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Phenologycal Aspectsof Croatian Breeding Birds; Contribution To Regulatory and Planning Aspectsof Wind Energyprojects

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Abstract

So far, 240 species of breeding birds have been recorded in Croatia, out of a total of 403 recorded species. A large part of the species is classified in one of the endangered categories. Thus, 90 species of breeding birds are endangered at the national level, according to the Red Book of endangered bird species in Croatia. Given that the authors have been working on various projects for many years, during which birds and the human influence on them were researched, there was a need for an appendix that would summarize data on the nesting period of breeding birds in Croatia. The nesting period of all breeding birds is shown in the table. The target species of the ecological network, 100 of them, are especially highlighted. Due to the diverse and valuable types of habitats and increasingly frequent interventions in nature, the nesting phenology for each species is shown in order to reduce the risks of planned interventions that will takes place in nature. The table shows the most sensitive time periods, which refer to the beginning and end of the nesting season in Croatia. The beginning of the nesting season is defined as the approximate earliest date of the start of breeding behavior on the chosen territory, nest building and egg laying, and the end of the nesting season is defined as the period during which the young leave the nesting area. Due to constant changes in nature and increasingly pronounced climatic extremes, there will probably be smaller deviations and less variability in the nesting season of certain species. The months are divided into periods of 10 days each, so each month consists of 3 decades. The aim of the contribution is to adapt interventions in nature to the nesting season of target species of birds important for the ecological network, and especially for rare and endangered species of nesting birds at the national level, but also for stable species that could become endangered due to various interventions in nature in the near future.

Introduction

Energy is a key factor in human development that ensures modern existence and standard of living, while electricity is precisely one of its most important forms. Due to the development of technology, efficiency and economics, the most important energy sources in the 21st century will be alternative or renewable energy sources, among which wind currently looks like the most promising energy source of the future, but it is already a significant source of electricity for the present. The increasingly frequent planning and construction of wind farms has imposed the need for more systematic research into their impact on the environment, especially on the ornithofauna component of the biosystem, i.e. on birds. The most obvious direct impacts included fatal and non-fatal collisions with wind turbine structures, and habitat disruption and loss. Seen seasonally, birds are most active in the spring period when mating and the nesting season begin. During the spring and autumn migration, certain species are especially active in their migratory movements, and

in some parts they appear in greater numbers during the flyover. Group of birds whose abundance, frequency and activities are of particular importance in monitoring the state of ornithofauna at the locations of wind power plants are nesting birds, especially species distributed in different categories of threat at the national level, as well as the target species of the ecological network [1]. Although numerous wind farms have been built on the territory of the Republic of Croatia, there is still considerable difference in opinion regarding their impact on the biodiversity of bird fauna. However, with more wind farms planned, there is an increasing potential for conflict between wind farm development and bird conservation, requiring a strategic approach for sustainable project development and environmental protection.

In order to determine the nesting period of each species of nesting bird in Croatia, we used our own data from field research in different parts of Croatia. Data were collected from 1973 and 1977 respectively, when observing pairs of birds in the nesting place, returning to the wintering place and occupying the territory and beginning to build the nest, the incubation period, the emergence of young birds and leaving the territory [2-7]. Field data were compared with data on breeding birds of Central Europe and the Western Palearctic and adapted for the area of Croatia [8-10].

Material and Methods

Fieldtrips to differentpartsof Croatia, wecollected data on individualspeciesofnestingbirds. In addition to the data collectedinthefield, wealsoused literature data on thenestingseasonofbirdsincentralandsouthern Europe [11-15]. The target species of the ecological network are marked in red. NOTE: The attached table shows sensitive time periods, which refer to the beginning and end of the nesting season in Croatia. The start of the nesting season is here defined as the approximate earliest date of territory/nest establishment and egg-laying, and the end of the nesting season is defined as when the young leave the breeding territory. There will be some year-to-year variability in timeframes, and the dates listed here will not always represent (and therefore include) extreme variability. The dates are divided into blocks of 10 days each, so that each month consists of 3 decades.

