



The preliminary study on feeding behavior of male and female little egret (*Egretta garzetta*) in mangrove and rice field habitats based on peck frequency

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ABSTRACT

The objective of the present study was to study the differences in feeding behavior from peck frequency and type of diets, between male and female little egret (*Egretta garzetta*) in two different habitats, mangrove and rice fields of Banda Aceh, Sumatra, Indonesia. Focal animal sampling was used to study the feeding behavior of randomly selected birds from 07.00 AM to 06.00 PM in July 2015. Statistical analysis was conducted using t-test to test for differences between male and female peck frequency and habitats. For the combined data of both males and females, the average peck frequency of little egret (*E. garzetta*) observed in the mangrove and rice fields was 238.8 and 226.2 respectively. Male *E. garzetta* peck frequency observed was 240 pecks in mangrove habitat while female peck frequency was 225 pecks in rice field habitat. The results of our study showed that there is a significant difference in the peck frequency of little egrets observed in the two habitats (mangrove and rice fields) and between male and female *E. garzetta*.

Keywords: Feeding behavior, henceforth, *Egretta garzetta*, mangrove, rice fields

INTRODUCTION

The little egret (*Egretta garzetta*) is a moderate-sized water bird commonly found in mangrove and rice fields of tropical countries such as Indonesia (Elfidasari, 2008). The little egret is included in the list of protected birds according to Government Regulation of Republic of Indonesia No. 7 of 1999 (Fachrul, 2007). This species is listed at vulnerable category in the International Union for the IUCN Red List (BLI 2015). Thus, this bird needs protection to ensure that they continue to thrive in their environment. There has been a steady decline in the population of the little egret due to the lack of protection, loss of habitat and hunting pressures that exist. Furthermore there is a lack of conservation awareness that leads to a further decline of the little egret (Gustama, 2011). The little egret is a member of the heron family (Ardeidae) and can be identified by its pure white feathers; elongated, sinuous neck; long, black legs and dark, stabbing bill (Cezilly, 1992). An opportunistic hunter, the little egret is highly dependent on visual cues when hunting and feeding mainly during the day whilst walking through shallow, open water, stabbing prey with its bill (Kazantzidis and Goutner, 1996). It feeds primarily on small fish, which are usually around 1.2 to 6 cm in length, but bivalves, crustaceans and other invertebrates are also consumed (Elfidasari, 2008).

Other studies that have focused on feeding behavior of the little egret in various parts of its range include Hafner *et al.* (1986), Fasola and Alieri (1992), Hafner and Dugan (1985). Little egrets are able to exploit various types of habitat and feed on available food in the area, for example they prey on different types of fish (Elfidasari, 2005) in the mangrove area and on insects in rice field and ponds surrounding the rice fields. In this study, we compare two feeding sites, rice fields and mangroves and test for differences based on peck frequency between males and females in two different habitats that harbor various types of food.

MATERIALS AND METHODS

Time and Site

This study was conducted in two different habitats in Aceh Besar District, Aceh Province, Indonesia. Two type of habitats namely mangrove and rice field were used to compare the feeding behavior of little egret between male and female. The mangrove habitat is situated in Lamnga Village and rice fields are situated in Lambitra Village (Figure 1 and Figure 2). The survey was conducted from 2 July to 26 July 2015

Sampling Procedure and Data Analysis

Sampling sites were selected using purposive sampling technique in mangrove and rice field habitat. Focal animal sampling method (Altmann, 1974) was used to observe little egret feeding behavior in the two habitats using a pair of binoculars, stopwatch and tally counter. Observation focused on the selected animal for observing their feeding activity including kind of food, peck frequency of food. T-test was used to know the differences between peck frequency of males and females in the two different habitats.

