

Research Article

Human-Bird Conflicts and Management Issues: A Case Study of Birds at Uppalapadu Lake, Andhra Pradesh, India

P. Rama Chandra Prasad,¹ J. Asha Kumari,² Manju Mathew,² and Rosina Thomas²

¹Lab for Spatial Informatics, International Institute of Information Technology, Gachibowli, Hyderabad 500032, India

²Department of Botany, Maris Stella College, Vijayawada 50008, India

Correspondence should be addressed to P. Rama Chandra Prasad, rcrasad@iiit.ac.in

Received 16 March 2012; Revised 8 May 2012; Accepted 14 May 2012

Academic Editor: Randy J. Nelson

Copyright © 2012 P. Rama Chandra Prasad et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

The current research focused on the issues related to human-bird conflicts and subsequent alternatives adopted by the migratory birds at Uppalapadu Lake (India). The study collates the information from field observations and literature surveys and draws conclusions based on the observation data. The study highlights the ways the local community, Forest Department, activist groups and other organizations participate in protecting the birds from harm. It also focuses on some of the management initiatives taken by the Forest Department that are helping the birds during their breeding periods. Overall, the research identifies the ecological importance of the lake with respect to birds and stresses the need for its protection and further expansion.

1. Introduction

Wetlands are important aquatic ecosystems that provide services in the form of provision of water for various human uses, groundwater recharge, support of aquatic biodiversity, and are the location of various recreational activities [1–3]. These wetlands act as critical breeding sites for different species of birds within India and overseas [4]. Many migratory birds visit water bodies (lakes, ponds, etc.) to lay eggs and raise their young and go back to their place once the young chicks are able to fly. Tourists are attracted to wetlands to see the birds. In turn, local people earn income from the tourism [5]. The primary needs of the birds during their breeding period are to have suitable habitat to lay their eggs (generally some kind of trees or shrubs) and a food source. For breeding to be successful, birds require minimal human disturbance and no other threats from humans [6, 7].

Human activities, however, are deteriorating wetland water quality. The main sources of pollution of Indian wetlands are discharges from industries and urban sewage systems [8, 9]. Once these pollutants enter into the birds' bodies, they impair their basic physiological processes and hamper their metabolic activities, which can result in the

death of the animals [10, 11]. The same impacts occur to both resident and migratory birds [12–16]. Migratory birds are affected by the deteriorated quality of food and water, which is especially harmful during the breeding period. Local people often threaten these migratory birds with their activities, precluding the possibility that the birds will return to the wetlands [17–20].

Given the aforementioned problems, we have chosen Uppalapadu Lake (India) as the location of a case study which will highlight the issues related to human and bird interactions. The study primarily addresses (i) reasons for the alternative habitat selection and adaptation by birds at Uppalapadu, (ii) resource limitation and water quality deterioration, and (iii) conservation initiatives and management activities undertaken by local people, the Forest Department, and activist groups to protect and retain the population of avian fauna for future generations.

Study Area. Uppalapadu is a small hamlet two kilometers from Guntur District of Andhra Pradesh State, India (Figure 1). The lake is named as Uppalapadu Cheruvu (Cheruvu is lake) after the village. The lake is a part of Pedakakani Mandal

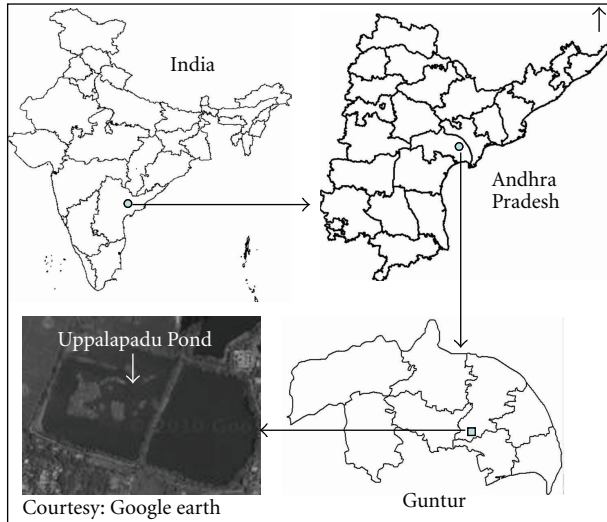


FIGURE 1: Map showing Uppalapadu Lake.

(Guntur) and is situated between $16^{\circ} 18' 24.5''$ N and $80^{\circ} 30' 36''$ E. Three more ponds lie adjacent to this lake, forming a complex of water bodies which comprise an area of 30 acres. Out of this area, the study lake accounts for nine acres, seven of which comprise the main permanently flooded area and two of which are saturated. The lake is surrounded in fencing. The lake is home to a variety of bird species, including rare and endemic species. Many researchers have analyzed species richness and avian fauna biodiversity on the lake, demonstrating its ecological importance.

