

Spotlight on the Red-naped Ibis *Pseudibis papillosa*

Nawin TIWARY¹, K. S. Gopi Sundar^{2*}

¹Indraprastha College for Women, University of Delhi, 31 Sham Nath Marg, Civil Lines, Delhi, 110054, India.

²13A, Arihant Greens, Govardhan Vilas, Udaipur, 313001, Rajasthan, India

*Corresponding author; e-mail: gopi.sundar@gmail.com

Abstract The Red-naped Ibis *Pseudibis papillosa* is an endemic large waterbird of south Asia and is one of the least studied bird species in the world. We collate published information on the habits of this species using available literature and build the most updated account of Red-naped Ibis ecology. Some behaviours such as nesting on artificial structures are recent. Others such as using a diversity of habitat for foraging and nesting singly remain consistent over time. A review of photographs available online also underscored the ability of the species to use a variety of habitats. Submissions to the Special Section added substantially to existing understanding on the species' ecology providing many novel insights into Red-naped Ibis ecology. More wetlands on the landscape attracted more ibises who also showed considerable plasticity in habitat use, flock size and abundance depending on location and rainfall. The first field-based robust estimate of Red-naped Ibis population size has been developed (17,45,340 – 25,41,460). Papers also described several novel behaviours of Red-naped Ibis in varied urban conditions. These include the first record of nectar feeding in ibises, regular colonial nesting in a village, predating on pigeons and their eggs, feeding on food waste in small towns, and fishing. Several important ecological aspects remain unstudied, but the Red-naped Ibis is beginning not to be one of the least-studied waterbirds of the world.

Keywords Agricultural habitats, breeding biology, habitat use, literature review, online photographs, *Pseudibis papillosa*, Red-naped Ibis.

Introduction

Majority of the extant ibis species of the world occur in Africa and Asia, but most of these remain poorly studied with their ecological needs and habits described largely by natural history anecdotes (Hancock *et al.* 1992; Ali and Ripley 2007). The Red-naped Ibis *Pseudibis papillosa* is one such ibis species that is endemic to South Asia making it an automatic focus of the IUCN SSC Stork Ibis and Spoonbill Specialist Group (SIS-SG) that aims to improve the knowledge base for all SIS species in the world. The inclusion of the attractive species in the logo of the SIS-SG by one

Article history

of us (KSGS) was deliberate to help draw attention to this very poorly understood endemic species. The Red-naped Ibis has a striking appearance and is easily observed in open landscapes (Figure 1). In this Special Section Editorial, we lay out what is known about the species in published literature (until 2020), compile information on habitat use using freely available photographs online, and briefly summarize the papers published in this Special Section. We listed publications using the Latin name and common names of the species as keywords on the site scholar.google.com, and also used the extensive referencing provided along with the species account on Wikipedia (https://en.wikipedia.org/wiki/Red-naped_ibis). With this review, we provide the most updated account of the habits and requirements of the Red-naped Ibis.

Published online: 30 March 2022

© 2022 The Authors. *SIS Conservation*. Published by: IUCN Stork, Ibis and Spoonbill Specialist Group

www.storkibisspoonbill.org/sis-conservation-publications/

15



Figure 1. Adult Red-naped Ibis *Pseudibis papillosa* using different habitats across the Indian subcontinent. (Top left: stubble field; top right: flooded grassland; middle left: freshly ploughed agriculture field; middle right: garbage dump with dead animals; bottom: flock in newly-harvested field. Photographs by K. S. Gopi Sundar.)

Existing research

Taxonomy and common names

The Red-naped Ibis has enjoyed a relatively stable taxonomic position since its description by Temminck in 1824 as a species of the genera Ibis. Early descriptions based on morphology and behaviour saw some changes such as the shifting of the species to the genera *Inocotis* by Richenback, and eventually to *Pseudibis* by Hodson (Oberholser 1922). Using nuclear and mitochondrial DNA, the species fits phylogenetically within the subfamily Threskiornithinae alongside several other ibis genera (Ramirez *et al.* 2013). The Red-naped Ibis was thought to be one of two subspecies along with the White-shouldered Ibis *Pseudibis*

davidsoni due to morphological similarities (Holyoak 1970) but was subsequently recognized as a separate species.

