Chapter 6

Major threats and conservation implications

Humans have made considerable changes in the Earth’s ecosystems in the last century (Alberti et al., 2003). These changes are in an alarming pace by controlling and consuming resources (Vitousek et al., 1986), altering habitats and species compositions (Brown et al., 2005; McKinney, 2002). According to Vitousek et al. (1997), it is estimated about one-half of the Earth’s landscapes have been altered by human actions. Birds respond to a number of structural and functional elements of the environment based on a diverse array of microhabitat requirements (Taylor, 2008). Wetland ecosystems are important bird habitats; birds use them for feeding, roosting, nesting, and rearing the young (Anon, 2000). Waterbirds form an important component of wetland ecosystem and plays significant cultural and social role in local communities (Kumar et al., 2005). They occur often in spectacular concentrations and are one of the most obvious indicators of the richness and diversity of these productive ecosystems (Wetlands International, 2006) and their presence is widely valued by numerous stakeholders including local human populations, tourists, associated enterprises and research biologists throughout the world (Li and Mundkur, 2007).

Kumar et al. (2005) stated that, 20% of the threatened bird species in Asia inhabit wetlands. Management of the wetlands is crucial for conservation, since the resident waterfowl spend most part of their life in the wetlands (Vijayan, 1995). As a wetland ecosystem, Kuttanad region is important for the breeding and roosting wetland birds and several other taxa of fauna and flora. Heronries are biologically active regimes formed by the nesting colonies of certain groups of waterbirds and are having conservational significance due to the presence of many rare as well as IUCN Red Listed species and great number of nests and individuals are found in a limited space and time (Balakrishnan and Thomas, 2004; Urfi et al., 2005). The breeding requirements are usually specific for a species and hence should be given high priority for the conservation and management (Vijayan, 1995). Conservation decisions concerning threatened bird species are often
based on data about population size or trend (Tucker and Heath, 1994; IUCN Species Survival Commission, 1994), although factors such as breeding parameters are important to consider (Delord et al., 2003). The maintenance of established heronries and associated feeding areas are essential to ensure the stability of breeding population of wetland birds and these are especially vulnerable to human disturbances and habitat destruction during the breeding season when large number of birds are concentrated in a relatively confined area (Bowman and Siderius, 1984).

Kuttanad wetland forms a premier roosting and nesting ground for many wetland birds including the globally near threatened Oriental Darter within Kerala. According to Zacharias and Gaston (2003), the near-threatened Oriental Darter population had declined in Kerala. The current chapter is aimed to highlight the basic factors which threaten the Oriental Darter, other wetland birds and heronries of Kuttanad wetlands and to propose a conservation action plan for the wetland birds of the region.

6.1 Major threats to the Kuttanad wetland ecosystem

In the Kuttanad region the major resources for livelihood is the Vembanad Lake, in the form of reclaimed lands for paddy cultivation, fishing, tourism etc. Several human interventions combined with poor management have led to ecological conflicts in this region. According to Sreejith (2013) biodiversity loss, decrease in agricultural production, depletion of aesthetic value, discharge of sewage, encroachment, flood and drought, habitat degradation due to developmental activities such as buildings, roads, railways, bunds, townships and other infrastructural developments, mining, obstruction of navigation, over exploitation of resources, pollution, reclamation, scarcity of pure water, waterborne diseases and weed management are the major concerns of Kuttanad wetland ecosystem. It is obvious that the anthropogenic pressure has inflicted drastic change in this ecosystem. All the above mentioned set backs are having its own positive and negative effects on the flora and fauna of this wetland.

