

Decade Long Study on Colonial Nesting of Waterbirds in Bhitarkanika National Park, Odisha, India

The objective of decade long study on colonial nesting of waterbirds in heronries of Bhitarkanika National Park was to enumerate species wise nest number, choice of nesting trees, documentation of the vegetation characteristics, population trends etc. Nesting of waterbirds in two heronries such as Bagagahan and Matha-Adia has been studied and analysed. A total of ten waterbird species i.e. Asian openbill stork (Anastomus oscitans), Little cormorant (Phalacrocorax niger), Little egret (Egretta garzetta), Intermediate egret (Egretta intermedia), Large egret (Ardea alba), Purple heron (Ardea purpurea), Night heron (Nycticorax nycticorax), Grey heron (Ardea cinerea), Oriental darter (Anhinga melanogaster), Black headed ibis (Threskiornis melanocephalus) were recorded to be nesting together in the heronries of Bhitarkanika. Asian openbill stork was the dominant species in both the heronries. In the last one decade, maximum 21204 nests were reported in the year 2016 and minimum 7206 nests in the year 2010. In 2012, Bagagahan heronry split apart and a new heronry at Matha-Adia came into existence. Asian openbill stork comprised nearly 76 % of nesting waterbirds population in both the heronries. Little egret and Black headed ibis had the least number of nests in the heronries comprised of only one percent of nesting waterbird population.

Key words: Colonial nesting, Bagagahan, Matha-Adia, Bhitarkanika.

Introduction

Heronries are ideal homes for breeding population of herons, egrets and other water birds. The heronries are ecologically very important for all aspects in fulfilling the requirements of colonial nesting of waterbirds and play crucial role in conservation of bird life.

The sanctum sanctorum of the Bhitarkanika National Park harbours one of the India's largest and oldest mixed species heronry (Behura and Kar, 1984; Gopi and Pandav, 2011; Kar, 1991, 2012; Patnaik *et al.*, 2012; Sahu and Kar, 1999 and Subramanya, 1996). Its secure abode of dense mangroves provides suitable breeding ground to many residential as well as other waterbird species (Gopi and Pandav, 2007). These multi-species colonies of waterbirds nest in large numbers on mangroves with the onset of monsoon in June – July and the entire nesting is over by mid-November.

In Bhitarkanika, there are two sites where colonial nesting of waterbirds have been reported. The nesting had occurred in Bagagahan heronry over a span of three decades but it ceased in 2016. The Matha-Adia heronry has been used for nesting by the waterbirds since 2012. In the year 2016, nesting birds completely abandoned the Bagagahan heronry and shifted to Matha-Adia for colonial nesting. The present effort is an analytical presentation of collected data on nesting trends of waterbirds in Bhitarkanika in last one decade. Long term monitoring, observations and understanding of the dynamics especially the breeding biology and ecology of birds are important parameters for conservation as well as management of species and the habitat.

A detailed study on nest and nesting of ten species of waterbirds in Bhitarkanika National Park emphasises that this unique mangrove ecosystem provides all the basic requirements for their survival and breeding in large number.

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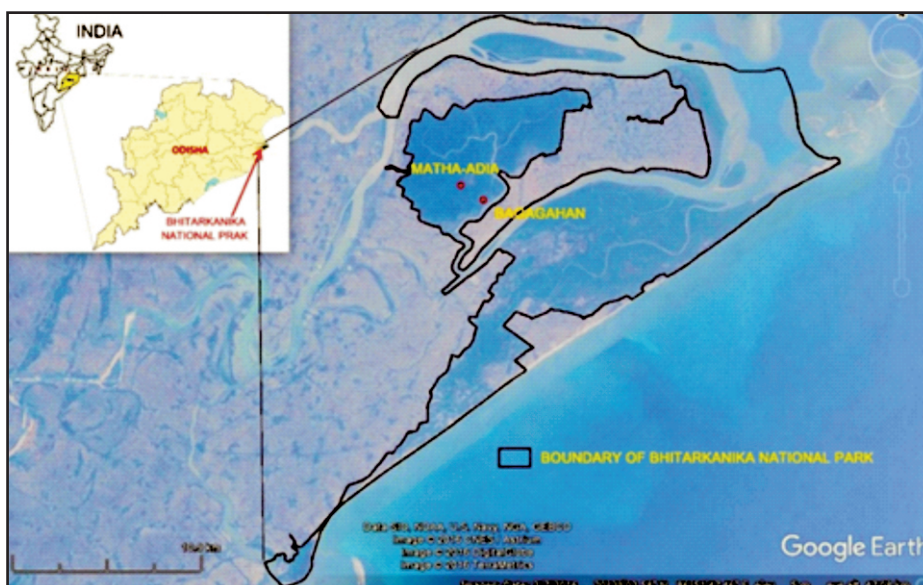


Fig. 1: Map showing location of Bagagahan & Matha-Adia heronries in Bhitarkanika National Park of Odisha, India.