The common English name of the species has seen many more changes. British hunters referred to the species variously as “king ibis”, “black curlew” and “king curlew”, though more formal literature referred to the species almost uniformly as “Black Ibis” or “Indian Ibis” or “Indian Black Ibis” for a long time (Blandford 1898, Baker 1929, Whistler 1949, Hancock *et al.* 1992, Ali and Ripley 2007). Red-naped Ibis ate a large number of grasshoppers and crickets in indigo fields earning them the moniker “planter’s friend” (Inglis 1903). The change of the common name to “Red-naped Ibis” does not seem essential or necessary. No other species of ibis was being confused with “Black



Ibis” despite the presence of other dark-coloured ibis species such as the Glossy Ibis *Plegadis falcinellus*. The other widely used name “Indian Ibis” was certainly a misnomer since the species occurs in other South Asian countries. Red-naped Ibis is easily recognized by people and has many names across South Asia including *Anril* (Tamil), *Buza* (Hindi), *Kala Buza* (Hindi), *Kālakantak* (Sanskrit), *Karāṅkal* (Telugu), and *Nella kankanum* (Telugu; (Blandford 1898, Inglis 1903, Dave 1985, Krishnan 1986). A more comprehensive list is needed and will require both field work and a more thorough literature review.

Ecology

The first detailed ecological assessment on the species was a compilation of observations of various people from across the Indian subcontinent on its breeding habits (Hume 1890). The summary noted that the nesting period of the species varied with location, pairs reused nests in subsequent years, some pairs shared nests with other birds especially raptors, ibises nested only on trees, nests were normally single with only one record of a colony of 4-5 nests together, and that the clutch size was 3-4 (Hume 1890). Information from Hume (1890) has been repeated in subsequent treatises of birds of the region. There have been a few recent observations of Red-naped Ibis nesting on power lines and other artificial structures (Ali *et al.* 2013, Sangha 2013), and on trees in villages and towns (Hancock *et al.* 1992; Ali and Ripley 2007). More detailed work on breeding ecology has shown Red-naped Ibis to be relatively cosmopolitan in locating its nest. Red-naped Ibis always nested singly either on *Eucalyptus* in agricultural areas (Rajesh and Kumar 2019), or on trees (primarily *Azadirachta indica* and *Ficus religiosa*) in and around a small city (Soni *et al.* 2011), or beside village ponds in arid areas (Nair and Vyas 2003). The habit of Red-naped Ibises nesting on artificial structures is relatively recent but most nests observed have been located on trees. An unusual instance of nepotism (helper birds assisting breeding adults to raise chicks) was observed during a drought, leading to improved breeding success (Soni *et al.* 2008).

Research interest in the Red-naped Ibis’ ecology seems to have peaked between 1980 and 1990 when several graduate dissertations and theses were published on the habits of the species. We were unable to access these dissertations and theses, and the work does not appear to be converted into papers in peer-reviewed journals. Nevertheless, going by the titles, the focus of the studies started out with behaviour, expanding into multiple aspects of ecology of Red-naped Ibis including foraging, feeding, and nesting biology (Salimkumar 1982, Sheshukumar 1984, Lathigara 1989, Vyas 1996, Chavda 1997). It would be of great value to peruse these studies in detail to understand the ecology of the species in an area (Saurashtra, Rajkot, India) from where additional studies have not emerged since. Another very detailed study that followed was conducted in Rajasthan with chapters subsequently published as separate papers that we have cited in this review (Soni 2008).

Diet of the Red-naped Ibis was compiled fairly early as including crustaceans (prawns, crabs), insects (beetles, crickets, grasshoppers), scorpions, and carrion (Jerdon 1864). The ibis’ behaviour of eating large numbers of crickets in indigo fields earned them the moniker “planter’s friend” (Inglis 1903). Stomach contents of two adults that were shot revealed several frogs and several smaller insects that were likely part of the frogs’ diet (Mason 1911). More recent studies have largely substantiated early observations of the species’ diet and foraging behaviour. Studies noted that Red-naped Ibis fed on several arthropod pests of agricultural crops, frequently foraging in flocks, leading to a suggestion that they protect crops in arid areas (Soni and Sharma 2007, Rajesh and Kumar 2017). Adult birds have been observed feeding on carrion (Khan 2015). Foraging was observed in a wide range of habitats throughout the year in and around a small city of Rajasthan, including a wastewater site, a garbage dumping site, agriculture fields and sand dunes (Soni *et al.* 2010). Like other ibises, the Red-naped Ibises have been observed preying on frogs that they removed from crab holes (Johnson 2003).

