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Habitat selection of the Shelduck *Tadorna tadorna* (Aves: Anseriformes) in Evros Delta, Greece

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Abstract. Evros Delta is the most important wetland habitat in Greece. Thousands of aquatic birds use to breed and winter in the area but the reduction of the habitat is still continuing. We used road transects and Shelduck *Tadorna tadorna* habitat selection was recorded. Based on Ivlev's electivity index, Shelducks have a preference for places with sweet and salted/brackish waters. Food availability and abundance are the key factors that influence the Shelduck movements in Evros Delta. Actions are required to maintain these habitats in order to protect the Shelduck population in the area.

Key words: aquatic birds, habitat, Shelduck, Evros Delta, Greece.

Introduction

The dramatic reduction of wetlands extend is a major subject of discussion for many years. Deltas are very important ornithological sites since birds are attracted by the estuaries taking advantage of their high food availability and the variety of their dwellings. Many rare species used Evros Delta for breeding, wintering and as a stopover site during migration, but thoughtless human activities caused a significant shrinkage of the wetland with negative impacts in the status of the populations (PARASKEVOPOULOS *et al.*, 1993). The major threats of the Evros Delta habitats were reported from SCHEPERS *et al.* (1990) and these are drainage, extensive cultivations, canalization, pumping ground-water etc. which have already affected bird population and distribution. Habitat destruction and fragmentation caused many problems worldwide, reducing bird populations to a lower level (NEWTON, 1998), and this emphasizes the meaning of understanding the ecological requirements of the wildlife species. The protection and the management of the key habitats for aquatic birds, requires the knowledge of the habitat selection during foraging activities.

Shelduck (*Tadorna tadorna*) is evaluated as Least Concern species and its European breeding population is relatively small (<65.000 pairs) but the population size is stable or increasing (BIRDLIFE INTERNATIONAL, 2009). It is a common wintering and breeding bird in Evros Delta (STUART *et al*. 1990) but data on the population status in Greece, remains unknown. However, local studies provide some useful information about the

populations of the Shelduck (HAILEY & GOUTNER, 2002) in Greek wetlands.

The aim of our study was to evaluate the most important habitats for the Shelduck in Evros Delta during the breeding season.

Material and methods

The study was carried out in Evros Delta wetland (40° 47'N, 26° 05'E) which covers a surface of 20.000 ha and 9.500 of them are under protection from the RAMSAR convention. The climate is of Mediterranean type, the mean annual precipitation is about 560 mm, the mean annual temperature is 15°C and the warmer period of the year is during August (PARASKEVOPOULOS *et al.*, 1993).

Evros Delta is a natural wetland of international importance, used by many rare and threatened bird species e.g. Lesser White-fronted Goose (*Anser erythropus*), Red-breasted Goose (*Branta ruficollis*), Collared Pranticole (*Glareola pratincola*) and Slender-billed Curlew (*Numenius tenuirostris*) in the previous years (GOUTNER & KAZANTZIDIS, 1989; HANDRINOS & GOUTNER, 1990; GOUTNER, 1997). The most common mammals in the study area that were observed accidentally form the first author during surveys were Golden jackal (*Canis aureus*), Badger (*Meles meles*), Red fox (*Vulpes vulpes*) and Wild cat (*Felis sylvestris*). Moreover, the area is gazed by numerous cows.

Surveys were conducted during the period March – June 2008 and only adult birds were recorded. Road transects, 47 km in length each, were carried out ten times (470 km in total) using a car, with an average speed of 25 km/h and all data were collected one hour after dawn until noon. The main route was along the main bund of the Delta, which is served as the main entrance for the area and passed through the six different habitats. Its height was about 3m and bird observations were made as far as possible using 10x42 binoculars. Observations from raised points are a commonly used method in wetlands and birds can be viewed without disturbance from a long distance (BIBBY *et al.*, 2000). Moreover road transects are practical in large open areas for conspicuous species (MEUNIER *et al.*, 2000).

Breeding pairs and non-breeding flocks were all included in the analysis. When a flock of birds was seen, habitat type that was used at the specific time was recorded. Habitat surveyed was categorized into six types: salted/brackish water, grasslands, tamarisks, reeds, inland sweet waters and cultivated fields (BABALONAS, 1979; GOUTNER, 1983; PARASKEVOPOULOS *et al.*, 1993). Other habitats of the area were coastal islets and riverside forests but they were not surveyed due to inaccessibility.

We used Ivlev's electivity index (JACOBS, 1974) to indicate habitat selection. Electivity varies from -1.0 to +1.0, where -1.0 indicates avoidance and +1.0 preferences for a particular habitat. The formula is:

$$Ei = \frac{r_i - p_i}{r_i - p_i - 2r_i p_i},$$

where r_i is the proportion of shelducks observed over habitat i and p_i is the proportion of habitat i in the study area. The proportions of available habitats were obtained from FOREST SERVICE OF ALEXANDROUPOLIS (2009).

Results and Discussion

We counted 1453 individuals of Shelducks at 6 habitats during ten surveys within the breeding season in Evros Delta. During observations it became apparent that Shelducks were using areas with salted/brackish and inland water all over the breeding season and Ivlev's electivity index was 0.492 and 0.334 respectively. Highest bird abundance was recorded on these habitats, which accounted for >50% of all birds counted and feeding was the most common behavior. Moreover, areas with *Tamarix* sp. and reeds were avoided (Table 1). Grasslands were used only from breeding pairs or colonies during nest prospecting, laying and incubation period. All birds were recorded in a distance of >50 meters from the bund. Problems of wetland degradation and their impact on wildlife were reported many years ago for Greece (HOFFMAN, 1989).

Several ornithological studies were conducted in Evros Delta many years ago (e.g. GOUTNER & ECONOMIDIS, 1986; GOUTNER, 1990) but comparative data for the habitat shrinkage and the effect on the aquatic birds populations is missing.

Table 1. *Habitat selection based on the Ivlev's electivity index of the Shelduck in Evros Delta, Greece.*

Habitat category	Birds observed	Proportion of the habitat %	Ivlev's electivity index
Cultivated areas	156	37.3	-0.664
Tamarix sp.	10	8.0	-0.852
Grasslands	535	28.6	0.185
Reeds	2	0.9	-0.723
Inland waters	357	14.0	0.334
Salted/brackish waters	393	11.2	0.492

This study emphasizes the importance of some habitats in the most important Greek wetland. Places with water (salted or sweet) seem to attract the Shelducks and most of the waterfowl species, in all stages of the breeding season but these areas are highly irrigated (GERAKIS & KALBURTJI, 1998) and available foraging habitats during summer are absent. Moreover, the most important species in the diet of the Shelduck is the small, hard-shelled mollusc *Hydrobia* (BUXTON & YOUNG, 1981; PATTERSON, 1982) and it can be found in large quantities in the Evros Delta especially in salted/brackish waters (KEVREKIDIS *et al.,* 1996). This can explain the Shelduck preference, for this type of habitat. Tamarisks and reeds are highly avoided, proving their typical desire for coastal places (PATTERSON, 1982). Therefore, Shelduck habitat selection is strongly depended on mollusk occurrence and abundance.

The continuing decrease of the available foraging habitat will have negative effects on the Shelduck population within following years. Local authorities should pay attention on preventing the damage of this international importance wetland.

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