The present research attempted to trace the historical and current habitat selection by avian fauna and identify their adaptation responses to positive and negative anthropogenic forces. An additional intention of this research was to increase understanding about the ecological dynamics between avian fauna and the wetland ecosystem. That objective was met through examining analyses done on this lake and comparing them to our recent observations.

2. Materials and Methods

This study used a combination of information from literature surveys, field observations, and analysis of satellite imagery to identify land use-land cover changes. At the commencement of the project, a preliminary field inventory was carried out to characterize the ecosystem of the lake, including avian fauna and the physical condition. Subsequent inventories by the team recorded significant biological elements in the lake. Interviews were conducted to obtain information about the historical migration of birds to the lake and efforts made by the local Forest Department to feed and breed the birds and encourage lawmakers to draft regulations to protect them. The study used satellite imagery to depict historic and current spatial features of the lake and its contributing area. Spatiotemporal satellite imagery for the period 1990–2000 was used, and high-resolution Google maps were used to

supplement contemporary spatial data (2008–2010). A meta-analysis was carried out using scientific literature, scientists' blogs, as well as "grey literature," Government reports and unpublished materials from the local Forest Department and other sources.

3. Results and Discussions

3.1. History

3.1.1. Migration from Garapadu Lake to Uppalapadu. According to the local residents, the birds of Uppalapadu Lake were once inhabitants of another lake called Garapadu Lake (Figure 2) situated about 4 kilometers away in Garapadu village (also known as Rama Chandra Palem), near Uppalapadu. Garapadu Lake is larger than Uppalapadu Lake and has a small island of seasonally saturated trees surrounded by annually flooded wetland: a combination of habitat characteristics which is highly suitable for bird nesting and feeding. These ecological dynamics were not fully understood by the landowners who chose a management practice inappropriate for the lake, ultimately resulting in the displacement of the birds in Garapadu Lake.

Garapadu Lake has long been under private management for commercial fisheries. The owners invested a substantial amount of money to feed the fish in the lake. In the past, every year, a flock of birds (which migrated from countries like Siberia and Australia) visited Garapadu Lake during the breeding season and consumed fish. The landowners consequently suffered economic losses. Since the intention of the landowners was to earn income through pisciculture, they saw the best management alternative to be preventing the birds from eating the fish. Therefore, the landowners started trying different techniques to remove the birds from the lake. One technique was to emit loud sounds near the bird habitat. Along with landowners, farmers also attempted to remove the birds since they feared that migratory birds spoiled their crops. In time, there was a drastic reduction in the number of birds visiting this lake and ultimately the majority of birds stopped using Garapadu Lake as their breeding site. During this study's field inventory, only a few individuals of one or two species of avian fauna were observed in the lake.

Given the anthropogenic disturbances at Garapadu Lake, the migratory birds searched for alternative habitats and chose the nearby Uppalapadu Lake as a safe breeding site. Birds appear to have adapted to visiting Uppalapadu during their breeding periods and the trend continued.

3.1.2. At Uppalapadu. Out of the four water bodies of Uppalapadu, only one serves as habitat for birds (Figure 3). The pond alongside the road (number 4) is on private property, and the two adjacent ponds are used for domestic water withdrawals and other purposes by the villagers. Rights to develop Uppalapadu Lake as a fishery have annually been placed on auction. Beginning in 2002, villagers put pressure on the local government, Panchayat, to stop auctioning fishing rights of this lake in order to protect the birds.

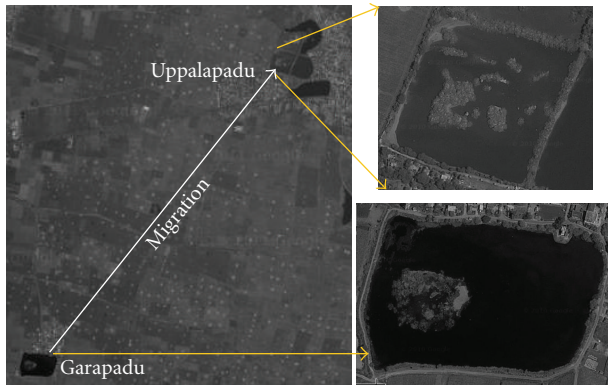


FIGURE 2: Map showing Garapadu and Uppalapadu Lakes (courtesy: Google map).



FIGURE 3: Map showing three associated water bodies and other land use-land cover classes surrounding Uppalapadu Lake (courtesy: Google maps).