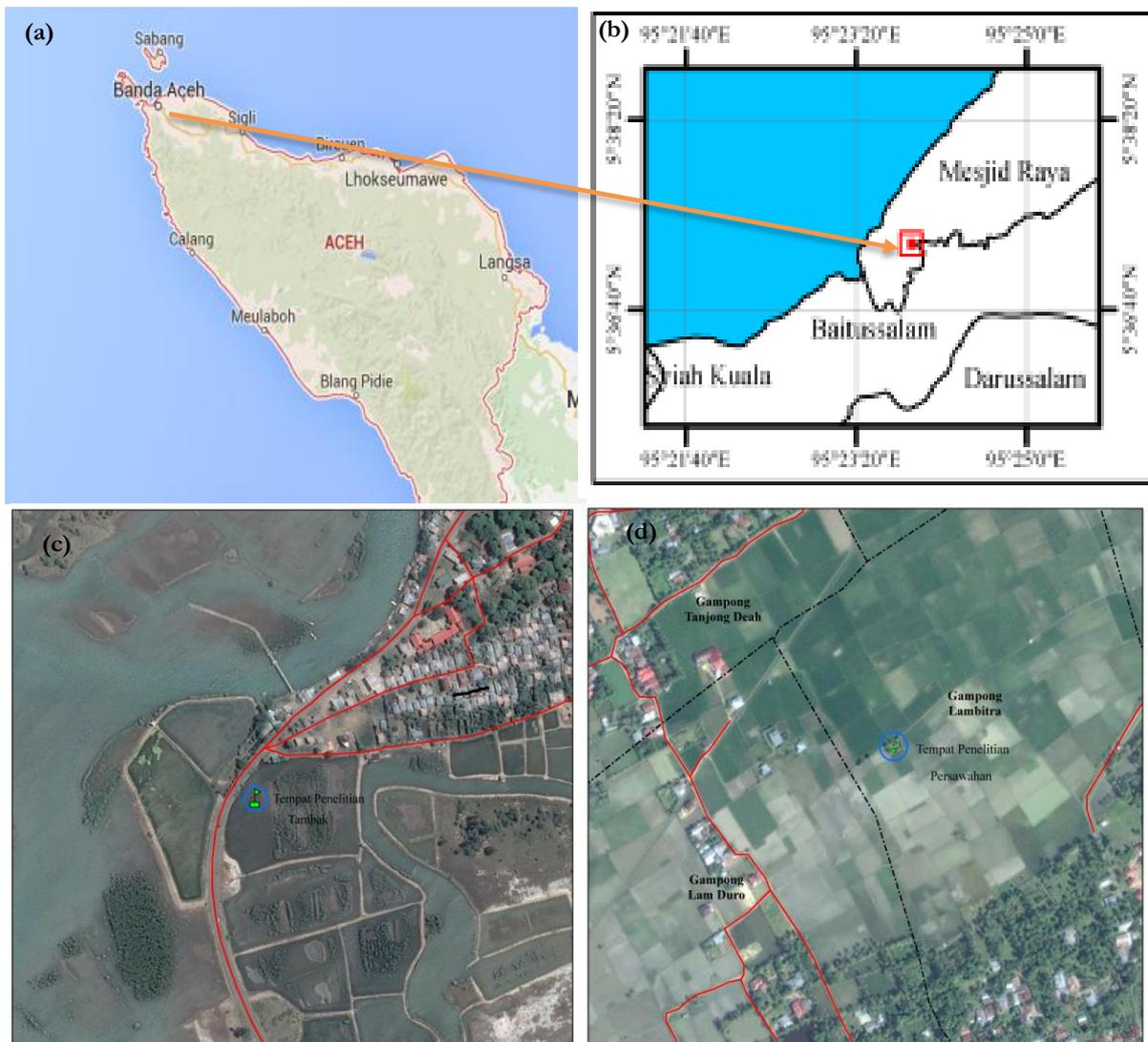


Figure 1. The map of Aceh Province (a) showing the study location (b), sampling site of mangrove habitat (c), sampling site of rice field (d)



RESULTS AND DISCUSSION

Univariate analysis was conducted to know the differences in the feeding behavior of little egret (*E. garzetta*). Variables used in the univariate analysis included peck frequency of male and female little egrets, habitat type (mangrove and rice fields), and the type of diets in these two habitats. Results indicated that the highest peck frequency in mangrove and rice fields is 238.8 and 226.2 respectively which occurred from 07.00 - 08.00 AM for both habitats during the ten day observation period (Table 1, Figure 1). The average peck frequency of habitat male and female little egret was 240 and 225 pecks, and the highest one was from 07.00 AM to 08.00 AM during ten days observation period (Table 1, Figure 2).

