



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2022; 10(6): 101-107

© 2022 JEZS

Received: 03-06-2022

Accepted: 08-07-2022

Rajesh Kumar

Department of Zoology, Shyama Prashad Mukharji Govt. Science and Commerce, Bhopal, Madhya Pradesh, India

Rabia Jahangir

Department of Botany, GGM Science College, Jammu, Jammu and Kashmir, India

Suchitra Banerjee

Department of Biotechnology, Institute for Excellence in Higher Education, Bhopal, Madhya Pradesh, India

Sanjay Telang

Department of Zoology, Shyama Prashad Mukharji Govt. Science and Commerce, Bhopal, Madhya Pradesh, India

Aman Sharma

Department of Zoology, Shyama Prashad Mukharji Govt. Science and Commerce, Shanshah Garden Bhopal, Madhya Pradesh, India

Brijesh Sharma

Department of Biotechnology, Institute for Excellence in Higher Education, Shanshah Garden Bhopal, Madhya Pradesh, India

Corresponding Author:**Rajesh Kumar**

Department of Zoology, Shyama Prashad Mukharji Govt. Science and Commerce, Bhopal, Madhya Pradesh, India

Comparison of marshland plant species used as the nesting material by Indian sarus crane (*Grus antigone*) in Bhopal and Raisen districts of Madhya Pradesh

Rajesh Kumar, Rabia Jahangir, Suchitra Banerjee, Sanjay Telang, Aman Sharma and Brijesh Sharma

DOI: <https://doi.org/10.22271/j.ento.2022.v10.i6b.9094>

Abstract

Sarus crane is a marsh nesting bird and uses a variety of plants to build their nests. During the study 84 nests were examined in Bhopal and Raisen districts between 2015 and 2018. Data collected from the observations of nests and the physical characteristics of the respective nesting sites over a period of four years showed that, Sarus crane used local plant species for nest building that are easily available in the vicinity of the nest site. In Bhopal district 21 plant species were used as nesting material and the dominant species recorded were *Ipomea aquatica* (82.22%), followed by *Scirpus littoralis* (80%) and *Typha domingensis* (55.56%). However, in Raisen district the Sarus crane used 25 plant species and the most dominant plant was *Typha domingensis* (51.28%) followed by *Ipomea aquatica* (51.28%) and *Ipomea carnea* (46.15%). Other plant materials were used less frequently and were observed in low percentage *Valisneria natans* (20.51% in Raisen and 11.2% in Bhopal), *Echinochloa colona* (28.2% in Raisen and 17.8% in Bhopal), *Cyperus rotundus* (10.26% in Raisen and 11.12% in Bhopal) and *Monoccharia hastata* (12.82% in Raisen and 15.56% in Bhopal).

Keywords: Sarus crane, nesting material, marshland

Introduction

Birds built their nests mainly to protect their eggs and growing chicks from potential predators and from extreme weather during the incubation and pre-fledging period. Sarus crane primarily utilizes aquatic vegetation to build their nests that are either inaccessible or camouflaged by the aquatic vegetation. Most cranes nests in complex hydrological conditions of the wetland systems and sometimes in agricultural marshland (White 1987, pivovarov 1995) [1, 2]. Previously it was believed that sarus crane only nests in large wetlands but now it is known to nest even in small seasonal wetlands distributed within the forested landscapes of Northern and North-Eastern Cambodia (Archibald *et al.*, 2003; Clements *et al.*, 2009, Barzen, 2004a) [3, 4, 5]. Wetlands additionally are significant for providing secure roosting and foraging grounds consistently. Therefore, the accessibility and quality of wetlands are critically important for cranes, impacting their dispersion, movement, and reproductive success. Conversion, loss and degradation of wetland habitats are viewed as an essential factor for decline of many crane populations (Meine and Archibald 1996, He *et al.*, 2009, Sundar 2009, 2011, Su and Zou 2012) [7, 8, 9, 10, 11]. Rainfall intensity has a significant effect on nesting, it has been observed pairs improving breeding success during normal or high rainfall (Sundar 2011b) [12].

Sarus crane (*Grus Antigone*) is the world's tallest flying bird in the world, due to agricultural expansion and deterioration of wetland habitats the Indian Sarus crane is rapidly declining and is considered as vulnerable (Miene & Archibald, 1996, Birdlife international 2001) [13, 14]. In South-east Asia sarus crane nests successfully in inaccessible wetlands and experienced a low breeding success in crop fields or near human habitation (Barzen 2004, Handschuh *et al.*, 2010) [15, 16]. 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 (Cody, 1985) [17].

