The pressure of raptors and their damages on Avocet (Recurvirostra avosetta) colonies in central Hungary

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ABSTRACT

There is a contradiction concerning some nesting sites, where protected and non-protected raptors regularly frustrate the breeding of strictly protected waders, and as a result the reproductive success is low. The study area, the Böddi-szék sodic pan and its catchment area is one of the most important alkaline habitats in the Carpathian Basin located in the central part of Hungary managed by the Kiskunság National Park. Its environment has been changed to a significant extent due to anthropogenic effects which lead to disturbance in the special nutrient cycle of the sodic pan and the fragmentation of the habitats. A LIFE-Nature project was granted in year 2013 with the aim to restore the original water dynamics, the special nutrient cycle and natural habitats.

The shorebirds have an important role in that ecosystem. The peak number of Avocet in post-breeding gathering was 628 individuals, with extraordinary low ratio of young birds. According to our observations the normal breeding of Avocets usually in April is regularly spoiled by different predator species, mostly by Hooded Crow (Corvus cornix), Jackdaw (Corvus monedula), Marsh Harrier (Circus aeruginosus). The density of the Red Fox (Vulpes vulpes) and the Wild Boar (Sus scrofa) had significantly been increased in the last few decades causing a permanent pressure on ground-nesting birds. Only a few late-breeder pairs of Avocet were able to rear their young successfully. Further studies would be essential how to to control the number of predators on these important breeding sites of Avocet.

Figure 1.: Dried-out lakebed of the sodic pan Böddi-szék, the study area

Figure 2.: Areal view of the study area

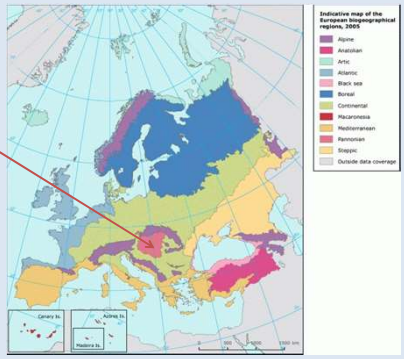

Figure 3.: Location of the Pannonian bio-geographical region in Europe

Introduction

Pannonian salt steppes and salt marshes occur only in a few countries of the European Union, mainly in the Pannonian bio-geographical region. The largest surface area and the centre of distribution of this habitat type is in Hungary, 99% of the Natura 2000 habitat type 1530 occurs in Hungary. Salt steppes and their associated salt-tolerant herbaceous communities are the western representatives of the continental alkaline vegetation in the Pontic region [1]. Within this region, the Carpathian Basin is the western border area of the sodic ecosystem range of Eurasia where characteristic continental soda pans occurs.

The ecological criteria of the natural astatic soda pans were stated recently to the total lowland territory of the Carpathian Basin, where the astatic soda pans are located. These most important criteria are: water body is shallow with bare pan bed (completely lack of marshland or grassland vegetation); the annual average of salinity exceeds 1 g/L and the presence of soda indicator species or characteristic flora and fauna [2]. According to this definition Böddi-szék is a characteristic sodic pan and is one of the most important of such wetland habitats in the Carpathian Basin located in the central part of Hungary. The extent of its area is significant with 18% of the open water surface sodic pans in Hungary [3].

Sodic pans with open water surface differ significantly from the real lakes because of their special hydrological background and nutrient cycle [4, 5]. This phenomenon is of utmost importance for the conservation of their characteristic and valuable flora and fauna.

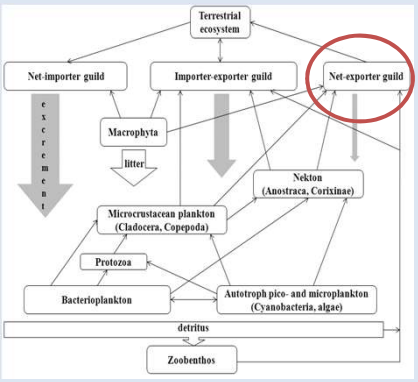

Figure 4.: The most important trophic relationships of the characteristic turbid alkaline soda waters, like the study area. The grey arrows represent the volume of inorganic and organic excrements of aquatic birds, serving as inorganic nutrients for autrotrophic plankton and organic nutrients for heterotrophic organisms. The white arrows represent the litter of macrophytes and other detritus of the water column. The simple arrows represent the most important trophic relationships [4].

