sea coast alongside the National Park is of main importance for the wintering and migrating birds f.e. Divers, Grebes, Cormorants, Herons, Waders, Gulls and Terns. The tidal mudflats inlet Modrič is of especial important. This bay has a great importance notably for Ducks, Herons and Waders in winter, and during the spring or autumn migrations.

Some resident birds from mountain forest and peaks, undertake altitudinal movements and spent a winter at the coast (Woodpeckers, Tits, Nuthatch, Alpine Accentor, Robin, Alpine Cough, etc). As a part of the Dinaric Alps on the east Adriatic flyway, Paklenica National Park is an important resting place for many species on their flight from Europe to Africa (Dotterel, Honey Buzzard, Icterin Warbler, Wood Warbler, etc).

Keywords

Birds atlas, plots, breeding pairs, distribution, endangered species

Introduction

This paper compares the spread of some birds species in area of National Park, between 1996 and 2012, especially in Canyons of Velika and Mala Paklenica. The Park covers an area of 9500 ha, but the most interesting area to visitors is the Canyon of Velika Paklenica. Closely to the Velika Paklenica Canyon is the other, smaller Canyon of Mala Paklenica (LUKAČ 2002). The difference between these two areas is in the size and ecological characteristics, number of visitors, especially in the number of climbers. Up until now 250 bird species have been noted in the National Park and their surroundings. This research was focused on 74 species noted in this two canyons, and especially on 23 of them that are known to be breeding birds in petrophilous habitats of both canyons. Five endangered species were sorted out: *Aquila chrysaetos*, *Falco peregrinus*, *Alectoris graeca*, *Bubo bubo* and *Corvus corax*. These species disappeared from the climbing zone in period of tourist season.

Methods

The ornithofauna of Paklenica National park was investigated in two periods. During the first period of 297 field days 193 birds species were recorded. In the second period of more than 2000 field days 57 species were recorded in the area of National park and its surrounding. The mapping method was done on the basis of plots 1 x 1 km (BIBBY et al. 1992, FLADE 1994). Total 175 plots in area of National park and their surrounding was investigated between 1996 and 2012.

The number of visitors passing through the Velika Paklenica is considerable (500-800 per day; maximum in some days of Mai and August 1.700-2.000 per day, total 118.000 in 2011), and relatively small in Mala Paklenica (20-50 per day, 2500-3000 in 5 months of season). After all, the Velika Paklenica canyon is the most famous climbing zone in Croatia and surroundings area with 34.000 of climbers entrances per year. The Mala Paklenica is forbidden climbing zone.

Results

During the study period, 74 breeding bird species were noted in two canyons. Of these, 23 petrophilous bird species were selected in the analyses of climber impact, and another 42 species for hiker impact. The number of breeding petrophilous bird species varied each year and shows a slowly decreasing tendency in Velika Paklenica Canyon. Two bird species have become extinct (LUKAČ et al. 2003) from this area over the past century, the Egyptian vulture (*Neophron percnopterus*) and Griffon vulture (*Gyps fulvus*). Three bird species no longer breed

in the recreational zone of Velika Paklenica Canyon: *Aquila chrysaetos*, *Falco peregrinus* and *Corvus corax*. These three species have moved from the recreational zone. The Peregrine falcon moved from the recreational zone in Velika Paklenica more inland into the park in 2002, to areas without climber activity. Other pairs breed in the no climbing area of the adjacent Mala Paklenica Canyon. The Golden eagle and Raven show the same tendency. Two other species, *Bubo bubo* and *Alectoris graeca*, are occasionally found in the recreational zone, usually outside the peak tourism periods in autumn and winter, when there are no rock climbers. It is likely that *B. bubo* occasionally nests in the climbing zone. Other species *Columba livia*, *Apus melba*, *Phoenicurus ochruros*, *Monticola solitarius*, *M. saxatilis*, *Otus scops* and *Sitta neumayer* were included as unaffected and stable species. The adaptive species, bred without interruption in the cracks of climbing routes in the climbing zone. Adaptive species were *Parus major* and *Falco tinnunculus*.

