Nest Characteristics and Clutch Size of *Prinia inornata* (Sykes, 1832) At Shwe Hlan Bo Lake Environs, Sintkaing Township, Mandalay Region

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Abstract

The total number of 81 nests and 241 eggs were found during April 2018 to January, 2019. The highest number of nests was found in September (15 nests). All nests were rather longer and pendant shaped and clutch size ranged from two to four eggs. The highest nest was found in Site II (26 nests). The most preference of nest site or nest plant was *Typha amgustifolia* (19 nests, 23%). Among seven nest plants, the correlation between nest area and nest volume were no significantly in *Saccharum spp* 1 and *Saccharum spp* 2 ($p>0.05$), the rests five nest plants (*Abutilon indicum* , *Calotropis procera*, *Typha amgustifolia*, *Saccharum officinarum*, *Cymbapogon citrates*) were significantly found ($p<0.05$). The correlation between nest height and eggs number were moderately negative correlation in three plants species (*Abutilon indicum, Calotropis procera, Saccharum officinarum*) the rests of two plants species strongly positive correlation (*Typha amgustifolia* and *Saccharum sp*1) ($p<0.05$) and the other two plants species week positive correlation(*Saccharum sp*1 and *Cymbapogon citrates*) ($p>0.05$) in the study area. Shwe Hlan Bo Lake environs appeared suitable nesting site for *Prinia inornata*, because this lake edged with inundated area, the abundance of suitable of nest plants, rich in food resources, and very little human disturbances.

Key words: Nest, Nest volume, Nest height, Clutch size and Nest plant

Introduction

Many animals build structures for protecting and raising their offspring during reproduction, which are usually called nests (Hansell 2000). Birds construct nests in a variety of different shapes, such as cups, domes, scrapes, or burrows and these acts as an extended phenotype (Collias and Collias, 1984).

During the breeding season, selection of the nest site of birds must maximize the potential for finding cover and protection from the sun, flood, predators etc. (Burger, 1985; Clark and Shutler, 1999; cited by Gill, 2007). The choice of nest site can influence whether the female survives in the nesting season and her eggs survive to hatch (Nergiz and Tabur, 2011). Nest sites vary from species to species. For breeding, most birds nest, which help them to incubate, or warm, the developing eggs, nests sometimes offer camouflage from predators and physical protection from the elements (Scott, 1997).

Nest building techniques and construction materials vary widely. Branches were mostly uesd and nests were built in hollow tree, lignum, reeds, rushes and dense stands of water plants (Scott, 1997). Birds lay from 1 to about 20 eggs per clutch. Clutch sizes can also vary within a single species. In many birds species, the clutch size tend to increase with latitude, that is tropical birds lay fewer eggs than their northern relative. (Wallance, 1963).

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2 Birds build nests to protect themselves, their eggs and their young from predators and n adverse weather. Other animals also built nests, but birds do so in a greater variety of materials, and on greater variety of sites (Gill, 2001).

The number of eggs a bird lays in one set is called the clutch. Clutch sizes can also vary within a single species. Some of these variations reflected genetic differences between individuals, ages, food availability and season (Gill, 2001). Birds construct nest in a variety of different shapes, such as cups, domes and scraps, pendant or borrow and these act as an extended phenotype (Collias and Collias, 1984).

Prinia inornata is a small warbler in the Cisticolidae family. It is a resident breeder from Pakistan and India to south China and Southeast Asia, typically found in wet lowland grassland, open woodland, scrub and sometimes gardens. The Plain Prinia builds its nest in shrub or tall grass and lays three to six eggs. These 13-15 cm long warblers have short rounded wings, a longish tail, strong legs and a short black bill (Roboson, 2016).

Plain Prinia (*Prinia inornata*) and their nests were observed from April, 2018 to November, 2018 in the study area. However, nest site characteristics, clutch size and nesting habitats of Plain Prinia was unknown. Therefore, *P inornata* of Shwe Hlan Bo Lake was chosen for this present study and aimed to investigate nest characteristics, to determine clutch size and egg dimension, to analyses the correlation between nest area and nest volume and to analyses the correlation between nest height and clutch size.

Materials and Methods

Study Area

For the present study, *Prinia inornata* was collected from Shwe Hlan Bo lake Environs is situated in the Sintkaing Township, Mandalay Region and lies between 21°46' 48.89" N - 21°49'26.26" N and 96°14'06.11" E - 96°14'05.80" E (Plate 1).