Visual observation of Landsat satellite imagery for the years 1990 and 2000 (Figure 4) showed significant changes with respect to habitat and settlement in and around the lake, as well as in the size of the standing water areas (mostly reduction). The changes in land use-land cover patterns in and around lake can be linked to the birds' population. A study by Sailaja et al. [21] reported reduction in the population of birds from 12,000 to 7,000 individuals, which they attributed to anthropogenic activities. There was also a change in the water quality of the lake compared to other hydrologically connected water bodies that can be seen in Google Map (Figure 3). Usually, deep, clear waters appear dark bluish or black in remote sensing satellite imagery because they absorb all the wavelengths of the electromagnetic spectrum. The presence of any sedimentation in water thereby increases reflectance so that the water bodies appear shades of grey to light blue or cyan. In the 1990 image, the lake was black. In 2000, it was grey, indicating that the lake's

turbidity had increased. One of the reasons for this change could be release of excreta into the stagnated water by the overcrowded bird's population.

The combined actions of local residents and the Forest Department helped the birds to establish and maintain stable nesting and breeding sites at Uppalapadu Lake. Though there are some reports of migrating birds occasionally stopping at Garapadu Lake, the majority of birds prefer Uppalapadu Lake. Thus, Uppalapadu Lake was declared as protected site by State Forest Department to safeguard the birds against poaching and other illegal activities that can harm birds and their chicks.

3.2. Fauna. Since the lake serves as home for a variety of avian fauna which migrate from Australia and Siberia (continental migration), the species richness of birds in Uppalapadu Lake is high and a few researchers and organizations (including Salim Ali Centre for Ornithology and Natural History, SACON) studied avian fauna diversity of this lake (Figure 5). A few studies compared the bird species in Uppalapadu Lake with that of other nearby local lakes [22]. A study by SACON [23] recorded about 1,583 birds belonging to 40 wetlands and 20 land species in and around Uppalapadu Lake with spot-billed pelican, painted stork, and night heron as dominant species. Their study recorded 283 nests of painted storks with 959 adults and 828 young ones and 145 nests of spot-billed pelican comprised of 649 adults and 282 young ones. This indicates that the birds favour Uppalapadu Lake as a breeding site.

An additional detailed study on the spot-billed pelican (a globally threatened species) was carried out by SACON researchers in 2007-2008 [24]. They observed an increase in the breeding population (400 individuals in October 2007 to 1,500 in February 2008) of this bird in Uppalapadu Lake compared to other areas of India, where there was drastic decline due to human disturbances near nesting sites, poaching, and lacking the pelican's primary food source: fish. They also reported about 560 nests in January 2008 at Uppalapadu Lake. The existence of favorable nesting and feeding conditions at this lake attracted a higher number of these birds, thereby showing peak population of this single species at Uppalapadu Lake. Existence of higher population of pelicans encouraged SACON researchers to further study other local ecological characters that might cause these birds to choose Uppalapadu Lake as breeding site. Along with pelican population statistics, SACON reported counts of other species and provided information on their nesting locations. Interestingly, they reported a breeding colony of spot-billed pelican, painted stork and ibis at Garapadu Lake (Rama Chandra Palem). This implies that the birds tried to return to their previous habitat despite past anthropogenic disturbances.

Single species studies are more commonly undertaken in Uppalapadu Lake. Mruthumjaya Rao [25], a bird watcher, did an interesting study about the birds of this lake. According to his observations, resident birds, including cattle egrets, little cormorants, open-billed storks, night herons, and jacanas, used to roost and breed there prior 1992. But

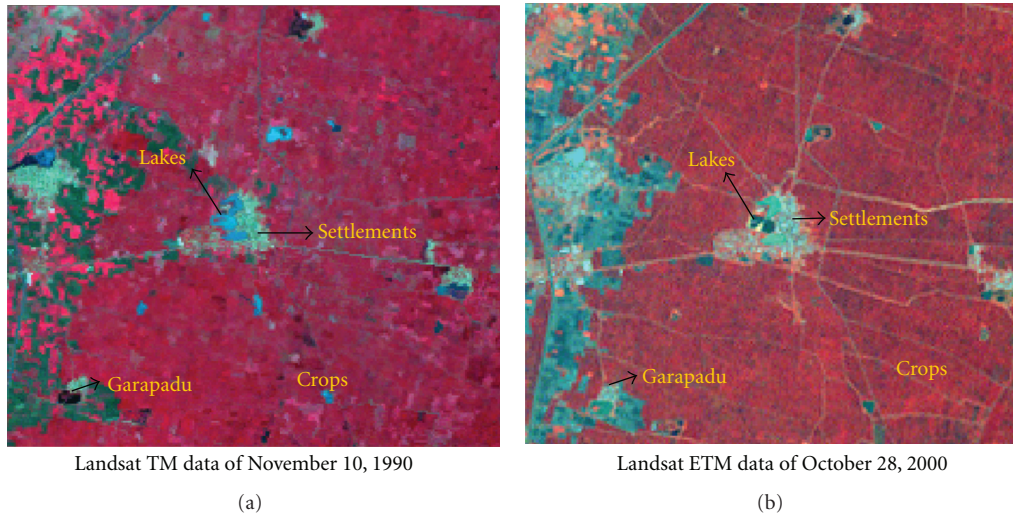


FIGURE 4: Satellite imagery showing changes in lake size and increased settlement areas.