Breeding ecology of the Indian Sarus crane was studied in Bhopal and Raisen districts of Madhya Pradesh in Central India from 2016 to 2018. The breeding season of Sarus crane in the region starts soon after the onset of south-west monsoon and remains till the summer of following year depending upon the availability of water, plenty of food and protection from the potential predators.

Study Area

Bhopal district

Bhopal region, traversing over a space of around 2772 km², is situated in the heart of Madhya Pradesh. The district lies between North Latitude 23°05' and 23°54' and east longitude 77°10' and 77°40', falling in Survey of India Tope sheet No. 55 E The region is surrounded by Guna district in the north, Vidisha district in the North East, Shore and Rajgarh region on the southwest and west individually and by Raisen district in the East.

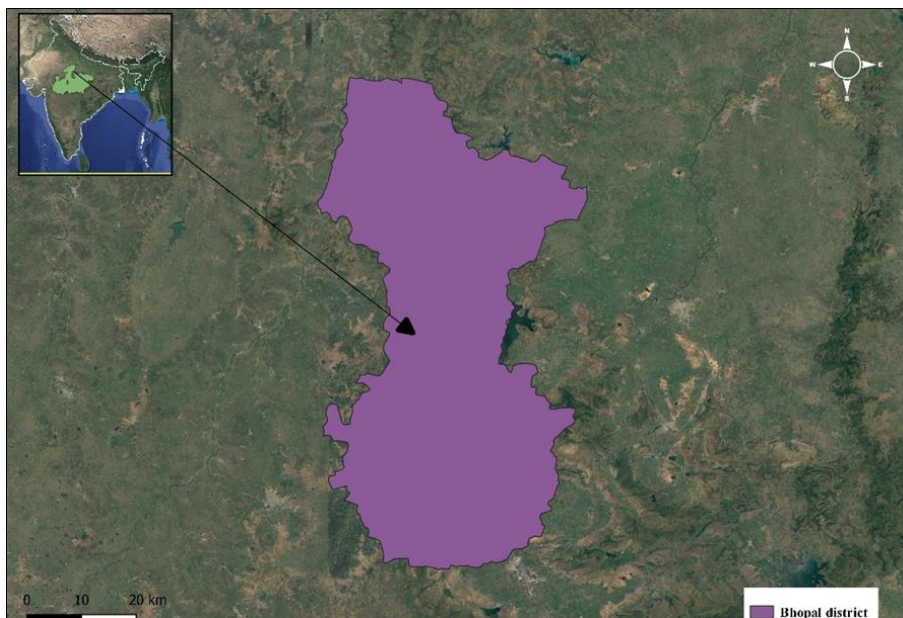


Fig 1: Map showing study area of Bhopal district

Rainfall and Climate

The climate of Bhopal is described by a blistering summer and all around circulated precipitation during the southwest monsoon season. The year can be divided in to four seasons. The winter begins from third week of November and keeps going till the mid February. The summer season commences from March to about first fifteen day stretch of June. May is the hottest month of the year. The southwest monsoon begins from mid-June till end of September. Month of October up to

the first two weeks of November marks the post monsoon or withdrawing monsoon season. The climate of the Bhopal district is arranged by the Thorn wait precipitation effectiveness technique which is based on assumption that all out month to month rainfall and temperature decide the climate. The yearly precipitation viability of the area is 63.7, which demonstrate that the climate of the district is primarily humid with a forest type vegetation.