Study Period

The duration of study period lasted from April 2018 to January 2019.

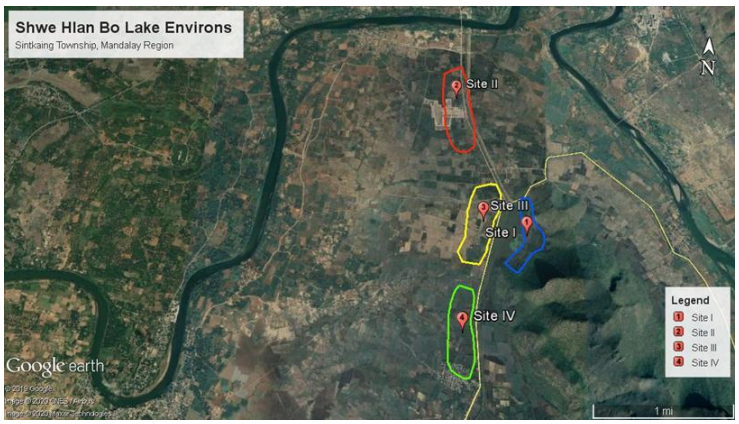

Plate 1 Location map of study area (Source: Google Earth, 2019)

Nest Searching

During the present study, nest searching was made at least twice per week. In breeding season, study site was visited daily or as required and nest was checked with used binoculars. Nest with eggs was recorded by digital camera.

Nest Characteristics

Nest types, nest width, nest length, nest depth, nest height above the ground surface and water surface, nest sighted date and nest numbers were recorded according to Peltingill (1985) and Soni *et al*. (2004). Nest plant species and nest materials were also classified according to Handley and Chit Ko Ko (1987).

Clutch Size and Egg

The number of eggs within each nest was noted. Egg breadth, egg width and description of eggs were measured by using digital clipper. Egg weight was taken by digital balance.

Data Analysis

Correlation between the mean nest height and the number of eggs (clutch size) was evaluated by ANOVA using SPSS software version 22. Nest area and nest volume were calculated following formula by Kosicki *et al*. (2007).

$$\text{Nest area} = \pi \times \frac{\text{nest length}}{2} \times \frac{\text{nest width}}{2}$$

$$\text{Nest Volume} = \text{nest height} \times \text{nest area}$$

Results

A total of 81 nests along with 241 eggs of *Prinia inornata* were recorded in Shwe Hlan Bo Lake Environs from April, 2018 to January, 2019 (Table 1).

Nest type, Nest Materials and Nesting Period

Nest was woven by using pliable materials from *Oryza* sp (Rice), *Saccharum* sp (Grasses) *and Imperata* sp (Grasses). Nest was pendant rather longer and pendant type structure. Nesting period of Plain Prinia was observed from April 2018 to the third week of November, 2018 in the study area (Plate 5 and Fig 2).

Nest Site or Nest plant

The study period, nests were found in three kinds of plants (*Abutilon indicum* (Country Mallon, Bauk-khway-galay), *Calotropis procera* (Swallo- wort/ Milk-weed, Mayo/ Mayo-gyi), *Typha amgustifolia* (Reed hace/ Lesser Cat's tail, Shin-mway-lon) and four kinds of grasses (*Saccharum officinarum* (Sugarcane, Kyan), *Saccharum* sp 1. (Grass, Myat), *Saccharum* sp 2 (Kaing Grass, Kaing Myat), *Cymbapogon citratus* (Lemon Grass, Sabalin) (Plate 2, 3, 4, 5, 6, 7 and 8).

Nest Number

During the study, ten nests were found in Site I, 26 nests in Site II, 22 nests in Site III and 23 nests in Site IV respectively and the highest of number of nest were found in September (15 nests) and the lowest number of nests were found in November (6 nests) (Fig 1).

Nest Site Preference

During the present study, the highest number of nests (19 nests, 23%) was found in *Typha amgustifolia* and followed after *Saccharum* sp. 2 (17 nests, 21%), *Abutilon indicum* (13 nests, 16%), *Calotropis procera* and *Saccharum spp* 1 (11 nests, 14%) in each and five nests, 6% in each *Saccharum officinarum* and *Cymbapogon citrates* (Table 2, 3, 4, 5 and Fig 2).