Several additional aspects of Red-naped Ibis have



been documented in publications. There is a single description of nocturnal calling (Shekhawat and Bhatnagar 2015). DDT levels have been recorded in the blood of Red-naped Ibis (19 ng/ mL; Dhananjayan and Muralidharan 2010). Growth rates of different body parts have been studied using chicks taken from the wild, and showed that toes, legs and tarsus had the fastest growth (Soni *et al.* 2009).

Several studies have recorded the presence of multiple parasitic taxa on Red-naped Ibis suggesting that focused work is needed to understand host-parasite relationships of the species. Two new species of trematodes, *Strigea pseudibis* and *Diplostomum ardeiformium*, have been described from captive-held Red-naped Ibis that died in the Berlin Zoo (Odening 1962). A new nematode species, *Belanisakis ibidis*, was discovered in the small intestine of Red-naped Ibis (Inglis 1954). The bird louse *Ibdidoecus dennelli* has been recorded on the feathers of Red-naped Ibis (Tandan 1958).

Summarized species accounts

Many publications, usually books, include species accounts that are meant to summarize known information. Many of these accounts detail ecological details of all bird species in a region and usually have brief accounts without properly referencing the provenance of the information provided. Species accounts also accompany bird identification guides whose focus is not ecology. We did not review such species accounts.

The most useful summaries were detailed species treatises that either covered all the birds of a region (Ali and Ripley 2007) or focused on specific taxonomic groups (Hancock *et al.* 1992). These summaries synthesized both published literature and included observations from the field providing the most thoughtful accounts that were very informative especially for poorly studied species. Ali and Ripley (2007) provided one of the earliest thorough literature reviews while also including novel information such as morphometric measurements of both eggs and adults of Red-

naped Ibis. Authors agreed on past descriptions of Red-naped Ibis' habitat requirements, feeding habits, and breeding ecology. Hancock *et al.* (1992) incorporated the information in Ali and Ripley (2007), added new published literature and included several personal observations from authors' field trips to India. Their summary provided novel descriptions of several behaviours including courtship, new locations of small breeding colonies and high nest site fidelity despite harassment by crows. Hancock *et al.* (1992) also noted the species' ability to use a variety of habitats for foraging, and nesting close to human habitation.

Red-naped Ibis ecology and conservation status have also been covered in two widely used global-scale publications. The first was the account in the "Birds of the World" series of books. (del Hoyo *et al.* 1992). Perhaps due to the scale of the effort, species accounts are very brief, and therefore lack novel information and do not include a thorough literature review. The account, however, did provide a list of counts at different wetlands based on volunteer enterprises which it uses to provide the first status assessments for the species. Authors state that the species may be severely affected due to wetland conversion and agricultural expansion. This statement is not substantiated and is in contrast to the description of the habits of the species which shows the ability of the species to use upland and other non-wetland habitats. The same information is repeated in the "The Cornell Lab of Ornithology: Birds of the World" accounts that accompanies the portal www.ebird.org. The second global-scale species account is the Red List species status assessment (BirdLife International 2016). The literature review in the status assessment is exceedingly brief and an ecological description is absent. The Appendix of the status account does very poorly to reflect the known ecology of the species at the time of publication of the account, but accurately reflects the absence of any usable population related information. The account nonetheless provides a confident status for the species as "Least Concern", while also indicating the population trend to be declining. Confident assertions of the negative impact of agriculture, designation of species status and descriptions of population trends despite absence



of information are unfortunately common for many SIS species leading to incorrect understanding of many species (Gula *et al.* 2023). Summaries describing Red-naped Ibis in ecology and status have greatly declined in quality and reliability in global-scale publications .

Habitat use as informed by photographs available online

We summarized habitat use by Red-naped Ibis using freely available photographs of the species online, that also had information on the broad location (state, country) where the photograph was taken (see Sundar *et al.* 2019 and Sundar 2020 for methods). Photographs were primarily sourced from ebird.org (N = 2,617), Facebook (N = 871), Oriental Images (N = 222), Flickr (N = 77) and Wikicommons (N = 64). At the scale of countries, Red-naped Ibis records were available largely from India. However, the available records for other countries were adequate to see that the species used wetlands relatively sparsely in all countries across South Asia (Figure 2). Within India, at the scale of the state, Red-naped Ibis used wetlands rarely in all states instead using agriculture, forest, and open areas much more (Figure 2). These findings using photographs available online broadly match existing description of the species as being a species that mostly forages in upland dry areas with sparse use of wetlands, and these habits do not appear to have changed for over a

century (Jerdon 1864; Blandford 1890; Inglis 1903, 1954; Baker 1929; Whistler 1949; Hancock *et al.* 1992; Ali and Ripley 2007).