6.2 Major threats to the Oriental Darter, other wetland birds and heronries of Kuttanad wetlands

Thanneermukkom salt-water barrage (1250m long) commissioned in 1975 was constructed across the narrow portion of the Vembanad Lake to prevent the saltwater intrusion during summer from sea and to spill out floodwater during monsoon. The
Thanneermukkom barrage has greatly influenced the ecology of the region. When this regulator is closed, there is virtually no flow of water beyond it on the southern side making the entire Kuttanad a static pool. At present the barrage is open from December 22nd to March 22nd. Water with heavy loads of pesticides and fertilizers from the paddy fields and uplands are drained into this stagnant water body. Persistence of these kinds of situations triggered several ecological backlashes like proliferation of weed growth, deterioration of the water quality, increased morbidity among the local fish population and destruction of subsistence fishery on which the local fishermen depended (Narayanan et al., 2011). Barrage also impaired the migration of marine and estuarine fauna. Horizontal and vertical shrinkage of Vembanad Lake, vanishing mangroves, eutrophication, increased interventions in the area by tourism, Thottappally spillway, sewage and industrial pollution etc. are the major problems of Kuttanad wetlands (Narayanan et al., 2011).

The loss of habitat through direct and indirect anthropogenic activities causes immense threat to the wetland birds especially the migratory species of Kuttanad. The most important threats to the Oriental Darter, wetland birds and the heronries are the following.

6.2.1 Landscape alteration

The key threat factor is the landscape alteration in Kuttanad. Encroachment of the wetlands for the construction of new buildings and settlements are very common in Kuttanad, even though it is legally banned. Before and after the year 1947, huge area of the Vembanad Lake has been converted to paddy fields to enhance the rising demand for food. This adversely affected the migratory birds such as ducks and teals by reducing the available roosting place, foraging areas and food (Narayanan and Sreekumar, 2012). The nesting trees in the heronries of South Police Station – Alappuzha, PWD guest house – Kottayam heonry etc. are situated very near to the road and any kind of future developmental activities in these regions may threaten the life of the trees in which Darters and other wetland birds nest. Cutting of the nesting trees in the name of developmental activities already been reported from the northern districts of Kerala (Sashikumar and Jayarajan, 2007).
6.2.2 Poaching

Hunting pressure is intense in certain areas of Kuttanad; Sashikumar and Palot (1996) have earlier reported heavy poaching of the birds from this area. The main hunting methods include shooting, hooks and line with fishes as bait and poaching the nestlings from nests. The main species caught by shooting is winter migrants like ducks, teals and godwits. Black-crowned Night-herons and egrets are the species heavily trapped by hook and line method (Narayanan, 2004). Heavy poaching of nestlings of Purple Heron from the nests situated in the thickets of *Phragmites karka* has been reported from the R Block area, but poaching of the chicks of Oriental Darter has not been observed during the study period. They used to nest very high in the trees and this would be the reason behind this.

6.2.3 Felling of nesting vegetation and roosting trees

Usually, people living close to the trees used by nesting birds are quite tolerant initially, but the effect of the stench that emanates from the defecations and the rotting remains of fish and nestlings that fall down from the nests above, will ultimately have a repulsive effect on people (Subramanya, 2005a). More often, this results in parts of the nesting trees being pruned (Fig. 6.1) or the tree even completely removed to discourage nesting birds (Subramanya, 1996). Such instances of cutting down nesting trees of colonial nesting waterbirds are rampant in Kuttanad. Each heronry in Kerala is facing similar kind of threat from the local people and it has been one of the main reasons for the collapse of once the largest Nooranad heronry of Kerala (Subramanya, 2005a). The reduction in size or the total felling of sacred groves also created trouble for the roosting and nesting Darter and cormorants. At Karumadi a nesting tree *Ficus benghalensis* was cut down by the owner (Fig. 6.2). The extent of mangrove trees in the Kumarakom heronry and Pathiramanal has drastically been reduced. After the taking over of Kumarakom heronry by KTDC, 13 hectares of the land was given to a venture company by KTDC. They cleared the mangrove belt along the lake and converted them into a lawn and constructed a tourist jetty. With this, a species of mangrove *Kandelia candel* was totally wiped out from the Kumarakom heronry (Ramachandran and Mohanan, 1990; Sreekumar, 2001). Same kind of destruction of native vegetation where wetland birds nested was reported by Narayanan and Vijayan (2008) from much said to be protected KTDC Tourist Complex heronry.
Wetlands and reed beds in particular are most often considered on conservational interest for its bird communities (Bibby and Lunn, 1982). The Kuttanad wetlands have a good area of *Phragmites karka* reeds and it has a crucial part in the breeding of the Purple Heron, Intermediate Egret and Black-crowned Night-heron. But these habitats are destroyed for various purposes and in certain instance these reed beds are cut down to poach the bird chicks (Fig. 6.3). Bibby and Lunn (1982) and Tscharntke (1992) considered the minimum reed bed size for the conservation purpose as 2ha. Studies of Rodgers and Smith (1995) throw light to both intraspecific and interspecific variations in the flushing response of birds to the human disturbance. In general, they recommended setback distance of about 100m for wading bird colonies. But at the KTDC Tourist Complex heronry this much distance between the visitors and breeding birds is lacking.