The above-mentioned trophic relationships demonstrate a well balanced unique ecosystem, where the aquatic birds play a key role in bottom up and top down regulation at the same time [4]. The bird species which feed exclusively outside of the open soda water bodies, but they use these waters as assembling and roosting sites (e.g. Anser-species) are mainly responsible for the external nutrient load. Their bottom up function in the regulation of the trophic relation is essential [5]. Those species which are feeding partly (e.g. most Anas species and certain Charadriiformes species) or exclusively (most Charadriiformes species) inside soda waters play role in the top down control regulation of the trophic relationship by successfully feeding of their pray (mainly Microcrustacean plankton and Nectonic species [6; 7; 8] in a short period.

Figure 5.: Recurvirostra avosetta is a character wader species of the site

Most wader species belong to the net-exporter guild, since they rather feed on macrozoobenthos and invertebrate nekton [6], which is a typical top-down control regulation.

Waders can remove 87% of their invertebrate prey in a short period [9].

The most important species of the net-exporter guild from the avifauna of Böddi-szék are the shorebirds. A few species of them feeding partly outside the sodic pan as well, like the Lapwing (*Vanellus vanellus*), and the Common Redshank (*Tringa totanus*), but also the Kentish Plover in a different way. The Black-winged Stilt (*Himantopus himantopus*) and especially the Avocet (*Recurvirostra avosetta*) however are feeding especially from the sodic pan during their stay in the Pannon Biogeographical Region. Other waders are passage migrant birds of the area, like the Spotted Redshank (*Tringa erythropus*), the Wood Sandpiper (*Tringa glareola*), the Common Greenshank (*Tringa nebularia*), the Marsh Sandpiper (*Tringa stagnatilis*) and from the calidrids mainly the Dunlin (*Calidris alpina*), the Curlew Sandpiper (*Calidris ferruginea*) and the Little Stint (*Calidris minuta*) which are feeding only from the water as well [10].

Unfortunately, there has been a dramatic loss of soda pans during the last few decades [3]. According to ecological importance and threatening factors, the international importance of most characteristic soda pans was taken into account from 1979 by the Ramsar Convention based upon the specific criteria of migratory aquatic bird populations as well as Special Protection Area of birds and Special Areas of Conservation in Natura 2000 network by unique habitats criteria (according to [Directives 79/409/EEC and 92/43/EEC]).

A LIFE-Nature project was granted in year 2013 (LIFE12 NAT/HU/001188) with the aim to restore the original water dynamics and natural habitats.

Sodic pans are extremely sensitive for the anthropogenic threatening factors, like fragmentation and the decrease of the ground water due to water management. For this reason this sodic pans with open water surface are endangered habitats in the Pannonian biogeographical region [5]. Based on this, the conservation or the restoration of this open surface ecological succession state of the 1530 Natura 2000 habitat type is of utmost importance.

Main threatening factors on the project area:

1.Draining, hindering of natural turbulence and habitat fragmentation due to the canal crossing the sodic lakebed

2.Lack of appropriate grazing

3. Increased predation pressure due to fragmented area

Figure 6.: Fragmented area due to a bisecting canal

Character bird species of the sodic pan ecosystem: the Avocet (Recurvirostra avosetta)

The Avocet is a migrating breeding bird in Hungary. Its country wide population number is about four hundred breeding pairs [11]. The species is spending usually 8 month (sometimes 9 or 10 months) in Hungary, between February and October (November). The studied area, the Böddi-szék is one of the best habitat for Avocet, where its peak number could reach 628 individuals in post breeding gathering time [10]. The reason of this preference is the excellent food supply. The zooplankton rich in micro-crustaceans, mainly from the Cladocera group: Arctodiaptomus spinosus, Cyclops spp. , which is the preferred food of the avocet