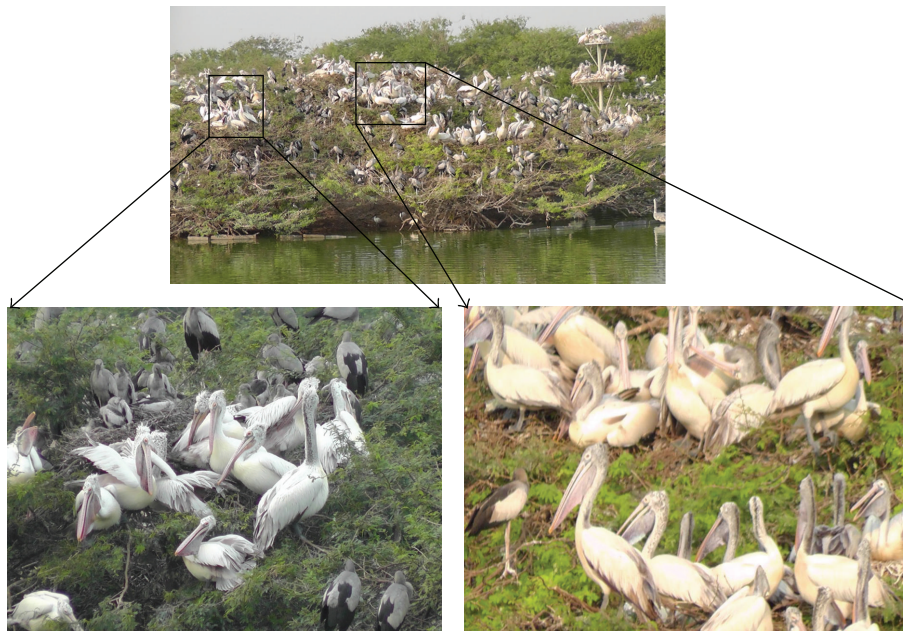


FIGURE 5: View of avian fauna at Uppalapadu Lake.

after 1992, local residents, painted storks, and the glossy ibis became regular annual migrants. He noted regular migration of pelicans and described how these pelicans build nests on *Prosopis juliflora* and now compete with painted storks for space.

A study carried out by Nanda Kumar et al. [22] described six dominant bird species inhabiting Uppalapadu Lake. Their study focused on the population characteristics of these dominant birds over a period of three years (2006–2010). They observed that the pelican's population was most abundant with a total of 6,700 individuals observed in three years, followed by white ibis (2,600), painted storks (2,000), open bill stork (1,820), glossy ibis (550), and darter (11), along with six other species (250). A comparison of the

population between years in this period showed a reduction in the population of few species during 2007-2008 (3,135) compared to 2006-2007 (4,984) and an increase in 2009-2010 (5,813). Nanda Kumar et al. [22] also reported the presence of painted storks only in Uppalapadu. The study also calculated diversity (using Simpson's diversity Index) of the avian fauna for the periods 2006 to 2010, ranging between 0.62 and 0.71 with an average of 0.67, which shows there was no significant variation in the diversity patterns. With respect to the distribution of bird species within the lake habitats, he noticed grey pelicans, painted storks, and open bill stork occupying upper strata levels and white ibis, glossy ibis at lower levels of *Prosopis juliflora*, and *Acacia nilotica* trees. The study concluded that the overcrowding