Papers in the Special Section

We started soliciting for manuscripts to be considered for the Special Section in early 2022, but these trickled in through mid-2023 resulting in the delayed production of this issue of *SIS Conservation*. Collectively, the papers provide several unique insights into Red-naped Ibis ecology and conservation requirements.

Four nuanced contributions provided information based on relatively large-scale surveys across different agricultural landscapes in Nepal and India. Katuwal and Quan (2022) continued their impressive and important contributions from the farmlands of lowland Nepal. They recorded ibises to be widespread, detailed novel aspects such as flock size variations in different seasons, and preliminary insights into the breeding ecology of the species in Nepal. Ameta *et al.* (2022) use an *a-priori* field design to ask if Red-naped Ibises were indeed “waterbirds”, and whether the species uses habitats differently when using landscapes that have different dominant land uses (agriculture and wetlands) in a semi-arid landscape of Rajasthan, India. They showed ibises responding positively to

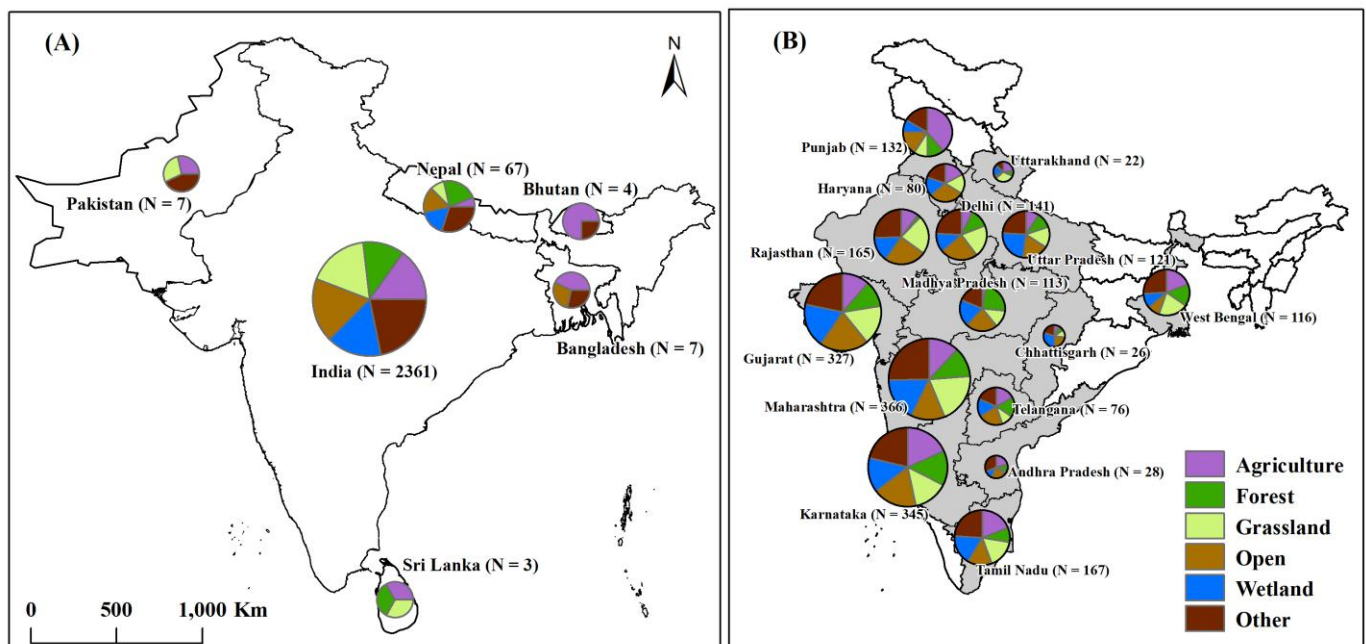


Figure 1. Red-naped Ibis habitat use at the scale of country in South Asian countries (A) and Indian states (B) as determined using photographs available online. (Maps by Swati Kittur.)