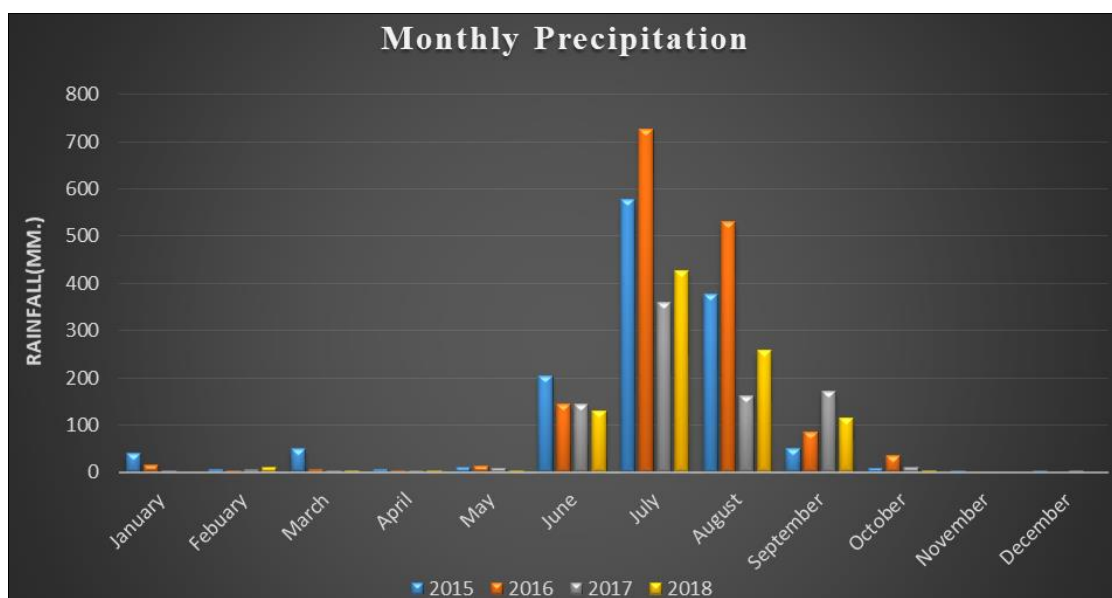


Chart 1: Graphic representation of annual precipitation in Bhopal district during 2015-2018

Raisen district

Raisen is adjoining district of Bhopal it is well connected by roads, railways and it also comes under Bhopal division. Total area of the district is 16974 Km² lying between North Latitude 22 degrees 45'00 degrees and East Longitude 77 degrees 21'00 degrees and 78 degrees 49'00 degrees falling under Survey of India top sheet 55E.f\F, I and J .It is surrounded by Vidisha district in North, Sagar district in northeast, Narshinghpur, Hosanna bad and Shore district in

south and Bhopal district in the west. Narmada River that flows along south eastern boundary separates it from Narshinghpur and Housangabad districts. Raisen district is an agricultural district occupying Narmada and Chambal river basins the crops grown in Wheat, Rice, Jowar, Maize and Soybean. Thus agriculture is the primary occupation of people, groundwater plays an important part of irrigation. Raisen forms a part of Vindhya Range with an undulating terrain.

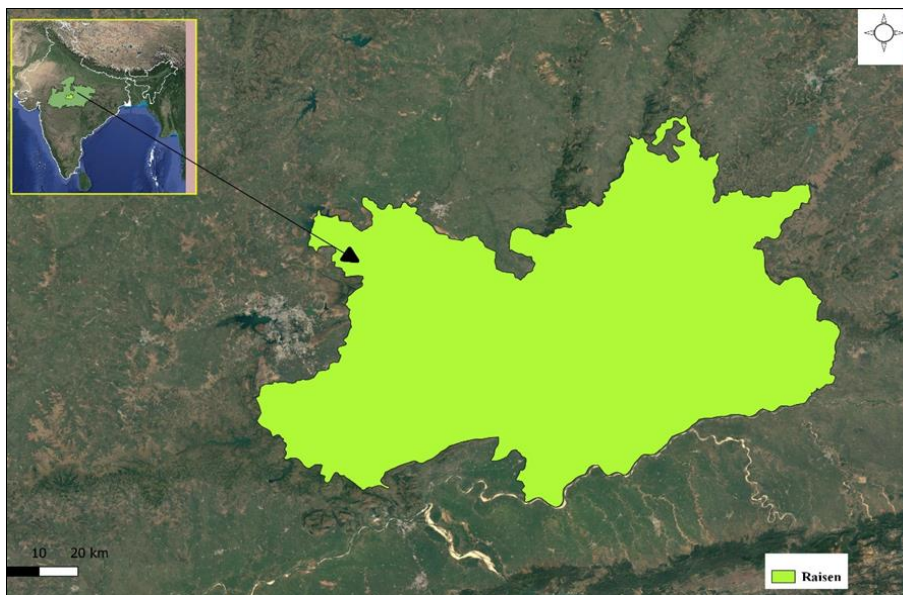


Fig 2: Map showing study area of Raisen district

Rainfall and Climate

The climate of Raisen is described by a dry and hot summer and all around circulated precipitation during the southwest monsoon season. The year can be divided in to four seasons. The Period from middle of November till the second week of February is the winter season. The summer season

commences from March to about middle of June. May is the hottest month of the year. The southwest monsoon begins from mid-June till end of September. Month of October up to the first two weeks of November marks the post monsoon or withdrawing monsoon season.