Clutch Size and Egg

A total of 81 nests with 241 eggs (29 eggs with Site I, 79 eggs with Site II, 67 eggs with Site III and 66 eggs with Site IV) were recorded in this study period. The clutch size of *Prinia inornata* ranged from two to four eggs. *Prinia inornata* eggs appeared glossy light blue with scattered reddish brown purple spots and blotches with fine lines (Table 1 and Plate 9).

The Correlation between Nest Area and Nest Volume

During this study, mean and standard deviation and r value of nest area and nest volume were calculated. Nest of *Abutilon indicum* (r = 0.84), *Calotropis procera* (r = 0.55), *Typha amgustifolia* (r = 0.93), *Saccharum officinarum* (r = 0.86) and *Cymbapogon citratus* (r = 0.89) were evaluated and therefore, there were significantly and strongly correlated nest area and nest volume in this five plant species ($p<0.05$). *Saccharum* sp 1 (r = 0.28) and nest of *Saccharum* sp 2 (r = 0.04) were calculated and therefore, there were significant difference between nest area and nest volume in this plant species ($p>0.05$) (Table 2).

The Correlation between Nest Height and Clutch Size

In the present study, correlation and calculate the mean and standard deviation of nest height and eggs number. Three plant species, *Abutilon indicum* (r = -0.511), *Calotropis procera* (r = -0.249), *Saccharum officinarum* (r = -0.449) between nest height and number of eggs, there were moderately negatively correlation ($p>0.05$). Another two-plant species, *Typha amgustifolia* (r = 0.493) and *Saccharum* sp1 (r = 0.791) between nest height and number of eggs, there were strongly positive correlation ($p<0.05$). The relationship of *Saccharum* sp 2 (r = 0.287) and *Cymbapogon citrates* (r = 0.539) between nest height and number of eggs, this two-plant species had weak positive correlation ($p>0.05$) (Table 3).

Plate 1 *P.prinia*

Plate 2 *A. indicum* with nest

Plate 3 *C. procera* with nest

Plate 4 *T. amgustifolia* with nest

Plate 5 *S. officinarum* with nest

Plate 6 *Saccharum* sp 2 with nest

Plate 7 *Saccharum* sp 1 with nest

Plate 8 *C. citratus* with nest

Plate 9 Clutch size of *P. Prinia*

Table 1 Number of nest and clutch size with plant species in study area during April 2018 to January 2019

No.	Nest Plant	Site I		Site II		Site III		Site IV		Total	
		Nest	Egg	Nest	Egg	Nest	Egg	Nest	Egg	Nest	Egg
1	*A. indicum*	3	8	4	13	2	7	5	16	14	44
2	*C. procera*	1	4	4	13	3	8	2	5	10	30
3	*T. amgustifolia*	3	9	6	15	5	15	5	16	19	55
4	*S. officinarum*	1	3	1	3	2	8	1	3	5	17
5	*Saccharum* sp 1	0	0	4	12	3	10	4	10	11	32
6	*Saccharum* sp 2	2	5	5	15	5	15	5	13	17	48
7	*C. citratus*	0	0	2	8	2	4	1	3	5	15
	Total	10	29	26	79	22	67	23	66	81	241

Table 2 Correlation between nest area and nest volume of study area, during April 2018 to January 2019

No.	Plant species	Area (cm^2)	Volume (cm^2)	r-value
		M ±SD	M ±SD	
1	*A. indicum*	79.93±4.42	7329.68±419.27	0.84
2	*C. procera*	73.57±1.59	5916.72±210.81	0.55
3	*T. amgustifolia*	79.24±7.09	7458.57±1017.27	0.93
4	*S. officinarum*	94.53±9.07	10961.6±2076.59	0.86
5	*Saccharum* sp 1	46.31±30.88	1774±1247.99	0.28
6	*Saccharum* sp 2	76.28±0.9	7073.92±552.15	0.04
7	*C. citratus*	52.32±34.93	3513.71±2355.49	0.89

Table 3 Correlation between nest height and clutch size at study area, during April 2018 to January 2019