landscape-scale availability of wetlands being more numerous in areas with more wetlands and foraged preferentially (used more than availability) in wetland habitats, though the vast majority of observations were in fallow lands and crop fields. They also show that ibises varied greatly in all aspects of ecology such as flock size, habitat use and abundance in different seasons irrespective of the dominant land use. Asawra *et al.* (2022) also focused on habitat use, flock size and abundance, but asked if these aspects of Red-naped Ibis varied when different amounts of wetlands occurred on another semi-arid landscape of southern Rajasthan. They demonstrated Red-naped Ibis showing scale-dependent use of the landscape in the driest season when many more ibises used areas with more wetlands. Other aspects (habitat use, flock size) did not vary much seasonally but ibises in Dungarpur district mostly used wetlands for foraging. Kittur and Sundar (2022) analysed a gigantic data set collected over 2014–2021 across nine districts in Nepal and India. They demonstrated that Red-naped Ibis ecology (habitat use, abundance) varied seasonally and locally, but density was highest during the winter in all the areas. Density was also negatively correlated with rainfall. They extrapolated average seasonal density to the known distribution range of the Red-naped Ibis and obtained the first field-based population estimate for the species at ~20,81,860 (95% CI: 17,45,340 – 25,41,260). This estimate is coarse but varied considerably from the existing guesstimate of ~10,000. This work underscored the high variation that local populations of Red-naped Ibis showcase, but the reasons for these fluctuations are not yet understood. These four papers provide the first landscape-scale understanding of how some aspects of Red-naped Ibis are similar across locations but highlight location-specific differences that are caused by local conditions, especially availability and distribution of wetlands on the landscape.

The other papers in the Special Section varied in their focus and provided several unique insights into Red-naped Ibis ecology. Tere (2022) provided the only existing nuanced account of Red-naped Ibis behaviour when they breed colonially. Observations over two years showed two colonies to be increasing despite being located on trees

inside a village. Red-naped Ibis nesting behaviour and breeding success were similar to the habits of comparable large waterbird species nesting in rural areas of south Asia. The rarity of colonial breeding of Red-naped Ibis is inexplicable, though may increase as more birds fledge from these two colonies. Juvvadi (2022) surveyed a rural landscape in Telangana state from where ecological research on birds has been sparse. He provided insights into the perching, roosting, and nesting of the species on transmission pylons and communication towers in an area with few trees highlighting the ability of Red-naped Ibis to use such artificial structures when trees are sparse.

Charan *et al.* (2022) used *ad-hoc* observations over two years to build a picture of the natural history of Red-naped Ibis in two small towns of Rajasthan, Dhariawad and Sikar. The paper uncovered several erstwhile unknown habits of the ibis such as hunting adults Rock Pigeons *Columba livia* and predating on their eggs, feeding on bone marrow of dead cattle, feeding on dead rats and left over food inside a town, scavenging on roadkill, and fishing. In both towns, all observed nests of the Red-naped Ibis were on artificial structures such as cell-phone towers, electricity pillion towers and light poles despite the presence of many large trees in the towns. These observations show that the Red-naped Ibis is capable of becoming fully urban and developing novel feeding habits when human persecution is absent. Finally, Sinha (2022) described the first known instance of ibis feeding on nectar beside a busy road in a mega-city, Delhi. Both juvenile and adult birds were observed feeding on nectar suggesting that this behaviour is likely learnt and is likely to become more common. This observation further underscored the behavioural plasticity of urban-dwelling Red-naped Ibis.

Epilogue

The literature review in this editorial and the papers included in the Special Section have helped highlight four main aspects of Red-naped Ibis ecology. First, the species shows major behavioural plasticity that aids in exploiting resources from unnatural conditions in a variety of



urban spaces, and on agricultural landscapes. Second, landscape-scale studies showed how wetlands on the landscape attracted the species, though most ibises preferred to forage in dry habitats such as farmlands. Third, the species displayed strong seasonal and locational variations in abundance due to rainfall and wetland availability suggesting that monitoring its population will be challenging. Undertaking population size estimations and long-term trends that based on counts made only at wetlands should be avoided. Based on the newly estimated population size, increasing observations of the species in urban areas and farmed landscapes, and the plasticity in habits, the Red-naped Ibis' global status appears secure. Finally, some habits of Red-naped Ibis such as the use of diverse habitats for foraging, breeding singly and rarely in colonies, and using human-modified areas appear not to have changed in over a century. Increased focus on urban dwelling Red-naped Ibis have helped discover several novel behaviours.