Study Area

Bhitarkanika is located in the deltaic region of the rivers of Brahmani and Baitarani in the Kendrapara district of Odisha in the east coast of India. The heronries are located within Bhitarkanika National Park ($20^{\circ}4' - 20^{\circ}8' \text{ N}$ and $86^{\circ}45' - 87^{\circ} \text{ E.}$). The National Park area is 145.00km^2 in area having dense mangrove forests and criss-crossed with tidal rivers and creeks. It is the core of Bhitarkanika Wildlife Sanctuary and is spread over an area of 672.00 km^2 . The Bagagahan heronry and Matha-Adia heronry are located on opposite side of Suhajora creek in the Bhitarkanika Forest Block (Fig. 1). The nesting ground remains submerged by the tidal water during the monsoon high tides which coincide with the time of peak community nesting.

The study site comes under tropical monsoon climate. Average annual rainfall is about 1800 mm of which maximum rainfall has been received during monsoon period in between July to September. During the active period of heronries the atmospheric temperature ranges from 25 to 36 degree celsius. The site is prone to tropical cyclones. Bhitarkanika Mangroves get semidiurnal tidal flow from the Bay of Bengal. The mangroves and associate plants belong to families of Avicenniaceae, Euphorbiaceae, Sterculiaceae, Tamaricaceae and Malvaceae etc. are used for nesting of waterbirds. *Excoecaria agallocha* and *Avicennia officinalis* are dominant plant species in the Bagagahan and Matha-Adia heronry, respectively.

Material and Methods

A series of comprehensive field activities including observations, counting of nests on trees and measurements of some characteristics of vegetations in the heronries were conducted for a decade, in each successive year from 2007 to 2016. Once the nest building of waterbirds are completed, the egg laying activities commence in July. A team of four to five

members including the researcher (S.D. Pradhan) visited the heronries to mark the nesting trees, record species wise nest number in each tree and other associated parameters on nest and nesting. Nest count is theoretically the best measure to assess the nesting biology of breeding population (Narayanan and Vijayan, 2007). Number of eggs and chicks in nests were counted using mechanic's mirror whenever possible. The height and girth at breast height of nesting trees at both Bagagahan and Matha-Adia heronries were measured and recorded. Special care was taken not to disturb the nesting birds and the fledglings during the field work.

Results and Discussion

In the mixed species heronries diverse groups of waterbirds congregate in large numbers to breed and raise their progeny. A total of ten waterbird species have been assembled in the colonial nesting in Bhitarkanika both at Bagagahan and Matha-Adia. Asian openbill stork (*Anastomus oscitans*), Little cormorant (*Phalacrocorax niger*), Little egret (*Egretta garzetta*), Intermediate egret (*Egretta intermedia*), Large egret (*Ardea alba*), Purple heron (*Ardea purpurea*), Night heron (*Nycticorax nycticorax*), Grey heron (*Ardea cinerea*), Oriental darter (*Anhinga melanogaster*), Black headed ibis (*Threskiornis melanocephalus*) were recorded to be nesting in the heronries of Bhitarkanika during the study period. Nesting of Cattle egrets in Bagagahan heronry in earlier years was recorded (Gopi and Pandav, 2007). During our study period there was no nesting of Cattle egrets. The enumerated year wise nesting data of waterbirds for last one decade (2007 to 2016) has been highlighted in Table 1.