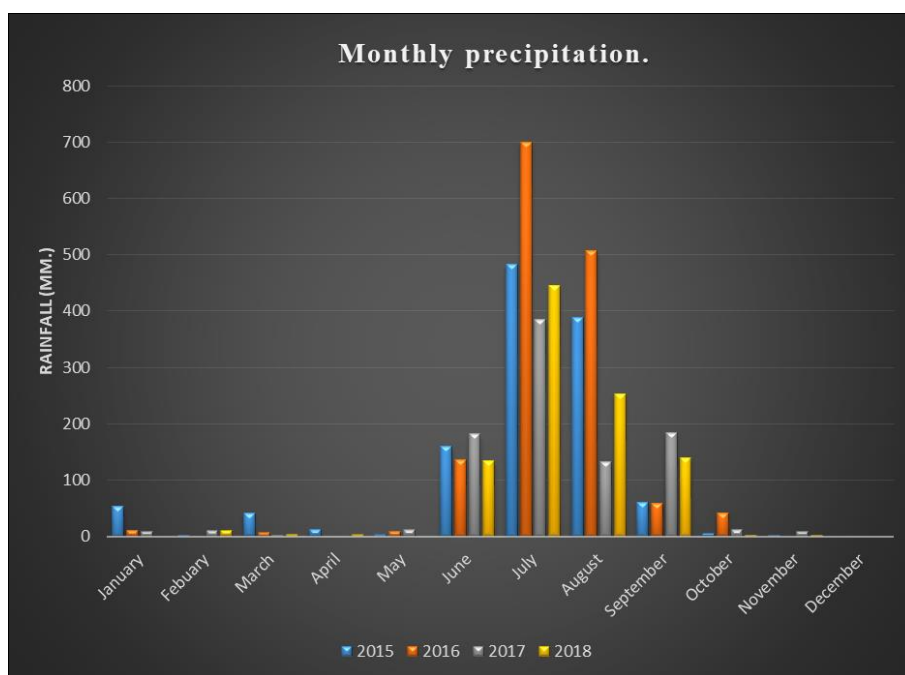


Chart 2: Graphic representation of annual precipitation in Raisen district during 2015-2018

Methodology

Nest survey was done four times a month from July 2016 to March 2018. 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 both the districts for comparison. About 89 nests were monitored during the study period and the specimens of nesting material from 84 nests were collected for identification. Other parameters like the seasonality of the nesting materials and their characteristics were also taken into consideration.

Results

Sarus crane is a marsh nesting bird and preferred to nest in marshes, the results showed that it uses plant materials that are readily available around the nesting territory. During this study the nesting season of the Sarus crane extends from July to December each year in Raisen district while, in Bhopal district nests were found almost throughout the year with a short non-breeding period from April to June. Both male and female cranes were involved in nest building activity and collected the nest material by uprooting the vegetation in the nest vicinity or by collecting the readily available heaps of

vegetation. In Raisen district 25 plants (Table 1) were identified, among the dominant plants used as nesting materials, the frequency of *Typha domingensis* was the highest (51.38%) followed by *Ipomea aquatica* (46.15%), *Ipomea carnea* (38.46%) *Scripus littoralis* (33.3%), *Eicchornia crassipes* (30.76%) and *cyanodon dactylon* (28.21%). Whereas, in Bhopal district sarus crane used only 19 plants (Table 1) as nesting material, the most dominant plant species was *Ipomea aquatica* (82.22%) followed by *Scripus littoralis* (80%), *Typha domingensis* (55.56%) and *Ipomea carnea* (53.33%). Other plant materials were used less frequently and were observed in low percentage like *Valissenaria natans* (20.51% in Raisen and 11.2% in Bhopal), *Echinochloa colona* (28.2% in Raisen and 17.8% in Bhopal), *Cyperus rotundus* (10.26% in Raisen and 11.12% in Bhopal) and *Monocchoria hastata* (12.82% in Raisen and 15.56% in Bhopal). The use of dominant plants such as, *Ipomea aquatica*, *Scripus littoralis* and *typha domingensis* provides a huge biomass for the preparation of nest platform, and also provides some degree of protection to the growing chicks from extreme heat. They also provides camouflage to the chicks from potential predators, hence providing additional benefits to the nesting success