No.	Plants Species	Plant Height (cm)	Clutch Size	r - value	p - value
		Mean±SD	Mean±SD		
1	*A. indicum*	91.73±11.4	3.08±0.76	-0.511	0.75
2	*C. procera*	80.85±6.05	3.09±0.83	-0.249	0.46
3	*T. amgustifolia*	91.81±14.74	4.47±7.2	0.493	0.03
4	*S. officinarum*	103.66±0.91	3.4±0.55	-0.449	0.45

5	*Saccharum* sp 1	41.91±6.67	2.91±1.14	0.791	0.004
6	*Saccharum* sp 2	92.97±16.12	2.82±0.64	0.287	0.26
7	*C. citratus*	67.5±3.92	3±1	0.539	0.35

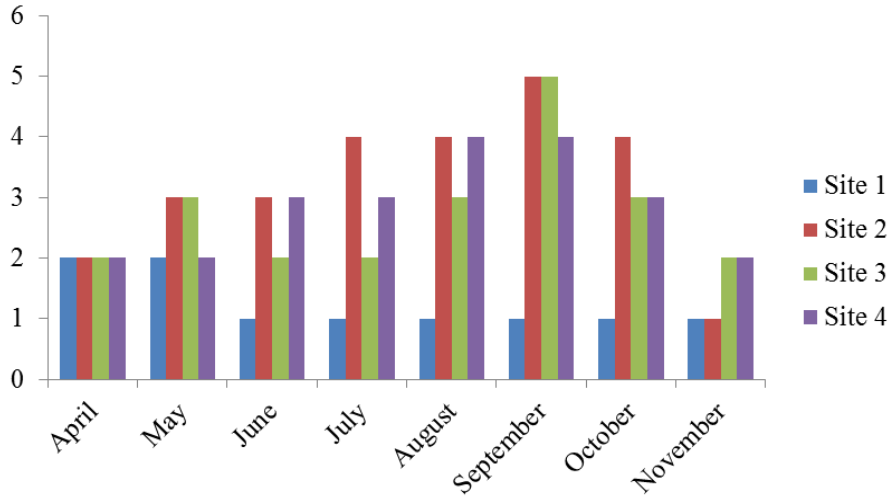

Fig. 2 Monthly recorded of nests number in study area, during April 2018 to January 2019

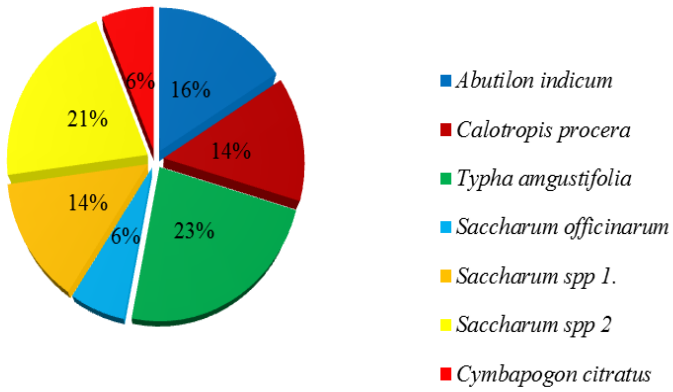

Fig. 1 Percentage of plant species of nest site selection, during April 2018 to January 2019

Discussion

A total of 81 Plain Prinia (*Prinia inornata*) nests were found in three kinds of plants and four kinds of grasses. The higher number of nests (19 nests, 23%) was found in *T. amgustifolia* and the lowest number of nest (five nests 6%) on *S. officinarum* and *C. citratus*. This study may be due to *T. amgustifolia* plant partly submerged on water and thus avoided threat from predators and other disturbance.

Zhitong (1985) was described, the breeding activities of *Prinia inornata* become apparent in April, with the first nest built at the beginning of May and their breeding period ends at the end of September or at the beginning of October in Kunming, Yunnan Province. In the present study, *Prinia inorna*t nesting time began April to November was observed. Therefore, this result was nearly similar Zhitong (1985).

During the present study, in Site I, a total number of 10 nests, the number of nests was the lowest among the nests recorded from the respective sites of study. The highest number of nests was found on *T. amgustifolia* (three nests) and the lowest number of a single nest on *S. officinarum*. Since this study site is usually inundated due to irrigation of the fields situated at the base of the hill, habitat was lost for the birds to take refuge and reproduce.