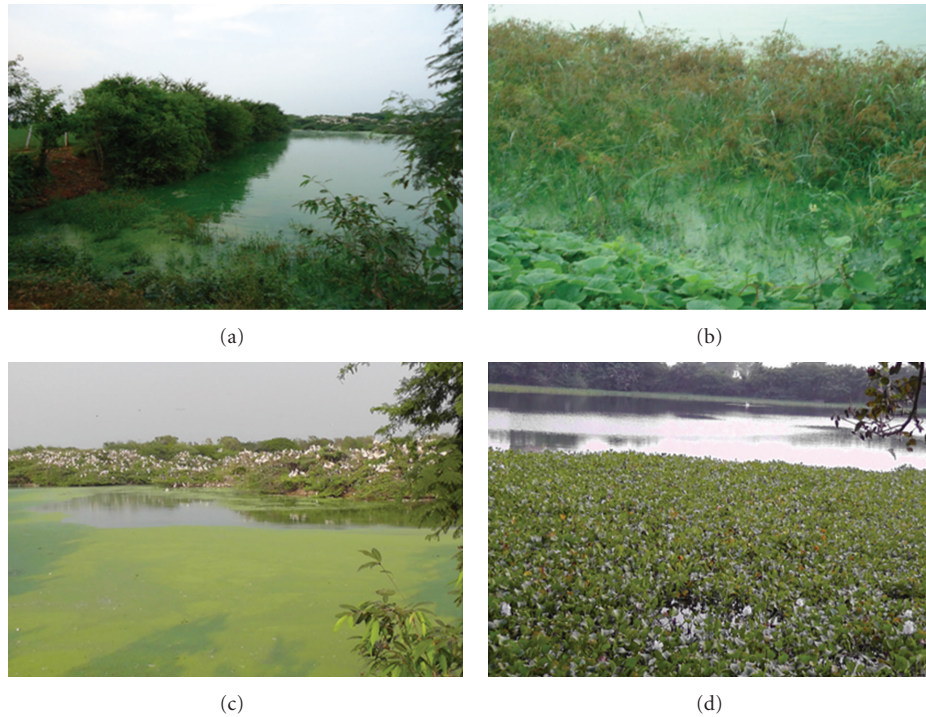


FIGURE 6: View of various aquatic weed growth at Uppalapadu Lake.

of birds and other resource limitations at Uppalapadu Lake led to a few bird species choosing alternative habitat near Garapadu village.

3.3. Threats to the Lake and Birds. In the past (maybe around 2002), there was impact from human activities on this lake [26]. At the time of this study, yet, there was no serious threat from anthropogenic activities observed to be affecting the lake. However, the size of the lake limits population of birds, which may exceed more than 20,000 individuals in peak season. The main reason for the increase in population is mainly due to the shrinking (by anthropogenic actions) of nearby Kolleru Lake (125 kilometers away), which is one of the important bird habitats [22]. Birds are not able to use adjacent water bodies, perhaps due to lack of shelter for nesting and limited food resources, or perhaps due to the threat of being nearer to human settlements, or a combination of these factors. In the past (prior to 2000), birds faced conflict with humans for space and food resources at Garapadu Lake. Currently, at Uppalapadu Lake, different bird species compete among themselves for food and space due to the limited availability of resources. Small water fowl has to compete with larger birds (pelicans) who come early to this lake to occupy the nests of other birds (such as the open bill stork); as a result, the later-arriving birds land in nearby paddy fields, ultimately being preyed on by domestic dogs and cats [25, 26].

The seven acres of annually flooded wetland of Uppalapadu Lake cannot sustain the entire migrating bird population. At the time of the study, it was estimated that the total population of birds per unit is higher than any other nearby

lakes [22]. The overcrowding of birds on *Prosopis juliflora* reduced the photosynthetic capacity of the trees and resulted in their death, which indirectly affected the birds [26]. An observation by Nani [27] was that, in order to cope with this space competition, a group of birds started migrating back to Garapadu Lake. Nani's study observed 700 pelicans and 50 storks inhabiting Garapadu Lake.

The constraint of space not only resulted in inter- and intraspecies competition but also fouled the lake water with the excreta of the birds, which is in excess of what the lake has historically been able to process. The bird excreta likely also contaminate the adjacent water bodies. Local residents who use this water for domestic purposes reported skin ailments (itching, pustules, and rashes) during interviews conducted for this study.

Since the water in the lake is nearly stagnant (less inflow than outflow), it accumulates biowaste materials from the birds, causing profound growth of invasive species, notably *Eichhornia spp.*, and microscopic algae. The extent of growth of these species varies seasonally. The team observed an increase in the area occupied by weeds and algae during field surveys conducted at different periods (Figure 6). The team noticed that the main lake along with adjacent water bodies is subject to eutrophication, resulting in the covering of the water surface with vegetation, predominantly *Eichhornia spp.* This ultimately reduced the open water on the lake, affecting birds' access to food.

3.4. Management of the Lake. The local residents of Uppalapadu village initially created problems for the migrating birds but later gladly accepted the migrating birds when