Over a span of last one decade Asian openbill storks were the dominating species in the heronries with maximum number of nests (76%) followed by Greater egret (5%), Little cormorant (5%), Intermediate egret (3%), Purple heron (3%), Night herons (2%), Grey heron

Table 1: Year wise nesting trend of water birds in heronries of Bhitarkanika (2007-2016).

| Waterbird species | Years | | | | | | | | | |
|----------------------|--------------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Asian Openbill Stork | 7368 | 10512 | 10099 | 4786 | 9296 | 13429 | 14312 | 15128 | 15191 | 15227 |
| Greater Egret | 810 | 683 | 1045 | 347 | 897 | 467 | 845 | 1073 | 1143 | 1213 |
| Intermediate Egret | 331 | 213 | 239 | 419 | 302 | 236 | 433 | 636 | 756 | 1111 |
| Little Egret | 202 | 418 | 223 | 81 | 206 | 42 | 162 | 170 | 89 | 105 |
| Grey Heron | 81 | 374 | 335 | 153 | 220 | 209 | 309 | 290 | 420 | 450 |
| Night Heron | 273 | 144 | 84 | 253 | 203 | 156 | 187 | 561 | 532 | 584 |
| Purple Heron | 303 | 319 | 440 | 294 | 370 | 239 | 287 | 536 | 722 | 756 |
| Oriental Darter | 208 | 306 | 501 | 66 | 410 | 82 | 166 | 290 | 228 | 245 |
| Black Headed Ibis | 90 | 51 | 134 | 176 | 242 | 112 | 200 | 168 | 255 | 295 |
| Little Cormorant | 633 | 574 | 907 | 631 | 680 | 450 | 646 | 932 | 1171 | 1218 |
| Total | 10299 | 13594 | 14007 | 7206 | 12826 | 15422 | 17547 | 19784 | 20507 | 21204 |

(2%), Oriental darter (2%), Black headed ibis (1%) and Little egret (1%). This finding corroborates with the observations of Gopi and Pandav (2011) on abundance of Asian openbill in the heronries.

In 2012, the nesting population of Greater egrets, Little cormorants, Little egrets, Night herons, Purple herons and Black headed ibis abandoned the Bagagahan heronry all together and nested in Matha-Adia heronry. Whereas nesting population of Asian openbill storks, Grey herons, Intermediate egrets and Oriental darters were found to be nesting in both the heronries. In 2013, the nesting waterbird population were separated and nested in two heronries. Greater egrets, Little cormorants, Little egrets, Night herons and Purple herons nested only in Matha-Adia heronry. Whereas Asian openbill storks, Grey

herons, Intermediate egrets, Oriental darters and Black headed ibis nested in both the heronries. In year 2014 and 2015 Asian openbill storks and Intermediate egrets were nesting in both Bagagahan and Matha-Adia heronries and rest of the waterbird species nested only in Matha-Adia heronry (Table 2).

The area of Bagagahan heronry was ranging from 3 ha to 5 ha during the study period over the 9 consecutive years (2007 to 2015). In the limit of Bagagahan heronry mangrove species such as *Excoecaria agallocha*, *Heritiera fomes*, *Cynometra iripa*, *Hibiscus tiliaceus*, *Avicennia officinalis*, *Tamarix dioica* plants were used for nesting. Among these plants, *Excoecaria agallocha* was the dominant species comprising more than 88% followed by *Heritiera fomes* (07%) and *Avicennia officinalis* (03%).

