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The Painted Stork

Ecology and Conservation

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*For Zara
And
For Siddiq Ahmed Siddiqi*

Preface

It is cheating to copy the work of another man; you should copy the work of TWO other men – they call that research (Love 1980; original source unknown)

Writing a book has everything to do with ones involvement with his subject. My association with the Painted Stork spans over 20 years and has been influenced by a host of personal and professional factors. While I hope to write about these, elsewhere, someday, the significant point is that for studying these delectable birds I did not have to venture very far most of the time. In my home town Delhi – India’s capital city, a colony of Painted Storks has been in existence since 1960. Each year in September, these tall, elegant birds start gathering at the Delhi Zoo where they build their nests on trees planted on islands in the ponds of the zoo. During the period of their residence, they breed, raise their young, oversee preliminary rites of passage and as soon as summer approaches, they are all gone, widely dispersed in the surrounding countryside, where they will live singly or in loose scattered parties seeking food and shelter for the rest of the year. Year after year I have seen the same pattern repeating itself.

The Painted Stork is a large, eye-catching, interesting looking, colonially nesting wading bird, listed as near threatened by international conservation agencies. It is found across large parts of South Asia and Southeast Asia, with a stronghold in the Indian subcontinent, particularly India and Sri Lanka. The genus *Mycteria*, to which it belongs, has representatives in three continents – Asia, America, and Africa, each differing from the other in minor details. But while these facts are interesting in themselves they are not sufficient to explain why a book on this species should be written. In Chap. 1 (Introduction), I have devoted a full section to explaining why a study of the Painted Stork and similar birds can be meaningful as well as topical. Therefore, while it will be pointless to repeat some of those points here, it should suffice to say, that, for me writing this book was a natural culmination of a journey begun long ago; a journey which has mostly been great fun and still continues.

British author and historian, William Dalrymple, well known for his books on Indian history, including several on Delhi, once said in an interview to a local newspaper,¹

¹The Indian Express, 7 February 1999.

Books are sheer hard work, journalism less difficult, producing documentaries the easiest things to do. But the money is in inverse proportion.

Having written a few books before this one, I am somewhat inclined to agree with this view. Also, in the career of a university teacher, while research papers in trade journals often come in handy while applying for promotions and grants, scholarly books (at least in the science departments), not necessarily so.

Those readers who are familiar with the game of cricket, so popular in countries which were once a part of the erstwhile British Empire, may be aware that the game has two versions. The popular, faster, and more recent version is known as limited over's cricket while the classical version, which is long drawn and bereft of the sparkle and dazzle of one day or T-20 matches, is known as "test cricket." Connoisseurs of the game hold that test cricket is the noblest and purest form of the game and, in some sense, the ultimate challenge for a player. If that be so then I would like to think that writing a scholarly book is also a bit like playing test cricket in that, one gets a chance to develop the subject in a manner which is not possible in journal publications of restricted length. Perhaps, writing a species monograph is also the ultimate test for an author as he settles down to play a long innings, drawing upon the knowledge and wisdom accumulated over the years.

All these years, while I have been on the trail of the Painted Stork, the focus of my studies has largely been the Delhi Zoo population. Besides the fact that it is so easy and convenient to study these birds at close quarters, a major advantage, when I began my studies, was that the basic work had already been done on this population in that, during 1966–1971, J.H. Desai, a former director of the Delhi Zoo, had published a detailed study on various aspects of this population. His work is an impressive data base and during the course of my own studies I have drawn heavily from it. Sometimes, when I feel that in my studies of the Painted Stork I have explored hitherto untouched aspects of this population and in doing so contributed towards a better understanding of the biology of this species, I am reminded of the famous line attributed to Sir Issac Newton,

If I have seen further it is only by standing on the shoulders of giants

I daresay that, due to our collective efforts, the Delhi Zoo Painted Stork population is perhaps the most well-studied among any population of (wild) birds in India (Urfi 2010). The two bursts of research activity on this population, first by Desai and coworkers and the other by my group have more or less coincided with other events happening in the ornithological world. For instance, the period of 1960s was one in which basic studies or whole biology studies of different species of wildlife were in vogue. This period also coincided with the considerable worldwide interest in the ecology, systematics and behavior of storks, and other waterbirds, as is amply clear from the publications of several international scientists cited in this book. The 1980s was a period in which considerable interest in field studies was generated by the initiation of Asian Waterfowl Census (Urfi et al. 2005). The easiest and most meaningful thing to do during those days was to count waterfowl and report findings, which is what I also initially did with the Painted Storks.

Modern biologists examine patterns of variability and ask specific questions about how a given trait could have evolved. An important arsenal in their research methodology is the comparative approach. In this book I have taken cognizance of research on other species of *Mycteria*, particularly the Wood Stork and Milky Stork and therefore employed the comparative approach freely. However, I must also confess that a bias towards Indian studies has been largely unavoidable, given that India is stronghold of the Painted Stork, and it is from here that most of the research on this species has emanated.

This book could have been written as an encyclopedic presentation of facts about the Painted Stork but then a very fundamental purpose – enthrusting other field ornithologists to undertake field studies on similar birds, take a stronger interest about wetland ecology and conservation issues, etc., might have been defeated. Hence, I have tried to build this book mostly around the studies that have been undertaken on the Painted Stork, particularly those from Delhi. In writing this book I have also tried to review various points of interest from across the range of the Painted Stork in an attempt to give the topic a pan Asian coverage.

Structure of the book: Chapter 1 (Introduction) attempts what all introductory chapters are supposed to do i.e., introduce the subject, discuss its significance and outline the basic biology of the species by touching upon its systematics, morphology, life history, etc.