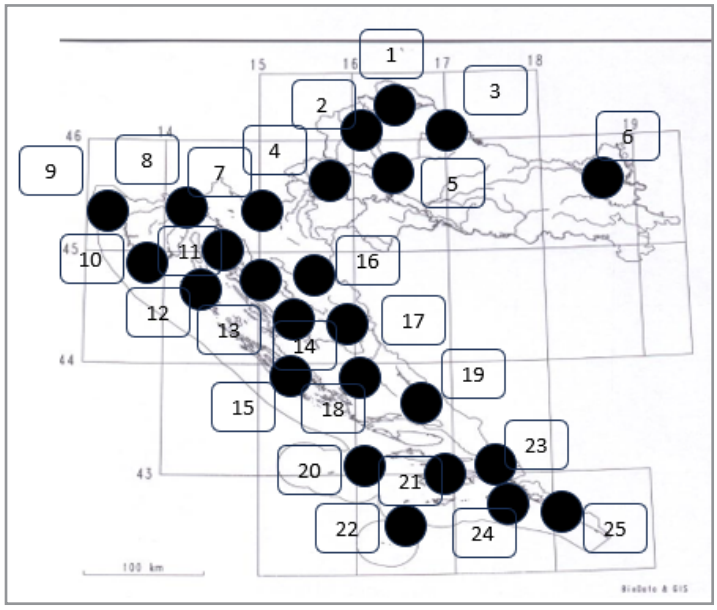

Figure 1: The areas of our field research in the nesting area during breeding season in different part of Croatia. 1. Varaždin and surrounding areas; 2. Hrvatsko Zagorje and surrounding areas; 3. Podravina and surrounding areas; 4. Zagreb, Karlovac and surrounding areas; 5. Posavina and surrounding areas; 6. Baranja and surrounding areas; 7., 8. Gorski kotar; 9., 10.Istra; 12. Kvarner; 13.,14.,15. North Dalmatia; 16. Lika; 17. Bukovica; 18. Middle Damatia; 19. Hinterland of middle Dalmatia; 20., 21., 22. Islands of middle Dalmatia; 23.,24., 25. South Dalmatia.

Results

The breeding season for each of the 240 breeding bird species is shown (tab.2). The target species of the ecological network, 100 of them, are especially highlighted. The earliest nesting is shown by the Golden Eagle, which intensively performs nuptial flights in the territory from the first decade of January, and its nesting season is the longest and lasts until the second decade of July. Some , already start their courtships flights at the end of September, which occasionally continue until the end of December. A similar type of nesting was recorded in the Eurasian Griffon Vulture. Practically, both species only have a month and a half without significant activity throughout the year, which makes it difficult to capture and build in nature. For the seabirds, the Shag starts nesting in December and continues until the end of May. The Gray Heron also has a long nesting period from the first decade of February to the end of June a full five months.

Scopoli s Shearwater started nests from the first decade of April until the end of September. A very long period of 5 months.

Yelkouan Shearwater, for comparisson, a little earlier from the second decade of February until the second decade of July.

Among Owls, the longest nesting period is the Tawny Owl, and the period is very long and is five months from the beginning of January to the end of May.

The mountain woodpecker already marks its territory at the beginning of March, and the nesting period ends at the end of May, when the young birds disperse to new forest areas after becoming independent. The course of nesting is particularly significant for 98 target species of nesting birds important for the area of the ecological network. Among the game birds, the longest nesting period is for the Quail, whose season lasts from mid May to the mid August, and Rock Partridge, from mid April to the end of June. Due to nesting on the ground, the female, brood and young are threatened by various predators. For waterfowls, the longest nesting period was recorded in the Mute Swan and Mallard from the beginning of April to the end of the second decade of July, more than three and a half months. Collared Dove and Feral Pigeon, as a species which breeding nearly exclusively within human habitatas, their breeding seasons lasts through whole year, and similar is recently noted for the Wood Pigeon, whose population started to breed inside human settlements. A long nesting period has also been recorded in the Pallid Swift. The shortest nesting period is recorded for migratory songbirds that return late from their wintering grounds, e.g. Oive-tree Warbler, Marsh Warbler. Nesting begins after returning from the wintering grounds in the third decade of May and lasts until the end of July, a little longer than two months. In the Ortolan and Black-headed Bunting, nesting begins in the third decade of May and lasts until the end of the second decade of July. The Black-headed Bunting already leaves its breeding range in August. Among the songbirds, there is a special possibility of nesting for the crossbill, which, especially in years with a large yield of cone seeds, can nest from the first decade of January until the second decade of July, i.e. in the month of December. By Passerines the Ravens nesting period is from the third decade of January to the end of May.

Table 1: Breeding birds species in Croatia and breeding range by decades. The total number of target species important for the ecological network Natura 2000 is 100. : Table 1

The threat of nesting birds and the number of threatened species at the national level is best shown in tab. 2, fig. 2.

Table 2: Endangerment of Croatian breeding birds, according Red data book.

Endangermentvategory	Numberofspecimens	Total numberofendangeredspecies
Lc - stabile	147	
Nt – nearthreatend	26	
VU –sensitive	14	90
EN - endangered	25	
CR – criticallyendangered	25	
NA- hard to estimate	3	
Total	240	

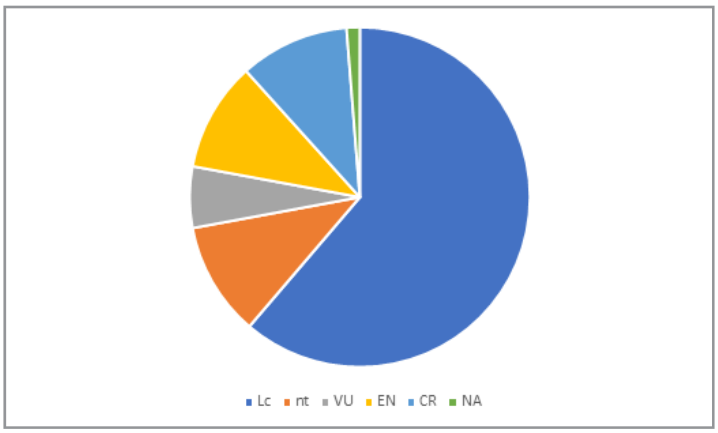

Figure 2: Endangermentof Croatian Breedingbirds.