Results indicated that the diets of both male and female little egret is different in mangrove and rice field. This difference was large due to the difference in the types of food available in these two areas. In mangrove areas, shrimp (*Penaeus* spp.) and fish (*Periophthalmu* sp.) species were mostly found, while grasshoppers (*Dissosteira carolina*) and beetles (*Aulacophora foveicollis*) were mostly consumed in rice fields. A peck frequency of 0.78 (product moment correlation r_{xy}) was obtained (Table 2, Figure 3). The results of the t-test that tested for differences in the peck frequency of little egrets in the two habitats showed that the null hypothesis (H_0) can be rejected, meaning that there were differences in the peck frequency in the two habitats, mangrove and rice fields. The Pearson product-moment correlation coefficient for peck frequency between male and female little egret in mangrove area was 0.43 (Figure 4).

Results of the t-test conducted to test for differences between male and female little egret in mangrove habitat indicated that there was a difference between peck frequency thereby rejecting the null (H_0) hypothesis. The Pearson product-moment correlation coefficient (product moment correlation r_{xy}) for peck frequency between male and female little egret in rice fields was 0.24 (Figure 3). Results of the t-test conducted to test for differences between male and female little egret in rice fields indicated that there was a difference between peck frequency thereby rejecting the null (H_0) hypothesis.

Although behavioral differences in the peck frequency between male and female little egret (*E. garzetta*) in the two different habitats are observed, our results indicated that a broad similarity in behavioral pattern exhibited while feeding. Both sexes exhibited distinct peaks in feeding activity during the early morning (07:00-08:00 am). This may occur when low oxygen forces fish or prawns to the surface (Hafner *et al.*, 1993), leading to an increased peck frequency in mangrove forests, while such a pattern of increased peck frequency was likely to be seen in rice fields in response to atmospheric temperature, as reduced peck frequency was seen from 01:00-02:00 pm which is likely to be the hottest time of the day when the birds may not be as active as at other times.

This research also indicated that both mangrove and rice field habitats play an important role as a feeding habitat for little egrets. The presence of little egrets in both habitats indicated that they take the opportunity to use both sites as source of food when they are available. The higher peck frequency of little egrets in rice field habitat may be related to the abundance of available food. In the other feeding habitats, where other types of prey were available (Kazantzidis and Goutner, 1996), reduction in foraging intensity was attributed to prey scarcity. Differences in peck frequency and success of little egrets in different habitats frequently reflect differences in prey density and availability in the relevant habitats (Erwin *et al.*, 1985). Prey behavior also plays a role (Fasola and Ghidini, 1983; Kersten *et al.*, 1991) in peck frequency recorded. Any differences in prey availability, abundance and behavior. Little egrets have also been observed to feed by joining other birds to form single and mixed species aggregations thus increasing or decreasing the peck frequency depending on whether they are feeding alone or in aggregations.

Studies showed that the use of rice fields provides birds with the opportunity to use complementary habitats, particularly during breeding, which has been found to be beneficial to foraging success (Hafner *et al.*, 1993). Furthermore, better understanding about prey productivity and cycles in the area is needed for habitat management purposes. This will ensure that little egrets can be conserved.