Figure 7.: Excellent food supply for avocets in the sodic pan

There are two basic **problems of protecting the Avocet** in that area. The first problem is a "trap-situation". The excellent food supply attract great number of Avocet, which find their food, and at the same time they should breed as well. During the field study however we have observed several times Hooded Crow attacks, Marsh Harrier attacks to the Avocet breeding pairs or to the colonies. Due to this disturbation no chicks were reared in a colony of about 15 breeding pairs in 2014, the raptors made impossible the successful breeding. The following raptor species were observed during the fieldwork on the area: Red Fox (*Vulpes vulpes*), Eurasian Badger (*Meles meles*), some corvids: Hooded Crow, Jackdow (*Corvus monedula*), Rook (*Corvus frugilegus*), and the most important accipitrids, the Marsh Harrier (*Circus aeruginosus*).

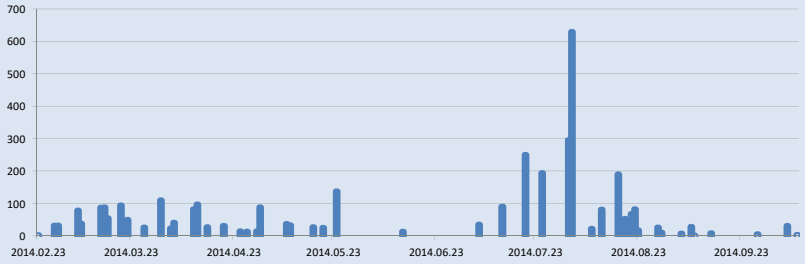

Figure 8.: Number of Avocet individuals at the Böddi-szék in 2014 (data from 50 observations day)

In the last few years the Wildboar (*Sus scrofa*) has also appeared and its number is increasing, their tracks can be observed even in the sodic pan bed as well [10]. Predators can easily approach Avocet colonies, since the area is fragmented and the dense marsh vegetation patches [12] offer good hiding opportunities.

Table 1.: The life cycle elements of Avocets at the Böddi-szék during a year

		Januray			February			March			April			May			June			July			August			September			October			November			December		
LIFE CYCLE ELEMENTS		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Pre breeding period	First arrivals																																					
	Mass arrivals																																					
Breeding period	Normal breeding time																																					
	Late breeding time																																					
Post breeding period	Main gathering time																																					
	Scattered gatherings																																					

Investigating the period which Avocets are spending in the sodic pan ecosystem, different sections of the life cycle elements could be differentiated. During the pre-breeding period first arrivals of Avocets can be observed usually in late February or early March. They are followed by the mass arrivals usually in the second and the third decade of March. The breeding time starts in early April and finishes about at the end of July, sometimes in early August. *The reason of this long breeding period is the intensive predating pressure in the first half of the breeding time, which is considered as the normal breeding time.* Since this is also the breeding period of the raptors, when they are rearing their offspring, the predation pressure is high. Predators are in a constant search for pray, and Avocet nests on open places or the flightless downy nestlings are easy to prey. Adult avocets try to chase away the intruder, but mostly without success. The corvids and the Marsh Harrier predate in daytime while the Wildboar, the Red Fox and the Eurasian Badger predate in the night. Nearly all breeding attempt of Avocet became unsuccessful by raptors in year 2014.

During the second part of the breeding time however the late breeders seem to be more successful. The reason of their success could be explained as follows: 1.) Only few number of late breeders; 2.) More scattered breeding pattern in the area; 3.) The raptors already have finished their own breeding cycle.

Conclusions

The LIFE-Nature project's overall objective is the restoration of the original water dynamics and natural habitats of the sodic lake and its catchment area, which is one of the most important of such habitats in the Carpathian Basin located in the central part of the Kiskunság. Böddi-szék is a priority habitat of the Natura 2000 network in Europe and the area is also protected in Hungary by national law. By reducing the fragmentation of the area as the result of the LIFE Nature project, the predation pressure is expected to be diminished as well. Analysing the breeding situation of the character species *Recurvirostra avosetta*, the predator control is a key element in the protection of the species, which plays important role in the top down regulation of the whole sodic pan ecosystem as representative of the net exporter guild.

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