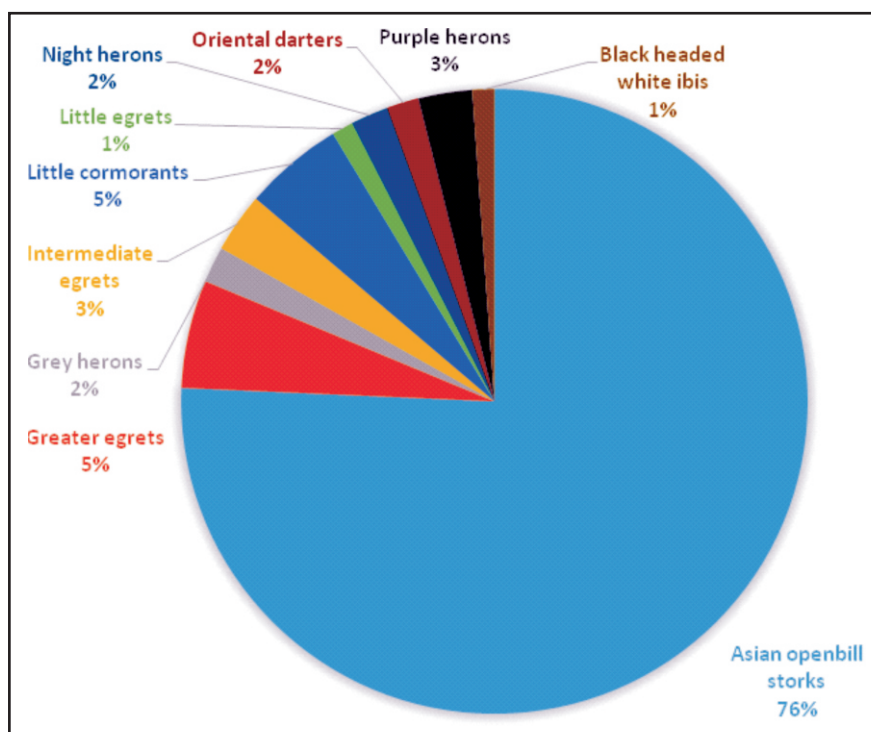

Fig. 2: Pi Chart showing species composition and mean number (%) of waterbirds.

Table 2: Nesting trend in Bagagahan and Matha-Adia heronries (2012-2016).

| Waterbird species \ Year | Bagagahan | | | | | Matha-Adia | | | | |
|--------------------------|--------------|--------------|--------------|--------------|----------|-------------|-------------|-------------|-------------|--------------|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Asian Openbill Stork | 11810 | 10585 | 13457 | 12415 | 0 | 1619 | 3727 | 1671 | 2776 | 15227 |
| Greater Egret | 0 | 0 | 0 | 0 | 0 | 467 | 845 | 1073 | 1143 | 1213 |
| Grey Heron | 8 | 31 | 0 | 0 | 0 | 201 | 278 | 290 | 420 | 450 |
| Intermediate Egret | 27 | 64 | 24 | 51 | 0 | 209 | 369 | 612 | 705 | 1111 |
| Little Cormorant | 0 | 0 | 0 | 0 | 0 | 450 | 646 | 932 | 1171 | 1218 |
| Little Egret | 0 | 0 | 0 | 0 | 0 | 42 | 162 | 170 | 89 | 105 |
| Night Heron | 0 | 0 | 0 | 0 | 0 | 156 | 187 | 561 | 532 | 584 |
| Oriental Darter | 7 | 12 | 0 | 0 | 0 | 75 | 154 | 290 | 228 | 245 |
| Purple Heron | 0 | 0 | 0 | 0 | 0 | 239 | 287 | 536 | 722 | 756 |
| White Ibis | 0 | 24 | 0 | 0 | 0 | 112 | 176 | 168 | 255 | 295 |
| Total | 11852 | 10716 | 13481 | 12466 | 0 | 3570 | 6831 | 6303 | 8041 | 21204 |

The mean height of nesting trees was 402.8 ± 97.41 cm ($n = 1248$; Range = 152 cm to 762 cm) and the mean girth at breast height was 25.64 ± 8.91 cm ($n = 1248$; Range = 8 cm to 65 cm) in Bagagahan heronry. Repeated use of trees for nest building by waterbirds in Bagagahan heronry leads to damage of the tree cover of plants resulting in loss of top canopy cover.

Matha-Adia heronry which came in to existence in 2012 has an area ranging from 2 ha to 5 ha in the last five consecutive years. The area and number of nesting trees in the limit of Matha-Adia heronry increased many folds in 2016 compared to past years. The Bagagahan heronry seized to be active due to abandonment of the nesting herons. In the limit of new heronry *Avicennia officinalis*, *Excoecaria agallocha*, *Heritiera fomes* and *Lumnitzera racemosa* plants were found with nests. A majority of nests were found on *Avicennia officinalis* trees in the heronry comprising more than 86% of total nesting trees followed by *Excoecaria agallocha* (14%). The mean height of nesting trees was 741.9 ± 129.5 cm ($n = 241$; Range = 426.7 cm to 1066.8 cm) and the mean girth at

breast height was 63.7 ± 19.8 cm ($n = 241$; Range = 22 cm to 162 cm) in Matha-Adia heronry.

Comparing nest and nesting data of both the heronries it was found that the mean nest number per plant was 3.7 ± 2.2 ($n = 1248$; Range = 1 to 14) in Bagagahan heronry and 21.45 ± 15.36 ($n = 241$; Range = 2 to 93) in Matha-Adia heronry. Nesting trees of Matha-Adia heronry accommodate more number of nests because of larger canopy cover compared to Bagagahan heronry.

