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Macrophytes used as the nesting material by Indian sarus crane (*Grus antigone*) in Sehore district of Madhya Pradesh

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Abstract
Macrophytes are the common and main nesting material used by Indian Sarus crane *(Grus antigone).* About 38 nest were examined between the period 2015 and 2017, the nesting material and their availability during the study period was observed as well. Data obtained from the observations of nesting materials and the characteristics of nesting sites for a period of almost three years shows that Sarus use locally available plant materials for nest building. Dominant macrophytes used were *Ipomea aquatica* (47.36%), followed by *Typha domingensis* (34.49%) and *Scripus littoralis* (31.84%). A trend was observed that Sarus crane uses readily available heap of *Ipomea aquatica* as a bedding material for nest building, hence requiring less time for nest building. It was also observed that the dominant plant materials such as *Ipomea aquatica, Typha domingensis* and *Scripus littoralis* provide benefits to the nesting Sarus as, large biomass for making nest and provides camouflage to the chicks to freeze when an intruder comes into nesting territory.

Keywords: sarus crane, macrophytes, nesting materials

Introduction

Macrophytes refers to the large plants having at least their vegetative parts in and around the wetland habitats permanently or periodically. Wetlands are considered as the most productive ecosystems, they play an integral role in maintaining the ecological balance and make the ecosystem. According to Land use Landover information (LULC) of India for the year (2018-19), the country has only 4.26% (109.92 L Ha) of its total geographical area (3281.55 L Ha) as water bodies in the form of Rivers, Lakes, Reservoirs and Ponds). Madhya Pradesh state in central India has 2.59% (7.98 L Ha) of its total geographical area (308.04 L Ha) as water bodies, while the study area Sehore district has 2.05 % (0.135 L Ha) land cover as water bodies of its total area (6.6 L Ha) (Vishal, *et al.*, 2020; Mohit *et al.*, 2018) [1, 2].

Cranes have thrived in the Landscapes containing wetlands over millennia. Most crane species depend on the vegetative cover, safety, and aquatic food sources provided by wetlands eventually during their yearly cycle, ordinarily during nesting and chick-raising. Wetlands additionally are significant for providing secure roosting and foraging grounds consistently. Henceforth, the accessibility and quality of wetlands are critically important for cranes, impacting their dispersion, movement, and reproductive success. Conversion of wetland habitats was viewed as the main factor influencing cranes all throughout the planet when the Crane Action Plan was distributed in 1996 (Meine and Archibald 1996) [3] and is at present the second most significant danger distinguished influencing cranes after the dams and water redirections. Loss and degradation of wetlands are viewed as an essential factor for decline of many crane populations (Tirshem *et al.*, 2015) [4].

Sarus crane (*Grus antigone*) is the world's tallest flying bird in the world with populations well spread across the tropics and sub- tropics of South-East Asia, South Asia and Australia.(Sundar and Choudhury, 2005) [5]. Indian Sarus crane is rapidly declining due to escalating agricultural expansion and deterioration of wetland habitats (Miene & Archibald, 1996) [3]. In India, Uttar Pradesh has the highest breeding population of Sarus crane (Sundar 2009) [6].Gujarat and Rajasthan holds a significant population of breeding Sarus crane, while central India is least studied. The present study provides the information about the nesting materials used by Sarus crane in the region. Sarus crane is a marsh nesting bird, nest site selection involves the suitable site to build a nest and it usually occurs just before egg laying (Archibald *et al.*, 2003) [7]. Breeding ecology of the Indian Sarus crane was studied in Sehore district of Madhya Pradesh in Central India from 2015 to 2017. The breeding season of Sarus crane in the region starts soon after the onset of south-west monsoon and remains till February.

Study Area

Sehore district is situated in central part of Madhya Pradesh. District has five Tehsils and five blocks with an area of 6579 km^2 lying between the North latitude of 22^o 33$'$25$''$ & 23^{o}40$'$25$''$ and East longitudes 78^o 26$'$ 00$''$& 78^o 26$'$ 00$''$. The district is surrounded by Vidisha and Raisen districts in the East, Shajapur and Rajgarh in the West, Guna district in the North and Hoshangabad & Dewas in the South.

Sehore district is a part of Malwa plateau with an undulating topography; it occupies the Narmada and Chambal basin valley and is predominately agricultural. Wheat, rice, jawar, maize and soybean are the major crops sown in the area.

Fig 1: Map Showing the Study area

Climate and Rainfall

Climate: Climate of Sehore district can be grouped into four seasons. Theperiod between the last week of November till the ending February is considered as winter season. Summer season starts from March and lasts till the third week of June. The Southwest monsoon commences from mid-June to ending September, October and November constitutes the retreating monsoon or post monsoon**.**

Rainfall: The average annual rainfall during the study period was 1190.36 mm. The highest rainfall i.e. 1460.3mm was recorded in the year 2016, During the Southwest monsoon period i.e. between June to September about 95% of the annual rainfall occurs. In the month of July the region receives the highest amount of rainfall about 41% of the yearly precipitation. Only 5% of the annual rainfall takes place in the winter and summer months (October to May). (Bharti, 2017) [8].