Table 1: showing percentage of nesting materials used by saru crane in Bhopal and Raisen districts

S. No	Botanical Name	Family	Raisen		Bhopal	
			F1	%(Percentage)	F1	%(Percentage)
1	<i>Ceratophyllum demersum</i> L.	Ceratophyllaceae	1	2.56		Not found
2	<i>Najas indica</i> (Willd.) cham.	Hydrocharitaceae	6	15.38		Not found
3	<i>Nechamandra alternifolia</i> Roxb.ex wight	Hydrocharitaceae	2	5.12		Not found
4	<i>Ottelia alismoides</i> (L.) Pers.	Hydrocharitaceae	4	10.26		Not found
5	<i>Vallisneria natans</i> (Lour.) H.Hara	Hydrocharitaceae	8	20.51	5	11.12
6	<i>Eichhornia crassipes</i> (Mart.) Solms	Pontederiaceae	12	30.76	10	22.23
7	<i>Nymphoides hydrophylla</i> (Lour.) Kuntze	Menyanthaceae	2	5.12	4	8.89
8	<i>Pistia stratiotes</i> L.	Araceae	5	12.82	2	4.44
9	<i>Potamogeton crispus</i> L.	Potamogetonaceae	7	17.95	4	2.63
10	<i>Ampleopteris prolifera</i> (Retz.) Copel.	Thelypteridaceae	1	2.56	2	4.44
11	<i>Eriocaulon cinereum</i> (R.Br.)	Eriocaulaceae	6	15.38	3	6.67
12	<i>Hydrolea zeylanica</i> (L.) Vahl.	Hydroleaceae	3	7.69	5	11.11
13	<i>Ipomea aquatica</i> Forssk.	convolvulaceae	18	46.15	37	82.22
14	<i>Ipomea carnea</i> Jacq.	convolvulaceae	15	38.46	24	53.33
15	<i>Isoetes coromandelina</i> L.f.	Isoetaceae	7	17.95	2	4.45
16	<i>Monocchoria hastata</i> (L.) solms	Pontederiaceae	5	12.82	7	15.55
17	<i>Typha domingensis</i> Pers.	Typhaceae	20	51.28	25	55.56
18	<i>Alternanthera sessilis</i> (L.) R.Br.ex DC	Amaranthaceae	9	23.07	9	20
19	<i>Bacopa monnieri</i> (L.) Pennell	Plantaginaceae	3	7.69	4	8.89
20	<i>Colocasia esculenta</i> (L.) Schott	Araceae	1	2.56	3	6.67
21	<i>Cyperus rotundus</i> L.	Cyperaceae	4	10.26	5	11.12
22	<i>Echinochloa colona</i> (L.) Link	Poaceae	11	28.2	8	17.78
23	<i>Scripus littoralis</i> Schrad.	Cyperaceae	13	33.3	36	80
24	<i>Ludwigia adsendens</i> (L.) H.Hara.	Onagraceae	2	5.12	4	8.89
25	<i>Cyanodon dactylon</i> (L.) Pers.	Poaceae	10	25.64	12	26.67
	F1= frequency.			n= 39		n=45