A large proportion of observations and studies on Red-naped Ibis are from arid and semi-arid regions of India, primarily from Gujarat and Rajasthan states, though some multi-year investigations in wetter areas such as the floodplains of Uttar Pradesh and Nepal are available. Studies covering the rest of the range of the species in south Asia, especially from wetter areas, will be useful to better understand the species' habits. Several ecological aspects such as population genetics, movement ecology, more focused studies on parasites, and survival have not yet been covered by studies, and are needed. Behavioural studies that focus on foraging efficiency, diet of the species in different locations, inter- and intra-species interactions, and mechanisms that allow Red-naped Ibis to live sympatrically with other ibis and waterbird species are also needed. The species appears to be recognized by people across south Asia suggesting that studies based in sociology and anthropology will be greatly rewarding.

We are now armed with a lot of new information that are helping to show the species to be among the most abundant waterbirds in the Indian

subcontinent. With the publication of this issue of *SIS Conservation*, the Red-naped Ibis begins to leap out of the list of the least studied waterbirds of the world.

Acknowledgments

We are grateful to all the authors who responded enthusiastically to our calls to consider submitting their observation for the Special Section on Red-naped Ibis. We also thank the reviewers who provide rapid yet sound feedback that greatly improved submitted manuscripts. The careful documentation of freely available online photographs was a gigantic chore managed by NT, and we thank the following people for collating this information: Nandini Pathak, Poornima Madan, Alma Ali and Gyanshikha Hazarika. We remain in awe of the photographers who continually and generously contribute their creations for free use in scientific and other outputs. We gratefully acknowledge the various editors on Wikipedia for creating the most detailed account of the Red-naped Ibis that is continually updated. Wikipedia pages are not citable for various reasons, but some like the page on Red-naped Ibis provided freely-viewable information of high quality. KSGS thanks Sai Anurag Nandagiri for developing the stunning artwork that adorns the front cover of this issue. Anurag deftly used photographs to create an image that evokes an artist's field sketch book, and generously donated the image for use by SIS Conservation. We thank S. Kittur for creating the maps used in this editorial. An earlier draft benefited from the comments and suggestions made by L. S. Cano-Alonso and S. Kittur.

References

- Ali, A. H. M. S., R. Kumar and P. R. Arun. 2013. Black Ibis *Pseudibis papillosa* nesting on power transmission line pylons, Gujarat, India. *Birding Asia* 19: 104-106.
- Ali, S. and D. S. Ripley. 2007. *Handbook of the birds of India and Pakistan. Volume 1: Divers to Hawks*. Oxford University Press, Bombay, India.
- Ameta, H., V. K. Koli, S. Kittur and K. S. G. Sundar. 2022. Is the Red-naped Ibis *Pseudibis papillosa* a "waterbird"? Distribution, abundance and habitat use in landscapes with two different dominant land uses in Udaipur district, Rajasthan, India. *SIS Conservation* 4: 30-39.
- Asawra, K., A. Mitra, K. Mehta, V. K. Koli and K. S. G. Sundar. 2022. Effect of wetland extent on seasonal abundance and behaviour of Red-naped Ibis *Pseudibis papillosa* in the semi-arid Dungarpur district, Rajasthan, India. *SIS Conservation* 4: 60-68.
- Baker, E. C. S. 1929. *The Fauna of British India, including Ceylon and Burma. Volume 6. 2nd Edition*. Taylor and Francis, London. Pp. 316-317.
- BirdLife International. 2016. *Pseudibis papillosa*. The IUCN Red List of Threatened Species 2016. eT22697528A93619283.
- Blandford, W. T. 1898. *The fauna of British India, including Ceylon and Burma. Birds. Volume 4*. Taylor and Francis, London, UK. Pp. 362-363.