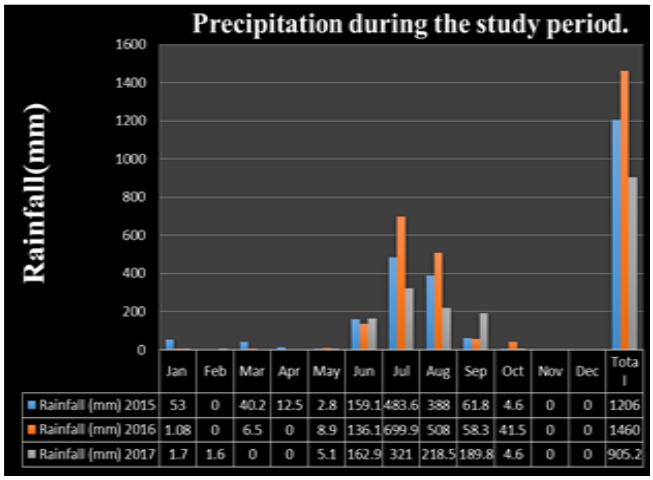


Fig 2: Chart showing rainfall during the study period.

Methodology

We used two kinds of survey to spot the nesting pairs; one survey was done during the monsoon period (July to third week of September). The other survey was done in the post monsoon period from last week of September to ending February; Nest survey was done four times a month from June 2015 to December 2017. Most of the nests were located during the initial stage of nest building; all the nests were inaccessible by motor vehicle and hence were approached on feet. Specimens of the nesting materials were collected from the nearby area of the nest for identification only after the bird was disturbed by some factor.45 nests were monitored during the study period and the specimens of nesting material from 38 nests were collected for identification. Other parameters like the seasonality of the nesting materials and their characteristics were also taken into consideration.

Table 1: Showing list of Plant materials used for Nesting

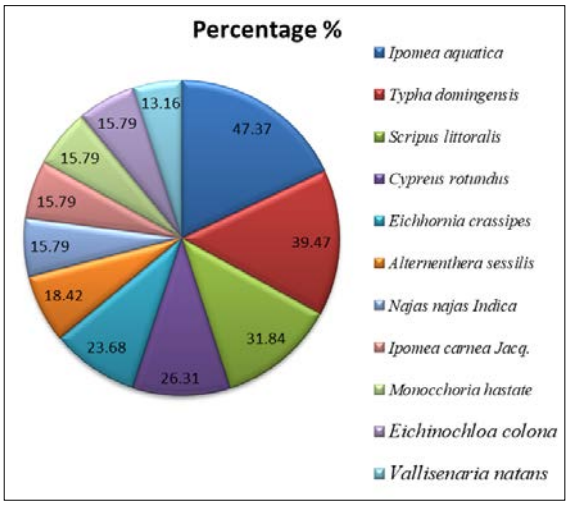
S.No	Botanical Name	Family	F1	%
1	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	4	10.52
2	*Ceratophyllum demersum* L.	Ceratophyllaceae	1	2.63
3	*Najas indica* (Willd.) cham.	Hydrocharitaceae	6	15.79
4	*Nechamandra alternifolia* (Roxb.ex wight)	Hydrocharitaceae	2	5.27
5	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae	1	2.63
6	*Vallisenaria natans* (Lour.)	Hydrocharitaceae	5	13.16
7	*Eichhornia crassipes* (Mart.) solms	Pontederiaceae	9	23.68
8	*Nymphoides hydrophylla* (Lour.) Kuntze	Menyanthaceae	4	10.52
9	*Pistia stratiotes* L.	Waraceae	2	5.27
10	*Potamogenton crispus* L.	Potamogentonaceae	1	2.63
11	*Ampleopteris prolifera* (Retz.) Copel.	Thelypteridaceae	2	5.27
12	*Eriocaulon cinereum* (R.Br.)	Eriocaulaceae	3	7.89
13	*Hydrocharis-morsus ranae* L.	Hydrocharitaceae	2	5.27
14	*Hydrolea zeylanica* (L.) Vahl.	Hydroleaceae	1	2.63
15	*Ipomea aquatic* Forssk.	convolvulaceae	18	47.37
16	*Ipomea carnea* Jacq.	convolvulaceae	6	15.79
17	*Isoestes coromandeliana* L.f.	Isoetaceae	2	5.27
18	*Monocchoria hastate* (L.) solms	Pontederiaceae	6	15.79
19	*Typha domingensis* Pers.	Typhaceae	15	39.47
20	*Alternenthera sessilis* (L.) R.Br.ex DC	Amaranthaceae	7	18.42
21	*Bacopa monnieri* (L.) Wettst	Plantaginaceae	4	10.52
22	*Celosia argentea* L.	Amaranthaceae	1	2.63
23	*Colocasia esculanta* (L.) Schott	Araceae	3	7.89
24	*Commelina erecta* L.	Commelinaceae	2	5.27
25	*Cypreus rotundus* L.	Cyperaceae	10	26.31
26	*Eichinochloa Colona* (L.) Link.	Poaceae	6	15.79
27	*Scripus littoralis* Schrad	Cyperaceae	12	31.84
28	*Ludwigia adscendens* H.Hara.	Onagraceae	4	10.52
29	*Portulaca oleracea* (L.)	Portulacaceae	1	2.63
30	*Sacchrum bengalense* Retz	Poaceae	2	5.27
31	*Vetiveria zizaniodes* (L.)Nash.	Poaceae	4	10.52
32	*Cyanodon dactylon* (L.) Pers.	Poaceae	5	13.16

F1 = Frequency (Number of times a plant material is recorded in nests).
% = Percentage.