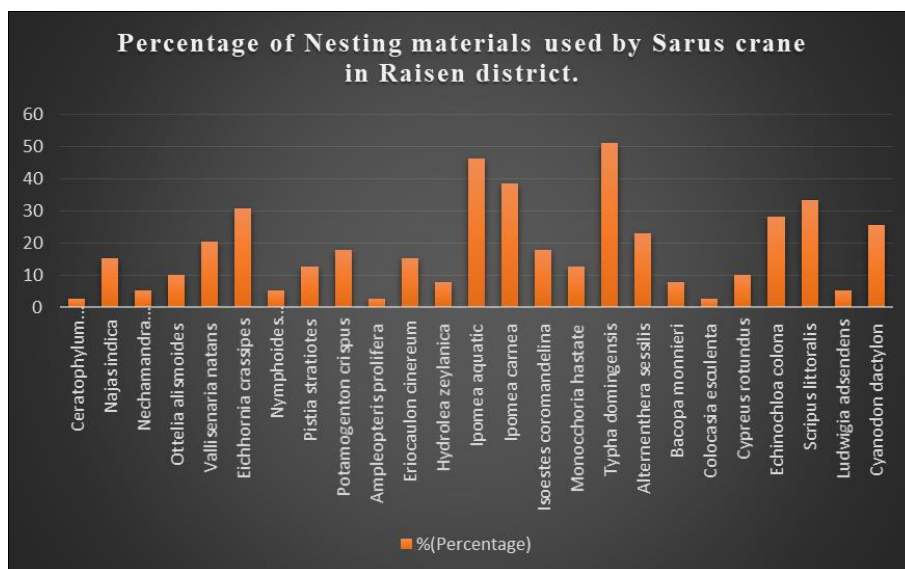


Chart 3: Graphic representation of plants used by Saru crane for nesting in Raisen district

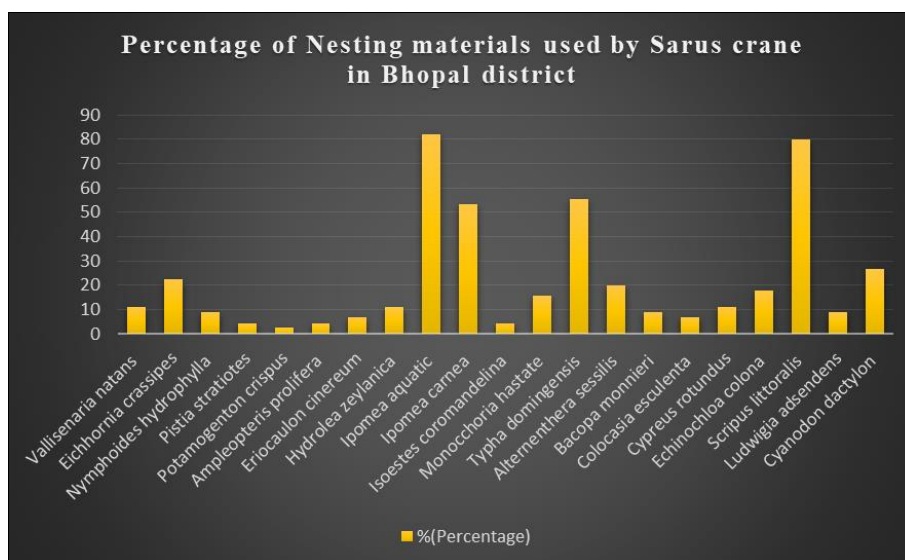


Chart 4: Graphic representation of plants used by Sarus crane for nesting in Bhopal district

Table 2: Showing availability of plant materials during the study period

Botanical name	Seasonality	Ecological indicator
<i>Ceratophyllum demersum</i>	Aug- Dec	Positive
<i>Najas indica</i> (Willd.)	Throughout the year	Positive
<i>Nechamandra alternifolia</i>	September- December	Positive
<i>Ottelia alismoides</i>	August- December	Positive
<i>Vallisneria natans</i>	October-March	Positive
<i>Eichhornia crassipes</i>	Throughout the year	Positive
<i>Nymphoides hydrophylla</i>	Throughout the year	Positive
<i>Pistia stratiotes</i>	Throughout the year	Positive
<i>Potamogenton crispus</i>	Throughout the year	Positive
<i>Ampleopteris prolifera</i>	November- February	Positive
<i>Eriocaulon cinereum</i>	June- November	Positive
<i>Hydrolea zeylanica</i>	June- November	Positive
<i>Ipomea aquatica</i>	Throughout the year	Positive
<i>Ipomea carnea</i>	Throughout the year	Positive
<i>Isoetes coromandelina</i>	August- November	Positive
<i>Monocchoria hastata</i>	December-March	Positive
<i>Typha domingensis</i>	Throughout the year	Positive
<i>Altemnerthera sessilis</i>	July -February	Positive
<i>Bacopa monnieri</i>	April-January	Positive
<i>Colocasia esculenta</i>	August- November	Positive
<i>Cyperus rotundus</i>	April-November	Positive
<i>Echinochloa colona</i>	Throughout the year	Positive