Discussion and conclusion

The most threatened birds in area of Paklenica National Park are the birds of rocks and cliffs, i.e. petrophilous species. Their numbers and number of nesting pairs vary by season, indicating the negative impact of climbers on this specific bird community. In order to achieve stability of the nesting bird fauna in Paklenica National Park, management should keep the climbing zone in the existing framework, to carry out regulation between climbing routes and to ban climbing during nesting season if one of the threatened species is present in that zone, i.e. *F. peregrinus*, *B. bubo*, *C. corax*, *M. saxatilis* or species, such as *O. hispanica*, *C. gallicus* and *P. rupestris*. In the future period, all climbing should continue to be prohibited with Mala Paklenica Canyon. Such a protection regime in the most heavily visited areas of the part can contribute to maintaining stability and enriching the nesting bird community in the canyon areas of the park. This can only be confirmed through an additional ten-year monitoring programme, which is imperative with such a regime and high visitor intensity. The Golden eagle moved to inaccessible areas of Mala Paklenica Canyon. Birds of prey are very sensitive to climber impacts (MEBS & SCHMIDT 2006). In individual protected areas, there are bans or regulations on climbing sites, particularly in national parks (HAMANN et al. 1999). In other cases, a certain buffer zone is applied during nesting season, and is specific for each species. However, not only birds of prey are vulnerable to increasing numbers of climber, as the Eagle owl has also been found to be sensitive to these impacts (MEBS & SCHERZINGER 2000). This species moved out of the recreational zone in Velika Paklenica Canyon at the beginning of every season, to areas without climbers (LUKAČ & HRŠAK 2005). The Rock partridge show the same tendency. This bird is very sensitive to climber disturbances (LUKAČ & HRŠAK 2005). The Raven regularly breeds in the area of Paklenica National Park, but outside of the climbing zone (LUKAČ 2011). This bird is very sensitive to the increasing number of climbers, but also to other negative influences, in neighbouring area of the national park.

The number of sensitive species varied in the number of their pairs in Velika Paklenica every year. Three species were included in this category, *Ptyonoprogne rupestris* and *Oenanthe hispanica*, whose numbers varied, and can be attributed to negative climber impacts, and *Circaetus gallicus* which nested for 6 years at the edge of the climbing zone, thereby qualifying as a potentially sensitive species. Other petrophilous species were included in groups of stable species, including *Columba livia*, *Apus melba*, *D. urbica*, *Phoenicurus ochruros* and *Sitta neumayer* (LUKAČ & HRŠAK 2005). It cannot be excluded that these species will not experience a decrease in the number of mating pairs over the next ten years. The main reason could be increased number of climbers, and more climbing activities during the breeding season. This will only be possible to say after other ten-year monitoring period.

It can be said that the abundance of certain petrophilous nesting birds is not directly dependent on the number of climbers, as nesting niches in rock fissures still represent good nesting protection, and not all rock faces are equally suitable for climbers (RICHARDSON 2000). As such, additional monitoring is required for the species *Columba livia*, *Otus scops*, *Phoenicurus ochruros*, *Apus melba* and *Sitta neumayer*. However, the same author holds that a constant increase in the number of climbers will negatively impact the nesting bird community, in this case, the American petrophilous species *Catherpes mexicanus* and *Aeronautes saxatilis*. Birds of prey and Owls simply move their nesting habitats deeper into the canyon where there are no climbing areas or climbers, and are thereby directly impacted in the increasing number of climbers. Of course, some species show fluctuations in the number of breeding pairs depending of ecological factors, such as food supply, predator-prey interactions and the like, such as *A. melba*, *C. livia* and *D. urbica* (LUKAČ & HRŠAK 2005). This is also the case when there are sudden climatic changes during the nesting season in the Velika Paklenica Canyon (personal observation). It is also necessary to recognize the differences in the abundance and the qualitative composition of species on rocks and cliffs with southern and northern expositions (MATHERSON & LARSON 1998).

Hikers account for virtually two-thirds of all park visitors. They primarily move along marked trails and paths and, for the most part, do not directly impact nesting bird fauna. The abundance of bird species of forest groves and shrubs is stable and unchanging; these include the species *L. megarhynchos*, *S. atricapilla*, *T. merula*, *P. collybita*, *O. oriolus*.

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