The fact that the Painted Stork is a colonially nesting species should suffice to explain why a chapter has been devoted to a breeding pattern, which is at best limited to only a small number of bird species (Chap. 2: Coloniality). The first part of this chapter serves to introduce the reader to the basic biological reasoning that has gone on to address the question of evolution of coloniality. However, a comprehensive review of all the theories about avian coloniality have not been undertaken here for which the reader will have to go through other sources. The second half of the chapter is devoted to describing the salient features of some of the important colonies which are referred to from time to time in the book.

Chapter 3 (Nesting Ecology) is devoted to different aspects of the breeding ecology of the Painted Stork, particularly the timing of reproduction and the role of proximate and ultimate factors. Food availability is widely regarded as the ultimate factor governing nesting time in birds and in the context of Asia which has a monsoonal climate, the whole issue has to be examined and understood in light of these factors. A review of the various biotic and abiotic factors that cause nest losses, at egg and nestling stage, is also included.

Due to the numerous studies undertaken on the Delhi Zoo Painted Stork population, this system is now fairly well understood. For instance, it is known that certain colonies are occupied first; which are those colonies? What are the patterns of occupation of colonies? And so on. Chapter 4 (Sexual Size Dimorphism and Mating Patterns) focuses on SSD, mating patterns, and habitat selection in the Painted Stork. The details of a study on SSD, using novel field study techniques are described in this chapter.

Chapter 5 (Growth and Development) is devoted to post-hatching growth and development of Painted Stork. Based largely on the studies conducted at the Delhi

Zoo by J.H. Desai and coworkers, an important consideration behind writing this chapter was to provide an illustrated guide about the characteristic growth stages of nestlings so that it may be possible to age the nestlings properly just by observing them through binoculars or a telescope in the field.

In birds the most important structure for efficient harvesting of food is the trophic apparatus, the bill. Some classical studies on Wood Stork demonstrated tactolocation in the *Mycteria* and these are reviewed in Chap. 6 (Food and Foraging). The bulk of the chapter revolves around our own studies on the foraging behavior of the Painted Stork in the Delhi region, covering aspects related to diet, length of bouts, prey sizes, seasonal changes in foraging patterns, etc. Also included in this chapter are the interactions of Painted Stork (and other heronry birds) with the environment, particularly enrichment of waters through dropping of guano and harvesting of fish.

Storks are the subject of numerous myths and legends which have been touched upon in Chap. 7 (Storks and Humans). I have also tried to explore how people have looked at heronries by an examination of writings of naturalists from different periods. Chapter 8 (Conservation) is devoted to conservation. It starts by examining the evidence for the decline of Painted Stork across India and discusses the various conservation problems and their solutions.

In my endeavors to create a smooth text I have tried to remove as many scientific names of plants and animals as possible by grouping them in the Appendix. However, this has not been possible in all cases. Hence, while scientific names of fishes, invertebrates, and some plants have been retained in the text, those of reptiles, birds, and mammals have been placed in the Appendix. A Subject Index has been provided.

Acknowledgments During the course of writing this book, when I got thinking about how I became interested in the Painted Stork, I also found myself remembering all those circumstances and people who made a difference. First it was childhood memories of seeing the stork colonies in the Delhi Zoo, in my father's company, not knowing at that tender age what those large white birds sitting on trees were, and ofcourse never imagining in my wildest dreams that one day these birds would occupy such a preeminent position in my life. Years later, visits to the zoo for bird watching became a great way to escape a feeling of claustrophobia, which I often experienced, working in a biological research laboratory at the University of Delhi, while doing my Ph.D. in fish biology.

After much trepidation, one day I made a jump from fish physiology, my original topic of research to field ornithology. Though at one level it was merely switching over from one area of Zoology to another, the process for me was one of re-inventing myself, a type of re-birth. Meanwhile, I passed through several institutions in India and abroad; came in contact with some truly remarkable people and also set about learning a new discipline, behavioral ecology. To all those friends, colleagues and teachers in Delhi, Ahmedabad, England and Germany, who greatly encouraged me in my bird studies, facilitated or helped in innumerable ways, I am grateful. I would particularly like to mention (in alphabetical order of their first names) Bikram Grewal, C.L. Talesara, C.P. Geevan, C.R. Babu, E.P. Jagdeesh, Ed Rispin, Humphrey Sitters, (Late) James Hancock, John D. Goss-Custard, J. Subbarao, Kandarp Kathju, Kartikeya V. Sarabhai, K. Muralidhar, Lalit K. Pande, (Late) Rajmannar, Rebecca Spurk, Richard Caldow, Sangita Gupta, S. Duraiswamy, S.S.S. Sarma, S.V. Goswami, Tejvir Singh, T.R. Rao, Vikas Rai, Zaheer Babar and Zafar Futehally.

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November, 2010

A.J. Urfi

References

- Love RM (1980) The chemical biology of fishes. Vol 2: advances 1968–1977. Academic Press, London
- Urfi AJ, Sen M, Kalam A, Meganathan T (2005) Counting birds in India: a review of methodologies and trends. *Curr Sci* 89:1997–2003
- Urfi AJ (2010) Using heronry birds to monitor urbanization impacts: a case study of Painted Stork *Mycteria leucocephala* nesting in the Delhi Zoo, India. *Ambio* 39:190–193

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Abbreviations

AWC	Asian Waterfowl Census
BNHS	Bombay Natural History Society
CEE	Centre for Environmental Education
DI	Dimorphism index
DPH	Days post-hatching
DZ	Delhi Zoo
EE	Environmental Education
KDGNP	Keoladeo Ghana National Park
LC	Least concern
NT	Near threatened
SNP	Sultanpur National Park
SSD	Sexual size dimorphism
VU	Vulnerable