Out of 240 recorded nesting birds, 147 of them have a stable number, tab 2, fig. 3., while 90 species are classified into one of the endangered categories.The total number of target species important for the ecological network is 100.

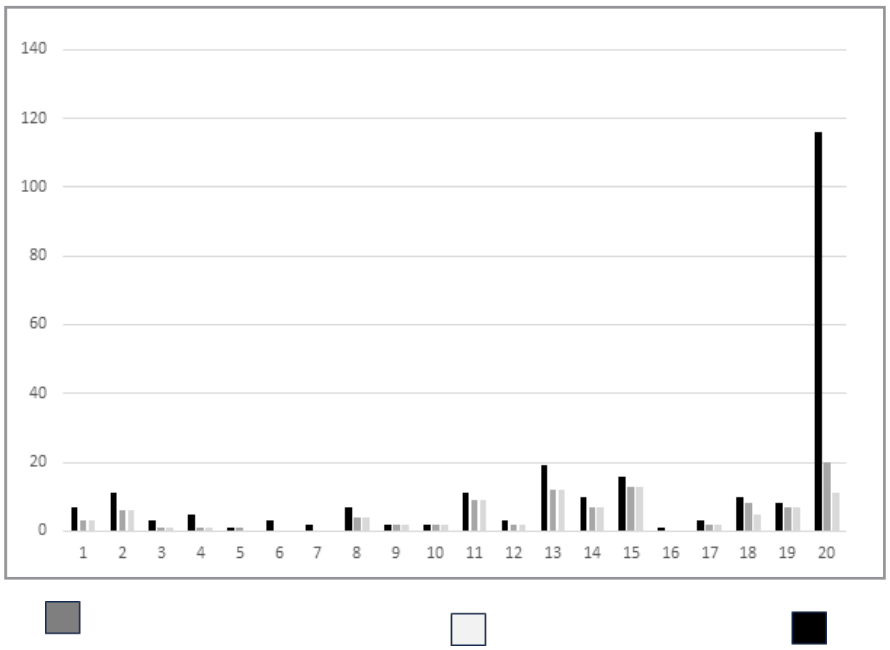

Figure 3: Birds orders and total breeding species per order ; number of important Natura 2000 species and endangered species in Croatia. 1. Galliformes7-3-3; 2. Anseriformes 11-6-6; 3. Podicipediformes 3-1-1-; 4. Columbiformes 5-1-1; 5. Caprimulgiformes 1-1-0; 6. Apodiformes 3-0-0; 7.Cuculiformes 2-0-0; 8. Gruiformes 7-4-4; 9. Procelariformes 2-2-2; 10. Ciconiiformes 2-2-2; 11. Ardeiformes11-9-9; 12. Pelecaniformes 3-2-2; 13. Charadriiformes 19 – 12-12;14. Strigiformes10 – 7-7; 15. Accipitriformes16-13-13; 16. Bucerotiformes 1-0-0; 17. Coraciiformes 3-2-1; 18. Piciiformes9-7-5; 19.Falconiformes 8-7-7;20. Passeriformes 116– 21-11.

Discussion

Until now, the data on the breeding range for bird species breeding in Croatia were not summarized. For this reason, based on field trips from 1974 to the present day, we collected and summarized the data on the nesting range of 240 recorded Croatian species of breeding birds, tab. 2, in different Croatian regions. The very long nesting range of certain birds of prey, which are increasingly endangered in Croatia, is particularly noticeable, and when planning interventions in nature, special attention should be paid to critically endangered (CR), endangered (EN), sensitive (VU) and near-endangered species (Nt). In Croatia, 90 endangered species have been recorded so far, of each are classified in one of the endangered categories, and 147 species are stabile for now, tab. 3,. The nesting range for 240 species of nesting birds in Croatia enables the planning of works outside the ecological network and can contribute to the postponement of works in the nesting season when pairs of birds are in a sensitive nesting phase, especially Raptores in protected areas or in ecological network [16].

Summary

The breeding range of Croatian 240 breeding species is shown tabularly. Based on field research since 1974, to date, in different part of Croatia, the breeding period for each species is divided into decades during the year. Thus, for each species, the range of breeding is shown, from the formation of pairs and possession of territory to the release of young and the abandonment of breeding territory. Analyzing the abundance of individual species, 147 species have a stable abundance, while 90 species are classified in one of the threatened categories. Important are 98 target species of the ecological network were selected, which are important in monitoring the condition and quality of habitats in the ecological network,especially when planning new interventions in nature near the ecological network.

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