<i>Scripus littoralis</i>	Throughout the year	Positive
<i>Ludwigia adsdens</i>	Throughout the year	Positive
<i>Cyanodon dactylon</i>	Throughout the year	Positive

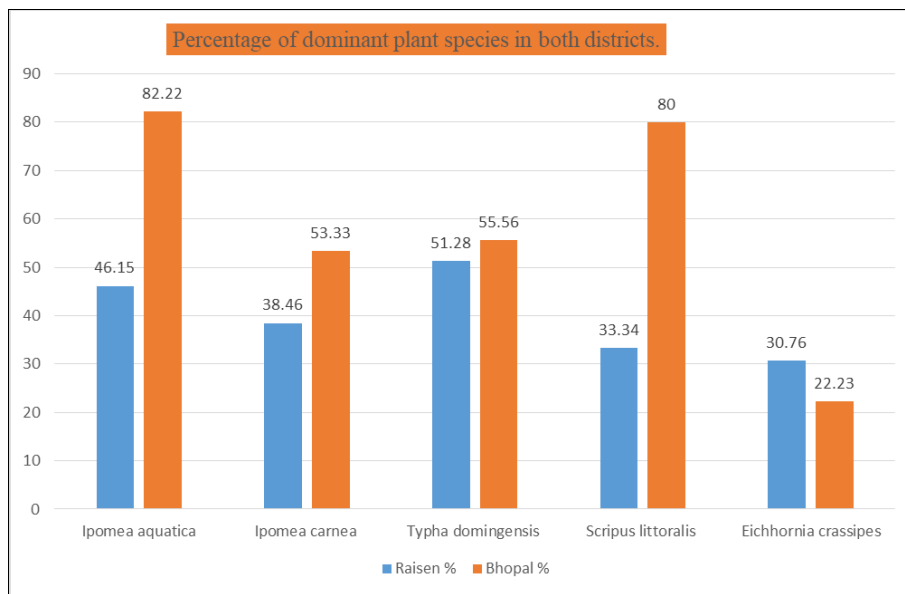


Chart 3: Graphic representation of percentage of dominant plant species used by Sarus crane for nesting in both districts



Fig 3: Sarus crane nest in forested marshland (usage of *Ipomea aquatica* as dominant nesting material)



Fig 4: Sarus crane nest in open marshland (usage of *Scripus littoralis* as dominant nesting material)

Discussion

The Sarus crane utilizes plant material from the area immediate to the nest site (Walkinshaw, 1973a, Ramachandran & Vijayan, 1994) ^[18, 19]. In Kheda district of Gujarat state, 28 plant species were identified within the Agricultural marshland (Mukherjee *et al.*, 1999) ^[20]. 23 plant species of medicinal importance used by Sarus as nesting material was recorded from the Alwara Lake of Uttar Pradesh (Prakash & Verma 2016) ^[21]. Rajesh *et al.*, 2021, ^[22] found 32 species of macrophytes used for nesting in shore district. In the present study we have recorded 25 species of marshland plants used by Sarus crane for nesting in Raisen district and 19 species in Bhopal district. *Typha domingensis* was the most dominant plant material observed in Raisen district and *Ipomea aquatica* in Bhopal district. Most of the plant materials were found throughout the year in the study area while other plants were available during the peak of the nesting season. Other crane species such as Sandhill Crane also used different plant materials while nesting in different habitats (Walkinshaw 1973b) ^[23]. When the utilization of dominant plant species was compared in both the districts, it was found that *Ipomea aquatica* was used in 46.15% of the nests in Raisen and 82.22% in Bhopal district. *Ipomea carnea* was used in 38.46% nests while in Bhopal it was found in 53.33% nests, however *Typha domingensis* was used in almost equal proportion (51.28% in Raisen and 55.26% in Bhopal). *Scopus littoralis* was used for building 80% of nests in Bhopal and only 33.35 in Raisen whereas, *Eichhornia crassipes* was used in less percentage in both the districts (30.76% in Raisen and 22.23% in Bhopal). Nesting materials like *Ipomea aquatica*, *Scopus littoralis* and *Typha domingensis* provides good biomass for nest building and in addition, they provide camouflage and safety to the fledging chicks from predators and trespassers (Rajesh *et al.*, 2021).^[24] The green vegetation around the nesting site provides protection and cover to the growing chicks from extreme heat during summers.