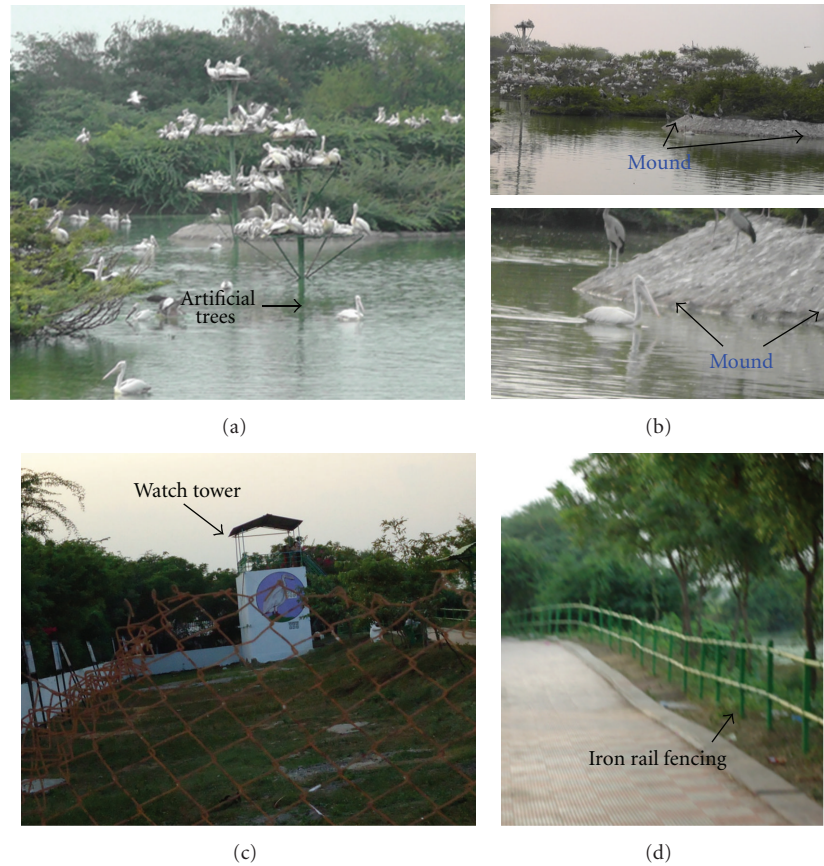


FIGURE 7: Management steps at Uppalapadu Lake.

they emigrated from Garapadu Lake and did not bother them in one of the lakes in the Uppalapadu complex. The villagers continued to use the water in the adjacent pond for the domestic purposes. In order to prevent pollution of the pond by bird feces, they constructed a bund (sand fence) to remove the hydrologic connection between the two lakes. The villagers liked these birds and started protecting them from poaching.

The Forest Department took over management of the lake in 1997 and developed it with the intention of restoring and maintaining physical and biological features that benefit the birds. The Department increased potential bird habitat by constructing fourteen mounds in the 2-acre lake that harbors the majority of the birds (Figure 7). They strengthened the mounds by curbing them with Napa slab.

Prosopis juliflora and *Pithecellobium dulce* are the dominant species on the mounds and are used by the birds for nesting [23]. Due to continuous use by the new immigrants, the shrubs get deteriorated regularly. In order to prevent further deterioration, the Forest Department introduced two artificial trees into the lake. The technique of introducing artificial trees provided the birds with a supportive substratum for nesting and breeding purposes. After noting that the birds nested in the introduced trees, the Department planted two more trees (Figure 7).

The Forest Department closed off the perimeter of the entire lake with a chain-like fence and iron railing. These

created a barrier to prevent direct and indirect human interference (Figure 7). In order to promote tourism, they installed a watchtower near the lake (Figure 7). The Forest Department also installed interpretive signs near the lake which showed pictures of some of the important bird species and described their life history (Figure 8).

The Forest Department continues to take additional measures to improve the quality of the lake for the birds. They frequently introduce fish into the lake to provide a food source for the birds. They also take measures to modify the hydrology of the lake. The lake inlet is a tributary to the Krishna River, and, whenever inflow exceeds outflow, they create an additional outlet to drain water into a nearby water body. Due to those measures, there is standing water in the lake throughout the year, which supports the birds.

Recognizing the ecological significance of this lake and its avian fauna biodiversity [28], the Government of Andhra Pradesh passed various laws to punish the people who try to poach the birds, steal their eggs, or disturb their activities. From February 2002 to present, two guards working for the Forest Department have monitored the lake and the activities of the visitors entering this protected area.

3.4.1. Proposals by the Forest Department to Promote Sustainable Management. Collated observations from the studies



(a) (b) (c)
 FIGURE 8: Display boards at entrance of the lake showing important bird species of the lake.

on this lake suggest that there are a large number of birds frequently visiting this lake. Species per unit area is very high, leading to constraints on perching, nesting, and breeding activities. Thus, the Forest Department has come up with following conservation proposals, which would amount to a 3.61 crores investment.

- (1) As space is the main constraint on the number of birds that can use the lake, they proposed acquiring habitat on adjacent land. One identified conservation area is the nearby high school property (Figure 3).
- (2) Creating a new pond with additional vegetated mounds.
- (3) Planting more saplings and shrubs that can provide shelter.

The Times of India [29] recently reported that, in Andhra Pradesh (State of India), the Irrigation Department released two crore rupees under the environmental protection fund that the Forest Department could use to upgrade the

Uppalapadu protected area. The planned use of these funds is to plant more shrubs to shelter migrating birds and thereby encourage more tourists to visit the lake.

