

## Habitat Selection of Oystercatchers in the Zohre Mudflats in Iran

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**Abstract:** Ecological relations between foragers and their prey items in oystercatcher population (*Haematopus ostralegus*), were studied in Zohre river mudflats. Results showed that cockles from *Cardidae* family (*Trachycardium sp.* and *Laevicardium sp.*) constitute the main food items of oystercatchers. Regression analysis showed that there is no significant relationship between patch selection by oystercatchers and cockles density. Meanwhile ANOVA showed significant relationship between mudflats patch area and patch selection by studied oystercatchers.

**Key words:** Mudflats · Prey and predator · Habitat selection · Shorebirds · Iran

### INTRODUCTION

Large numbers of mollusk-eating oystercatchers (*Haematopus ostralegus*) congregate outside the breeding season in the zohre river estuary's mudflats in the south of Iran whereas they can find diverse feeding items particularly the cockles from *Cardidae* family [1,2]. Food availability plays a crucial role in virtually every aspect of bird's life, including their geographical distribution, reproductive success, habitat selection, migration and territoriality [3,4]. According to the Ideal free distribution theory [5] foragers should select a patch that maximizes received energy while expensing the lowest costs. Royama [6] and Hassell and May [7] showed that shorebirds congregate in areas of high prey density. Custard *et al.* [8] found that prey density alone was insufficient to account for the distribution of oystercatchers feeding upon mussels such as *Mytilus edulis*. Some investigations showed that patch selection in foraging crab plovers that feed on crabs are completely dependent to density or activity of fiddler crabs so Crab plovers select the patch that provides them the most crab density [9,2]. Esmailifar [1] showed that oystercatchers forage in lower parts of the river off from estuary in the high tide times. Since in such habitat, high tides periodically force shorebirds off mudflats and because of limited time for foraging it seem that the birds must choose patches that can get the highest intake. The overall goal of this study was to test how the prey density and patch area affect oystercatchers habitat use in low tide.

### MATERIALS AND METHODS

**Study Area:** This study was conducted at the Zohre river estuary mudflats in Sajjafi fishing harbor in the Mahshahr province, Iran (30° 10' N, 49° 30' E) between August 2009 to November 2010. The maximum temperature in summer could soar up to 48 degrees Celsius while in winters the minimum temperature could fall around 2 degrees Celsius. The annual rainfall is 195 mm. Tides are semidiurnal and the maximum tidal height is 2.7 m, which is extended about 17 km from the estuary into the river. We used binoculars to scan the mudflats for the presence of oystercatchers. Sites were surveyed twice per month. Point surveys were usually conducted from the boat or other accessible areas. Nine major mudflat patches were traversed and each mudflat was divided into three to five point surveys, depending on the amount of available habitat. The duration of a survey depended on the number of birds and the amount of suitable habitat.

**Data Recording and Statistical Analysis:** For studying feeding habits of oystercatchers, 12 individuals were hunted and their stomach content were analyzed. Meanwhile their breeding areas at Ghabre-Nakhoda Island were investigated for potential remained food items. Direct feeding behavior monitoring was used as well. The density of the oystercatchers were recorded via line transect methods as well as, variable circular plot method (VCP) [10]. Then the following formula [11] birds was used to bird density estimation which "r" is covered radical distance,  $N_1$  and  $N_2$  show number of individuals had been seen with respect to the r radius (100 m).

$$D = \frac{L_n \left( \frac{N_1}{N_2} \right) N_1}{\pi r^2}$$

For cockle's population density estimation, quadrat method was used. Cockle's population densities were calculated from using 30 randomly distributed squared quadrates (1 ×1m) for each mudflat patch [12]. Surveys were conducted only in low tide conditions.

Regression Analysis was used to distinguish the relationships between oystercatcher population densities and patch area and cockles density. ANOVA was used for detecting differences between different mudflats patches.

## RESULTS

Analyzing stomach content of hunted oystercatchers and direct sighting as well as examination of shells around the breeding nests showed that this species feed mainly on cockles from *Cardidae* family, especially *Trachycardium lacunosum* (lacuna cockle). Mean cockles densities per each patch differed significantly among the nine patches ( $Z = 6.53, P < 0.001$ ). Cockles density was significantly higher in nearest patch to the estuary (Tukey's multiple comparison test,  $P < 0.05$ ). Regression analysis showed that there is no significant correlation between oystercatcher and used cockles density ( $R = 0.07, P < 0.005$ ). Patch area positively affect oystercatcher patch selection as the largest patch was selected first and then the smaller patches were used while water rising. ANOVA analysis showed that habitat area (ANOVA:  $F = 24.13, P < 0.005$ ) significantly affect patch selection by oystercatchers but this is not a case for cockles density (ANOVA:  $F = 14.11, P < 0.005$ ).

## DISCUSSION

Many studies emphasis that food availability plays a crucial role in every aspect of shorebird's habitat selection but in case of oystercatchers this seems true in macrohabitat scale, since feeding items density don't affect its habitat selection at microhabitat scale [3]. Oystercatchers select the largest patch area for feeding during low tide. This is because of maximizing received energy while feeding in large groups [5]. Royama [6] and Hassell and May [7] showed that shorebirds congregate in areas of high prey density. Similar to Custard *et al.* study [8], we found that prey density alone is insufficient to account for the distribution of oystercatchers feeding upon lacuna cockles although this is not true for some other shorebirds such crab plovers that completely

dependent to crabs density [2,9]. Since high tides periodically force oystercatchers off from estuary mudflats and there is limiting time for foraging, they forage on the largest mudflats patch at first then lower parts of the river off from estuary were selected.

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