In Site II, 26 nests were recorded, the highest number of 6 nests was found on *T. amgustifolia* plant and the lowest number of one nest on *S. officinarum* plant. In the present research, the highest number of nests was found in Site II and alluded to the presence of cultivated fields, paddy field and the density of plants available to build nest is higher than other study sites.

Zhang *et al*. (2006) disclosed that related to the height of the vegetation and the height of the cover and there were higher numbers of shelters of construction of the nest, such vegetation conditions increase the safety and predation of the nest. The difficulty in finding the nests was found to reduce the predation risk of the nest. In this research, the highest numbers of nests were found in Site II, it may be due to the highest density of plant and decrease the risk of predators. The fact that Plain Prinia selected this site with taller and highest density cover their nests other sites to avoid predators and human disturbance.

In Site III, a total number of 22 nests were observed, the highest number of five nests was found on *T. amgustifolia* and *Saccharum* sp 2 and the lowest number of two nests on *A.indicum, S.officinarum* and *C. citrates*. In Site IV, 23 nests were recorded, the highest number of five nests was found on *T. amgustifolia* and *Saccharum* sp 2 each plants species and the lowest number of one nests on *S. officinarum* and *C. citrates*.

Lusk *et al*. (2003) and Pidgeon *et al*. (2003) reported, nests-site selection has been well studied in birds, and many studies have shown that microhabitat structure and plant species composition are related to both nest placement and success.

Gjerdrum *et al*. (2005) reported, the importance of vegetation structure makes sense if birds are selecting sites based primarily on their suitability for avoiding flooding or predation.

In the present study, Plain Prinia build nests preferred places of dense vegetation and irrespective of the height of plants but all Plain Prinia nests were covered by study plants where protection from predation and human disturbance are afforded.

Doig (1879) found a nest of Rufous-vented Prinia near the bank of a minor canal and build a nest nest some 20-40 cm above the ground in order to avoid ground predation by small mammals. Similarly, in the present study the lowest nest height was found above 40 cm on *Saccharum* sp 1 plant. This may be also due to reduce predation risk.

Baker (1924) reported the clutch size Rufous-vented Prinia is three to four eggs. In shape these were blunt and oval. In the present study, the clutch size was two to four and the shape of eggs are also blunt and oval. Therefore, this result is different with Baker (1942) and may be due to the different species.

In the present study, the highest number of 55 eggs in the nests on *T. amgustifolia* plant, 17 with eggs in the nests on *S. officinarum* and 15 eggs in nests on *C. citrates* the lowest number of nests recorded.

Pablo *et al*. (2010) observed the relationship between nest size (area and volume) and breeding success was that nests may be able to contain more fledglings than smaller ones, before abandonment, chicks must exercise their wings and make some flying attempts. In a small nest, chicks were at risk of falling from the nest, which would have negative consequences both for the chick and the breeding success of their parents. Thus, nest size may restrict breeding success.

During this period, nest area and nest volume on different plants recorded to be significantly correlated ($p<0.05$), except *Saccharum* sp 1 and *Saccharum* sp 2 ($p>0.05$) plant species

Amano *et al*. (2002) described density of vegetation at the nest site and nest height did not influence nesting successes. Avian predators such as corvids depend on visual cues, and activities of parent birds may be important cues for such predators and the effect of nest-site characteristics to predation may vary depending on the predator species (Hoover & Brittingham (1998)).

Amano *et al*. (2002) reported, high nest predation and failure to detect a significant relationship between nesting success and nest characters may be due to a varied predator community.

In the present research, correlation between the nest height and number of eggs encountered on the of three plant species (*A. indicum*, *C. procera*, *S. officinarum recorded* moderately negatively correlated, however on *T. amgustifolia* and *Saccharum* sp 1 positively correlated, but only positive relationship on *Saccharum* sp 2 and *C. citrates* plant species. As the study area appeared to have no apparent threat from the predators

Plain Prinia showed preference to stay near their nest, the *T. amgustifolia* and *Saccharum* sp 2 (among seven plant species) on which they erect their nests. Correlation between nest area and nest volume was significantly correlated, so also the clutch size was higher.

Shwe Hlan Bo Lake environs therefore appeared a suitable nesting site for *Prinia inornata*, because of the eco-friendly nature of the area with abundant vegetation for their choice to build nests, moreover is rich in food sources and very little anthropogenic disturbances.

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