3.5. Activist Groups Working on Bird Conservation. Currently, the local people living around Uppalapadu Lake show great compassion for the birds that inhabit their lake. Even though these birds raid their crops to build their nests and dirty their water bodies with their excreta, the residents ignore these damaging impacts and actually protect the birds from poachers. School children also demonstrate appreciation for the birds. They are actively involved in identifying bird's species and explaining their characteristics to the tourists [25].

Apart from Government and local people, a nongovernmental organization called "Care for Nature's Creatures" advocates protection of the birds. They take care of orphaned pelicans and rehabilitate them until they can take care of themselves [30]. In 2009-2010, SACON conducted a study on the spot-billed pelican breeding colony with 500 nests.

Their study suggested that expanding the protected area by acquiring adjacent land to provide more nesting platforms and active community participation in rescuing the birds and their habitat will help in protecting this near-threatened species. The committee formed by the local villagers passed a resolution in 2005 to protect biodiversity of the area by declaring it as a “Community Wildlife Reserve” [31].

3.6. Suggestions. One outcome of our study was to identify additional measures for improving the environmental quality of the lakes. The following are the identified improvement measures.

(1) Since a major portion of the open water on Uppalapadu Lake is covered with *Eichhornia spp.*, frequent removal of this invasive plant from the lake should be adopted as of the immediate means of improving the quality of water.

(2) Additional water quality management measures like chemical treatments may reduce the foul odour of the water.

(3) Water quality could also be improved by increasing the regular inflow of water into the lake.

4. Conclusions

The present data analysis detailed a brief historical scenario of birds' adaptation to human impacts. It has focused on negative actions of Garapadu Village and the positive protective measures taken by Uppalapadu villagers and the Forest Department for the conservation of the migrating avian fauna. The study highlights the methods and techniques adopted by Forest Department officials in providing artificial shelter and fish for feeding. The study identified that the lake could benefit from further management efforts to improve the water quality and increase the habitat (lake space) to accommodate a higher population of birds. The initial measures proposed by the Forest Department are admirable and may help in preserving and protecting the birds in this wetland over the long term. The research conducted by SACON on the species within this lake ecosystem has been extensive. It is our hope that this research will provide a better understanding of the behaviour, adaptive ability, and life cycle of birds in relation to their ever-dwindling habitats.

Acknowledgments

The authors are thankful to the Global Land Cover Facility Programme, University of Maryland for providing satellite data. Thanks to officials of Forest Department of Andhra Pradesh (India) and local people of Uppalapadu and Garlapadu village for their valuable information. Thanks are due to Ms. Kirsten for her constructive comments and edits in revising the paper.

References

- [1] R. Brouwer, I. H. Langford, I. J. Bateman, T. C. Crowards, and R. K. Turner, “A meta—analysis of wetland contingent valuation studies,” *Regional Environmental Change*, vol. 1, pp. 47–57, 1999.
- [2] R. T. Woodward and Y. S. Wui, “The economic value of wetland services: a meta-analysis,” *Ecological Economics*, vol. 37, no. 2, pp. 257–270, 2001.
- [3] IWMI, “Working wetlands: a new approach to balancing agricultural development with environment protection,” 2006, http://www.iwmi.cgiar.org/Publications/Water_Policy_Briefs/PDF/WPB21.pdf.
- [4] A. Bhatt, “Migratory birds: our celestial guests,” 2012, <http://www.greaterkashmir.com/news/2012/Jan/17/migratory-our-celestial-guests-18.asp>.
- [5] B. L. Sharma and Jaydeep, “Wetland Tourism—a case study of Keoladeo Bharatpur Wetland,” in *Proceedings of the 29th Indian Geography Congress*, Udaipur, India, November 2007.
- [6] W. J. Sydeman, J. F. Penniman, T. M. Penniman, P. Pyle, and D. G. Ainley, “Breeding performance in the western gull: effects of parental age, timing of breeding and year in relation to food availability,” *Journal of Animal Ecology*, vol. 60, no. 1, pp. 135–149, 1991.
- [7] S. Y. Kim and P. Monaghan, “Interacting effects of nest shelter and breeder quality on behaviour and breeding performance of herring gulls,” *Animal Behaviour*, vol. 69, no. 2, pp. 301–306, 2005.
- [8] B. L. Bayne, D. A. Brown, K. Burns et al., *The Effects of Stress and Pollution on Marine Animals*, Praeger, New York, NY, USA, 1985.
- [9] J. Seager and L. Maltby, “Assessing the impact of episodic pollution,” *Hydrobiologia*, vol. 188–189, no. 1, pp. 633–640, 1989.
- [10] C. J. Henny, J. L. Kaiser, R. A. Grove, V. R. Bentley, and J. E. Elliott, “Biomagnification factors (fish to osprey eggs from Willamette River, Oregon, U.S.A.) for PCDDs, PCDFs, PCBs and OC pesticides,” *Environmental Monitoring and Assessment*, vol. 84, no. 3, pp. 275–315, 2003.
- [11] S. Wei, Y. Wang, J. C. W. Lam et al., “Historical trends of organic pollutants in sediment cores from Hong Kong,” *Marine Pollution Bulletin*, vol. 57, no. 6–12, pp. 758–766, 2008.
- [12] S. B. De Luca-Abbott, B. S. F. Wong, D. B. Peakall et al., “Review of effects of water pollution on the breeding success of waterbirds, with particular reference to ardeids in Hong Kong,” *Ecotoxicology*, vol. 10, no. 6, pp. 327–349, 2001.
- [13] N. Pastor, M. Lopez-Lazaro, J. L. Tella et al., “DNA damage in birds after the mining waste spill in southwestern Spain: a comet assay evaluation,” *Journal of Environmental Pathology, Toxicology and Oncology*, vol. 20, no. 4, pp. 317–324, 2001.
- [14] D. W. Connell, B. S. F. Wong, P. K. S. Lam et al., “Risk to breeding success of Ardeids by contaminants in Hong Kong: evidence from trace metals in feathers,” *Ecotoxicology*, vol. 11, no. 1, pp. 49–59, 2002.
- [15] D. W. Connell, C. N. Fung, T. B. Minh et al., “Risk to breeding success of fish-eating Ardeids due to persistent organic contaminants in Hong Kong: evidence from organochlorine compounds in eggs,” *Water Research*, vol. 37, no. 2, pp. 459–467, 2003.
- [16] J. C. W. Lam, S. Tanabe, M. H. W. Lam, and P. K. S. Lam, “Risk to breeding success of waterbirds by contaminants in Hong Kong: evidence from trace elements in eggs,” *Environmental Pollution*, vol. 135, no. 3, pp. 481–490, 2005.
- [17] J. R. Liebezeit, S. J. Kendall, S. Brown et al., “Influence of human development and predators on nest survival of tundra birds, Arctic Coastal Plain, Alaska,” *Ecological Applications*, vol. 19, no. 6, pp. 1628–1644, 2009.