Table 1. The time of observation along with peck frequency of male and female little egret (*Egretta garzetta*) in mangrove habitat and rice fields

Time	Mangrove Habitat				Rice fields				Male (Mangrove and Rice fields)		Female (Mangrove and Rice fields)	
	Male	Female	Peck Frequency	Mean	Male	Female	Peck Frequency	Mean	Peck frequency	Mean	Peck frequency	Mean
07.00-	2472	2304	4776	238.8	2328	2196	4524	226.2	4800	240	4500	225
08.00-	2166	2058	4224	211.2	1890	1770	3660	183	4056	202.8	3828	191.4
09.00-	1530	1314	2844	142.2	1212	1086	2298	114.9	2742	137.1	2400	120
10.00-	1050	942	1992	99.6	1026	894	1920	96	2076	103.8	1836	91.8
11.00-	750	208	958	47.9	624	534	1158	57.9	1374	68.7	1158	57.9
12.00-	678	570	1248	62.4	546	432	978	48.9	1224	61.2	1002	50.1
01.00-	462	348	810	40.5	390	312	702	35.1	852	42.6	660	33
01.00-	924	786	1710	85.5	1032	906	1938	96.9	1956	97.8	1692	84.6
03.00-	618	480	1098	54.9	630	498	1128	56.4	1248	62.4	978	48.9
04.00-	942	816	1758	87.9	918	804	1722	86.1	1974	98.7	1620	81
05.00-	318	234	552	27.6	318	252	570	28.5	636	31.8	486	24.3

Table 2. The correlation between habitats (mangrove and rice fields), sex (male and female little egret) in mangrove habitat and rice fields

Day	Habitat					Sex (Mangrove)					Sex (Rice fields)				
	Mangrove (X)	Rice field (Y)	X.Y	X ²	Y ²	Male (X)	Female (Y)	X.Y	X ²	Y ²	Male (X)	Female (Y)	X.Y	X ²	Y ²
1	2148	1992	4278.8	4613.9	3968.0	1134	1014	1149.8	1285.9	1028.1	1068	924	86.8	1140.6	853.7
2	2190	2178	4769.8	4796.1	4743.6	1170	1020	1193.4	1368.9	1040.4	1158	1020	81.1	1340.9	1040.4
3	2514	2220	5581.0	6320.1	48.400	1350	1164	1571.4	1822.5	1354.8	1152	1068	230.3	1327.11	1140.6
4	2310	2004	4629.2	5336.1	4016.0	1230	1080	1328.4	1512.9	1166.4	1032	972	003.1	1065.0	944.7
5	1950	1932	3767.4	3802.5	3732.6	1098	852	935.4	1205.6	725.9	1092	840	17.2	1192.4	705.6
6	2196	2226	4888.2	4822.4	4955.0	1152	1044	1202.6	1327.1	1089.9	1182	1044	234.0	1397.1	1089.9
7	2394	2310	5530.1	5731.2	5336.1	1242	1152	1430.7	1542.5	1327.1	1194	1116	332.5	1425.6	1245.5
8	2274	2070	4707.1	5171.0	4284.9	1182	1092	1290.7	1397.1	1192.4	1050	1020	071.0	1102.5	1040.4
9	2190	2124	4651.5	4796.1	4511.3	1164	1026	1194.2	1354.8	1052.6	1146	978	120.7	1313.3	956.4
10	2178	2112	4599.9	4743.6	4.460.5	1200	978	1173.6	1440	956.4	1096	10020	0981.9	1201.2	100.4