Results

Sarus crane uses a variety of macrophytes as nesting material that is easily available in the vicinity of the nest site. Among the nesting materials used, the frequency of *ipomea aquatica* (47.36%) was highest, followed by *Typha domingensis* (34.49%) and *Scripus littoralis* (31.84%). Nesting materials like *Cyperus rotundus* (26.31%),

Eichhornia crassipes (23.68%) and *Alternenthera sessilis, (*18.42%) were used in moderate frequency. Other macrophytes such as *Ipomea carnea, (*15.79*%) Najas indica* (15.78), *Valisenaria natans* (13.16%) were used in semi moderate frequency. Plant materials like *Ludwigia adsendens*, *Cyanodon dactylon*, *Hydrilla verticellata*, *Bacopa monnieri*, *Nymphoides hydrophylla*, and others were used in low frequency. During this study, the breeding season of the Sarus crane extends from July to February. It was observed that, the plant materials that are available almost throughout the year around the nesting habitat were used more frequently for nesting. Nest Building activity started two to three days before egg laying, both the sexes are involved in the nest building activity. Collection of the nesting material is done by uprooting the plant materials and piled up into a heap of vegetation. It requires 30 to 52 hours for the preparation of nest platform, often the cranes were seen using the readily available heap of macrophytes such as *Ipomea aquatica*, *Scripus littoralis, and Typha domingensis.* Hence, required less than 30 hours for nest building in some cases. These were also the dominant plant materials used for nesting, observations of almost three years reflects other characteristics like *Ipomea aquatica* provides a readymade platform for nest building while *Scripus littoralis* and *Typha domingensis* provide huge biomass for nest building and also provides safety to the chicks. Hence, these three species provide other benefits to the nesting cranes and ultimately adds value to their nesting success



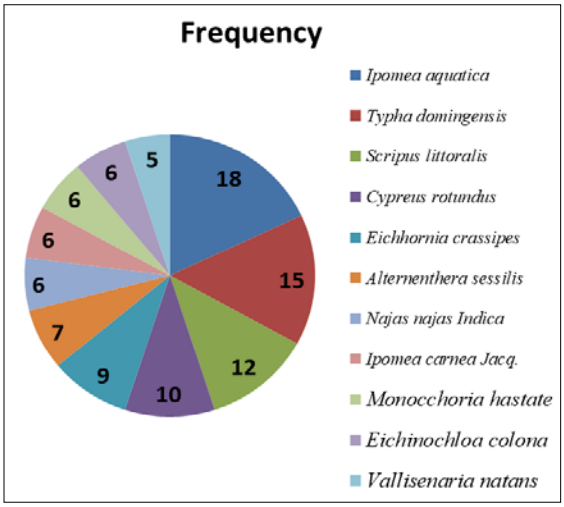


Fig 3: Chart showing the Percentage and Frequency of dominant plant materials.

Photoplate A: Observation of Nest & Eggs of Sarus Crane

Photoplate B: Parental care by the Parent Sarus Crane

Discussion

The Sarus crane collected nest material from the area immediate to the nest site. Previous studies on the use of nesting material by the Sarus crane was done by (Kandarp, 2007) [9], where, 28 plant species were identified within the Agricultural marshland in Kheda district of Gujarat state. 23 plant species of medicinal importance used by Sarus as nesting material was recorded from the Alwara Lake of Uttar Pradesh (Ashok & Verma 2016) [10]. In the present study we have recorded 32 species of macrophytes used for nesting in Non-Agricultural marshland with and *Typha domingensis* as dominant plant material. The Sandhill Crane also used different plant materials while nesting in different habitats (Prakash & Verma 2016b) [11] In cranes, both the sexes perform the activity of nest building, therefore a visible labor of division between the pairs is present, hence requiring less time for nest building and energy conservation for incubation duties (Mrutyumjaya, 2007) [12]. Previous authors provide information about the number of nesting materials but, did not gave emphasis on their significance. In the present study we observed that the dominant plant materials used for nesting provides additional support like *Ipomea aquatica* provides a readymade bedding material for nest building therefore, it takes less time for Sarus crane to build the nest. Nesting materials like *Scipus littoralis* and Typha *domingensis* provides good biomass for nest building and in addition, they provide camouflage and safety to the growing chicks from predators and trespassers (Ramachandran & Vijayan, 1994) [13].

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