- [18] E. Mellink and M. Riojas-López, "Waterbirds and human-related threats to their conservation in Laguna Cuyutlán, Colima, México," *Revista de Biología Tropical*, vol. 57, no. 1-2, pp. 1–12, 2009.
- [19] H. M. Conesa and F. J. Jiménez-Cárceles, "The Mar Menor lagoon (SE Spain): a singular natural ecosystem threatened by human activities," *Marine Pollution Bulletin*, vol. 54, no. 7, pp. 839–849, 2007.
- [20] R. T. Kingsford and R. F. Thomas, "Destruction of wetlands and waterbird populations by dams and irrigation on the Murrumbidgee River in Arid Australia," *Environmental Management*, vol. 34, no. 3, pp. 383–396, 2004.
- [21] M. Sailaja, Narsimha Reddy, and V. B. Murthy, "Participatory development for biodiversity conservation. The Eastern Ghats," EPTRI ENVIS Newsletter, 2006, <http://envis-eptri.ap.nic.in/images/Vol.12,No.1,2006.pdf>.
- [22] N. V. Nanda Kumar, K. Sailaja, and A. Nagarjuna, "Avian biodiversity indices and comparative chronobiology of uppalapadu and nelapattu bird protected areas of Andhra Pradesh, India," *European Journal of Applied Sciences*, vol. 3, no. 2, pp. 62–66, 2011.
- [23] "SACON Annual Report (2006-2007)," Ecology and Conservation of the Spot-billed Pelican in Andhra Pradesh, http://moef.nic.in/divisions/csurv/annual_report_E_2007.pdf.
- [24] "SACON Annual Report (2007-2008)," Ecology and Conservation of the Spot-billed Pelican in Andhra Pradesh http://moef.nic.in/divisions/csurv/annual_report_E_2008.pdf.
- [25] M. Rao, <http://www.wildorissa.org/uppalpadu.htm>.
- [26] <http://www.atsweb.neu.edu/pparimi/The%20Hindu%20%20Children%27s.htm>.
- [27] Nani, <http://hanione.blogspot.com/2009/09/uppalapadu-bird-sanctuary.html>.
- [28] <http://www.indiavideo.org/andhrapradesh/travel/uppalapadu-bird-sanctuary-5838.php>.
- [29] Times of India, 2011, http://articles.timesofindia.indiatimes.com/2011-03-07/india/28665167_1_rare-birds-sanctuary-kolleru.
- [30] P. J. Sanjeeva Raj, "Eco-management for successful pelican conservation," *Indian Journal of Environmental Education*, vol. 10, pp. 5–12, 2010.
- [31] <http://www.hindu.com/2005/07/20/stories/2005072003050200.htm>.



Hindawi

Submit your manuscripts at
<http://www.hindawi.com>