References

- White DM. The status and distribution of the Brolga in Victoria, Australia: Archibald GW, Pasquier RF (ds), Proceeding of the 1983 International Crane Workshop. International Crane Foundation, Baraboo, WI, USA; c1987. p. 115-131.
- Pivovarov AT. Cranes in the Tselinograd region of Russia, In: Prange, H. (Eds), Crane Research and protection in Europe. Europe Crane Working Group/Martin Luther-University, Halle-Wittenberg, Germany; c1995.p. 528-529.
- Archibald GW, Sundar KSG, Barzen J. A review of three subspecies of Sarus Crane (*Grus Antigone*). Journal of Ecological society (India). 2003;16:5-15.
- Clements T, Garrett L, John A, Keo O, Kong K, Pech B, et al. Trans Links case study: bird nest protection in the Northern Plains of Cambodia. Report prepared for WCS Trans Links Program, USAID; c2009.
- Barzen J (2004a, b.) An aerial survey of wetlands in northern Cambodia, Baraboo, Wisconsin, USA: International Crane Foundation, Cambodia Program. Unpublished report; c2001.p. 65.
- Kumar R, Jahangir R, Husain N, Trak T, Banerjee S. Macrophytes used as the nesting material by Indian sarus crane (*Grus antigone*) in Sehore district of Madhya Pradesh. International Journal of Botany Studies. 2022;7:403-6.
- He C, Ishikawa T, Sheng L, Irie M. Study on the hydrological conditions for the conservation of the nesting habitat of the Red-crowned Crane in Xianghai Wetlands, China. Hydrological Processes. 2009;23:612-622.
- Sundar KSG. Are rice field suboptimal breeding habitat for Sarus Cranes in Uttar Pradesh, India? Condor. 2009;111:611-623.
- Sundar KSG. Agricultural intensification, rainfall patterns, and large water bird breeding success in the extensively cultivated landscape of Uttar Pradesh, India. Biological Conservation. 2011;144:3055-3063.
- Su L, Zou H. Status, threats, and conservation needs for the continental population of the Red-crowned Crane. Chinese Birds. 2012;3:147-164.
- Birdlife International. Threatened birds of Asia: The Birdlife International Red Data Book. Cambridge, UK: Birdlife International; c2001. p. 1118-1150.
- Handschuh M, Rours V, Rainey H. Clutch size of Sarus Crane *Grus Antigone* in the Northern Plain of Cambodia and incidence of clutches with three eggs. Cambodian Journal of Natural History. 2010;2:103-105.
- Cody ML. An introduction to habitat selection in birds, (In): Habitat selection in Birds (M.L. Cody Ed.). Academic press, Inc. Tokyo; c1985. p. 558.
- Walkinshaw LH. The Sarus Crane (*Grus Antigone*). In: Cranes of the world. Winchester Press, NY. 197- 216pp.
- Walkinshaw 1973b. A history of Sandhill cranes on the haebnie sanctuary Michigan. Jack-Pine Warbler. 1973a;51:54-74.
- Ramachandran NK and Vijayan VS. Distribution and general ecology of Sarus crane (*Grus antigone*) in Keoladeo National park, Bharatpur, Rajasthan, Journal of Bombay Natural History Soc. 1994;91(2):211-223.
- Mukherjee A. Ecological study on the Indian Sarus Crane (*Grus Antigone*) in the central Gujarat. Ph.D. Dissertation, Saurashtra University, Rajkot, Gujarat; c1999 .p. 281.
- Shri P, Ashok KV. Studies on use of Local Medicinal flora in Nest building by threatened bird (*Grus antigone*) in and around Alwara lake of district Kaushambi (U.P), India. Journal of Applied Sciences International. 2016;5(3):1-7.
- Rajesh k, Rabia J, Nisreen H, Touseef Trak, Suchitra B. Macrophytes used as the nesting material by Indian Sarus crane (*Grus antigone*) in Sehore district of Madhya Pradesh. 2022a;7(1):403-406.
- Meine CD, Archibald GW (Eds.). The Cranes: Status Survey and Conservation Action Plan. IUCN, Gland, Switzerland and Cambridge, UK. Northern Prairie Wildlife Research Centre Home; c1996a, b, p. 294.