- Charan, M. S., P. Sharma, M. Singh, S. Kittur and K. S. G. Sundar. 2022. Natural history and behavioural observations of Red-naped Ibis *Pseudibis papillosa* in Dhariawad and Sikar cities, Rajasthan. *SIS Conservation* 4: 55-59.
- Chavda, P. B. 1997. *Studies on some ecological aspects of the Indian Black Ibis, Pseudibis papillosa (Temmick) at Junagarh and its surrounding area*. Unpublished Ph.D. thesis, Department of Bioscience, Saurashtra University, Rajkot, India.
- Dave, K. N. 1985. *Birds in Sanskrit literature*. Motilal Banarsidas, New Delhi.
- Dhananjayan, V. and S. Muralidharan. 2010. Levels of organochlorine pesticide residues in blood plasma of various species of birds from India. *Bulletin of Environmental Contamination and Toxicology* 85: 129-136.
- Gula, J., K. S. G. Sundar, S. Williams-Munro and C. T. Downs. 2023. The state of stork research globally: a systematic review. *Biological Conservation* 280: 109969.
- Hancock, J. A., J. A. Kushlan and M. P. Kahl. 1992. *Storks, ibises and spoonbills of the world*. Academic Press, London, UK.
- Holyoak, D. 1970. Comments on the classification of the Old World Ibises. *Bulletin of the British Ornithological Club* 90: 67-73.
- Hume, A. O. 1890. *Eggs and nests of Indian birds. Volume 3*. R. H. Porter, London, United Kingdom. Pp. 228-231.
- Inglis, C. M. 1903. The birds of the Madhubani sub-division of the Darbhanga district, Tirhut, with notes on species noticed elsewhere in the district. Part 6. *Journal of the Bombay Natural History Society* 15: 70-77.
- Inglis, W. G. 1954. On some nematodes from Indian vertebrates. I. Birds. *Annals and Magazine of Natural History*. 12. 7(83): 821-826.
- Jerdon, T. C. 1864. *Birds of India: A natural history. Volume III*. Wyman and Co., Calcutta, India. Pp. 769-770.
- Johnson, J. M. 2003. Black Ibis *Pseudibis papillosa* feeding on frogs from crab holes. *Journal of the Bombay Natural History Society* 100: 111-112.
- Juvvadi, P. S. 2022. Nesting substrates of Red-naped Ibis *Pseudibis papillosa* in human dominated landscapes of Telangana, India. *SIS Conservation* 4: 48-54.
- Katuwal, H. B. and R.- C. Quan. 2022. Status of the Red-naped Ibis *Pseudibis papillosa* in agricultural landscapes of Nepal. *SIS Conservation* 4: 24-29.
- Khan, A. N. 2015. Indian Black Ibis *Pseudibis papillosa* feeding on carrion. *Journal of the Bombay Natural History Society* 112(1): 28.
- Kittur, S. and K. S. G. Sundar. 2022. Red-naped Ibis *Pseudibis papillosa* density across time and space in south Asian farmlands: the influence of location, season and rainfall. *SIS Conservation* 4: 69-77.
- Krishnan, M. 1986. The Anril. In: Guha, R. (Ed.) *Nature's spokesman*. Oxford University Press, New Delhi, India. Pp. 93-95.
- Lathiagara, R. 1989. *Behavioural and ecological studies on population census, roosting, foraging, feeding and breeding of the Indian Black Ibis at Jamnagar, India*. Unpublished Ph.D. thesis, Saurashtra University, Rajkot, India.
- Mason, C. W. 1911. *The food of birds in India*. (Edited by Maxwell-Lefroy, H.) Memoirs of the Department of Agriculture in India, Agricultural Research Institute, PUSA. Imperial Department of Agriculture in India, Calcutta and London. pp. 280-282.
- Nair, A. and R. Vyas. 2003. Nesting record of Black Ibis *Pseudibis papillosa* in Kota district, Rajasthan. *Zoo's Print Journal* 18(3): 1050.
- Oberholser, H. C. 1922. *Inocotis* Reichenbach to be replaced by *Pseudibis* Hodgson. *Proceedings of Biology* 35: 79.
- Odening, K. 1962. Trematodes from Indian birds of the Berlin Zoo. *Zeitschrift fur Parasitenkunde* 21: 381-426.
- Rajesh and M. Kumar 2017. Abundance and feeding ecology of Black Ibis (*Pseudibis papillosa*) in agricultural fields of Punjab, India. *Journal of Entomology and Zoology Studies* 5(4): 992-995.
- Rajesh and M. Kumar 2019. Breeding ecology of Black Ibis *Pseudibis papillosa* in agro ecosystem of Punjab, India. *Journal of Experimental Zoology India* 22: 1151.
- Ramirez, J. L., C. Y. Miyaki and S. N. del Lama. 2013. Molecular phylogeny of Threskionithidae (Aves: Pelecaniformes) based on nuclear and mitochondrial DNA. *Genetics and Molecular Research* 12: 2740-2750.
- Salimkumar, C. 1982. *Ecology and behaviour of the Indian Black Ibis, Pseudibis papillosa (Temminck), around Saurashtra University campus: an aerial study*. Unpublished M. Sc. dissertation, Saurashtra University, Rajkot, India.
- Sangha, H. S. 2013. Nesting of Indian Black Ibis *Pseudibis papillosa* on electricity pylons near Bikaner, Rajasthan. *Indian Birds* 8: 10-11.
- Shekhawat, D. S. and C. Bhatnagar. 2015. A nocturnal call of the black ibis (*Pseudibis papillosa*). *Taprobanica: The Journal of Asian Biodiversity* 7(1): 56.
- Sheshukumar, Y. 1984. *Feeding ecology of the Indian Black Ibis, Pseudibis papillosa (Temmick) in and around Saurashtra University campus*. Unpublished M. Sc. Dissertation, Saurashtra University, Rajkot, India.
- Sinha, N. 2022. Nectar in the diet of the Red-naped Ibis *Pseudibis papillosa*. *SIS Conservation* 4: 78-81.
- Soni, K. C. 2008. *Study on population, foraging, roosting and breeding activities of the Black Ibis (Pseudibis papillosa) inhabiting the arid zone of Rajasthan, India*. Unpublished Ph.D. thesis, Department of Zoology, M.D. S. University, Ajmer, India.
- Soni, V. C., P. B. Chavda and K. C. Soni. 2010. Differential growth of various body parts of the Indian Black Ibis, *Pseudibis papillosa* Temminck (Aves: Threskionithidae). *Current Biotica* 3(3): 439-444.
- Soni, K. C. and A. N. Sharma. 2007. Role of the Black Ibis (*Pseudibis papillosa*) in crop protection in fields around Churu city, Rajasthan, India. *Flora and Fauna (Jhansi)* 13(2): 371-374.
- Soni, K. C., A. N. Sharma and V. C. Soni. 2008. Drought induced nepotistic behaviour in Indian Black Ibis (*Pseudibis papillosa*) inhabiting the arid zone of