The mean height and girth at breast height of nesting trees in Bagagahan heronry was 402.8 cm and 25.64 cm respectively whereas the mean height of nesting trees was 741.9 cm and girth at breast height was 63.7 cm in the Matha-Adia heronry.

The highly productive detritus food chain of the mangrove ecosystem provides supply of sufficient food for the nesting birds and their chicks for sustenance and survival. Due to less human interference in heronries of Bhitarkanika large number of birds are attracted to breed and nest in this National Park. The extensive agricultural

**Fig. 3:** Panoramic view of Bagagahan Heronry.

fields surrounding Bhitarkanika National Park act as primary source of food to these nesting birds (Kar, 1981).

Eggs in heronries were predated by Jungle crows (*Corvus macrorhynchos*), House crows (*Corvus splendens*), White bellied sea eagles (*Haliaeetus leucogaster*), Water monitor lizards (*Varanus salvator*) and Pythons (*Python molurus*). Predation of nesting birds, as in present case, by crows, eagles, snakes etc. has also been reported earlier (Pratt, 1972; Frederick and Collopy, 1989). During the highest tide conditions, Estuarine crocodiles (*Crocodylus porosus* Schneider) were seen to be roaming on inundated slushy ground in both the heronries for preying on fallen chicks and fledglings from the nests. Pelicans are also seen visiting the heronry and used the trees for perching but they never build nests in these heronries.

The area is prone to tropical cyclones during the months of September and October which are detrimental to nests in heronry leading to damage of nests, eggs and also chicks.

Conclusion

The increasing number of nesting waterbirds in heronries of Bhitarkanika National Park indicate that this mangrove ecosystem is becoming most suitable nesting habitat for local as well as migratory waterbirds.

भितरकनिका राष्ट्रीय पार्क, ओडिशा, भारत में जल पक्षियों के उपनिवेशीय नीड़न पर दशक तक अध्ययन
सौम्या दर्शन प्रधान एवं सुधाकर कार
सारांश

भितरकनिका राष्ट्रीय पार्क के बकाशयों में जलपक्षियों के उपनिवेशीय नीड़न पर दशक तक अध्ययन का उद्देश्य प्रजातिवार नीड़ संख्या की गणना करना, नीड़न वृक्षों की पसन्द, वनस्पति अभिलक्षणों का प्रलेख-पोषण, आबादी रूझान जानना था। दो बकाशयों, यथा-बागा गाहन और माथा-अडिया में जलपक्षियों के नीड़न का अध्ययन और विश्लेषण किया गया। कुल दस जलपक्षी प्रजातियों, यथा- एशियन ओपन बिल स्टार्क (एनास्टोमस ऑसिहेन्स), लिटिल कॉम्पैरेन्ट (फेलेक्रोकोरेक्स नाइगर), लिटिल इग्रीट (इग्रीटा गार्जीटा), इन्टरमीडिएट इग्रीट (इग्रीटा इन्टरमीडिया), लार्ज इग्रीट (आर्डीया एल्बा), पर्पल हीरोन (आर्डीया पूर्पूरीया), नाइट हीरोन (नीक्टीकोरेक्स नीक्टीकोरेक्स) ग्रे हीरोन (आर्डीया सिनीरीया), ओरिएन्टल डार्टर (एनहिंगा मीलेनोगेस्टर), ब्लैक हैडेड इबिस (श्रीस्कओर्निस मीलेनोसीफेलस) को भितरकनिका के

बकाशयों में एक साथ नीड़न करते हुए अभिलिखित किया गया। दोनों बकाशयों में एक एशियन ओपनबिल स्टार्क प्रधान प्रजाति थी। गत एक दशक में वर्ष 2016 में अधिकतम 21204 घोंसले और वर्ष 2010 में न्यूनतम 7206 घोंसले सूचित किए गए। 2012 में, बागा गाहन बकाशय पृथक हो गया और माथा-अडिया में एक नया बकाशय अस्तित्व में आया। एशियन ओपनबिल स्टार्क दोनों बकाशयों में नीड़न जलपक्षी आबादी का लगभग 76 प्रतिशत को मिलाकर हैं। लिटिल इग्रीट और ब्लैक हैडेड इबिस की बकाशयों में घोंसले की न्यूनतम संख्या थी, जो नीड़न जलपक्षी आबादी का केवल एक प्रतिशत है।

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