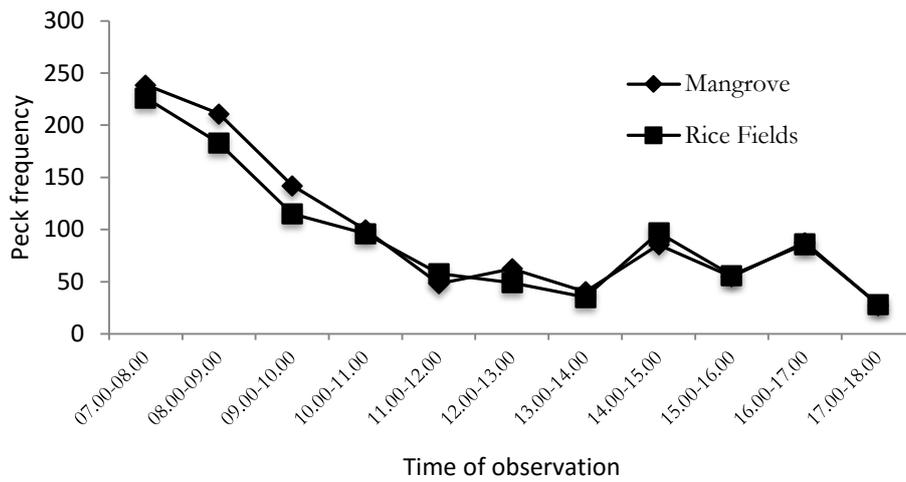


Figure 2. The average of peck frequency of little egret (*E. garzetta*) in mangrove and rice field habitat.

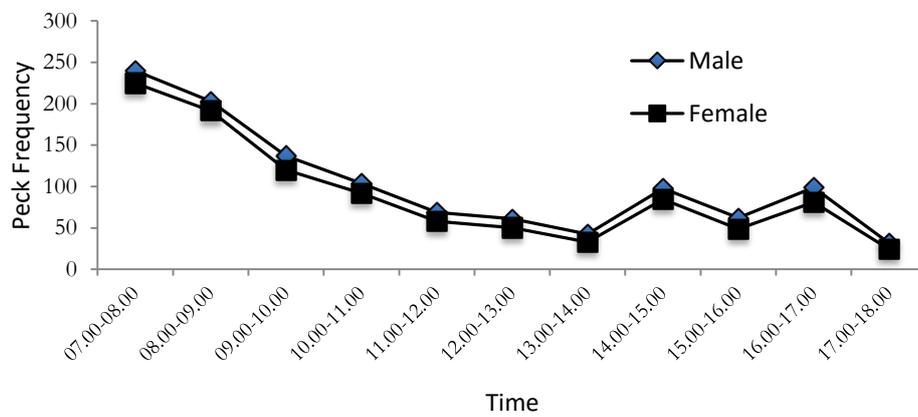


Figure 3. The average of peck frequency of male and female little Egret (*E. garzetta*) in two habitats, mangrove and rice field, combined.

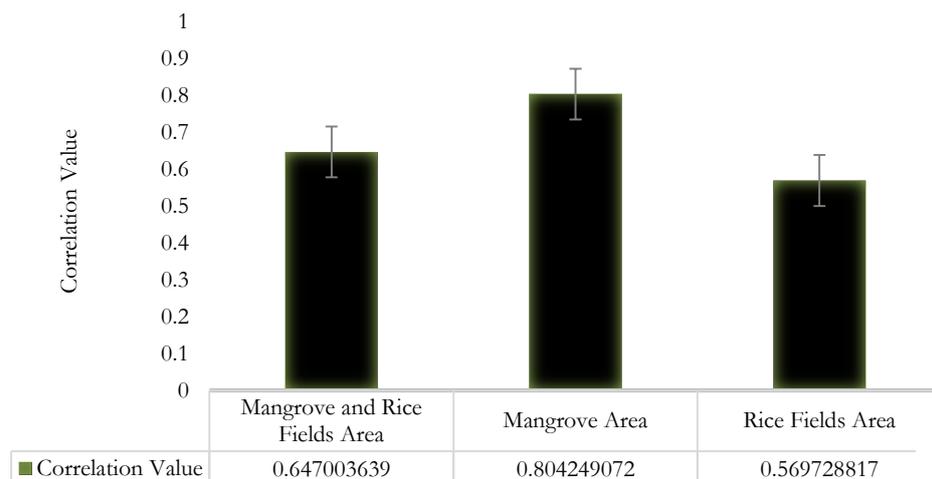


Figure 4. The correlation test product moment in the two habitats.

CONCLUSIONS

There are differences between male and female little egret in mangrove habitat base on peck frequency. Both mangrove and rice field habitats play the important role as a feeding habitat for little egrets. The presence of little egrets in both habitats indicated that they take the opportunity to use both sites as source of food when they are available. The higher peck frequency of little egrets in rice field habitat may be related to the abundance of available food.

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Received: 5 April 2016

Accepted: 14 June 2015