- Rajasthan, India. *Our Nature* (2008)6: 47-51.
- Soni, K. C., A. N. Sharma and V. C. Soni. 2010. Foraging behaviour and feeding success of the Black Ibis (*Pseudibis papillosa*) inhabiting rural and urban area of Churu city, Rajasthan, India. *Recent Research in Science and Technology* 2(5): 63-72.
- Soni, K. C., A. N. Sharma and V. C. Soni. 2011. Nesting ecology, interspecific interaction and nesting association of Indian Black Ibis (*Pseudibis papillosa*) inhabiting the arid zone of Rajasthan. *Our Nature* 8(1): 12-25.
- Sundar, K. S. G. 2020. Woolly-necked Stork – a species ignored. *SIS Conservation* 2: 33-41.
- Sundar, K. S. G., V. K. Koli and S. Kittur. 2019. Advancing regional ornithology using freely available online images: the case of the distribution of the Variable Wheatear *Oenanthe picata* in India. *BirdingAsia* 32: 30-33.
- Tandan, B. K. 1958. Mallophagan parasites from Indian birds-Part IV. Species belonging to the genus *Ibidoecus* Cummings, 1916 (Ischnicera). *Transactions of the Royal Entomological Society of London* 110: 393-410.
- Tere, A. 2022. Observations of colonially-nesting Red-naped Ibis *Pseudibis papillosa* at Amla, Gujarat: nest tree preference and breeding success. *SIS Conservation* 4: 40-47.
- Vyas, S. N. 1996. *Some aspects of ecology of the Indian Black Ibis Pseudibis papillosa (Temminck) at Rajkot*. Unpublished Ph.D. thesis, Saurashtra University, Rajkot, India.
- Whistler, H. 1949. *Popular handbook of Indian birds. 4th Edition*. Gurney and Jackson, London, United Kingdom. Pp. 497-498.
-