![Pruned branches of a nesting tree](image-url)  
*Fig. 6.1 Pruned branches of a nesting tree*  
© B. Sreekumar
Fig. 6.2 Completely destroyed nesting tree *Ficus benghalensis* from Karumadi heronry

© Suresh Payippad

Fig. 6.3 Destroyed reed *Phragmites karka* patches

© B. Sreekumar
6.2.4 Pesticides

Intensive use of chemical fertilizers and pesticide as a part of the agriculture activities has played havoc on the traditional farming system and lifestyle of Kuttanad, affecting birds, other wildlife as well as human beings (Sashikumar and Palot, 1996). Organochlorine and organophosphate pesticides are widely used in paddy cultivation all over the State. Studies conducted in the Kuttanad ecosystem show that these chemicals are present well above the permissible limits. Seedikkoya and Shukkur (2004) reported the presence of organochlorines such as DDT, DDE, Dieldrin, Aldrin and heavy metals such as zinc (Zn) and copper (Cu) in Indian Pond-heron, Little Egret *Egretta garzetta* and Eastern Cattle Egret *Bubulcus coromandus* from northern Kerala. But such studies on birds are not yet conducted in Kuttanad.

6.2.5 Overgrowth of exotic vegetation

Infestation of the exotic waterweeds like *Eichhornia crassipes*, *Salvinia molesta* are causing serious harm to the diving waterbirds (Sashikumar and Palot, 1996), but at the same time they provide foraging areas for the species like Jacanas and Moorhens. At certain periods of the year shallow regions of the Vembanad Lake are being covered by *Eichhornia crassipes* which is drastically reducing the foraging area of the Oriental Darter (Fig. 6.3 and 6.4). In the same way, the recent spread of the exotic rooted submerged *Cabomba caroliniana* also causes similar kind of harm for Darter. Spread of exotic vegetation pose immense threat to the native flora and fauna of this region including the humans.

![Exotic Eichhornia crassipes covered shallow regions of Vembanad Lake](image)

**Fig. 6.4** Exotic *Eichhornia crassipes* covered shallow regions of Vembanad Lake
Fig. 6.5 *Eichhornia crassipes* covered area close to the Pennar River within the Vembanad Lake

© Aneesh Sasidevan

6.2.6 Tourism related activities

Ali (1987) reported that large flocks of wintering ducks roost in the calm waters of Vembanad Lake. At present, amplified promotion of tourism by using boats and speedboats force migratory ducks to desert roosting place in the Lake. Most of the tourist resorts in and around the Vembanad Lake and Kuttanad do not have any proper solid waste and wastewater treatment facilities, therefore all waste materials are dumped into the Lake during night hours. This activity adversely affects self-sustaining capacity of the Lake. House boats discharge effluents and wastes directly into the lake and large amount of oil are spilled into the system. In the name of tourism the authorities, who own the Kumarakom heronry cleared pure stands of *Phragmites karka* (Fig. 6.3) where Black-crowned Night-heron, Intermediate Egret, and Great Egret nest. This activity has drastically affected nesting habitats of the breeding birds.

6.2.7 Predation and other kinds of mortalities

Predation may be one of the sources of nest failure in the colonial nesting wetland birds. The nest predation is often the primary source of nest failure in Passerine birds (Ricklef, 1969). Nest predation has significant role in the evolution of many aspects in avian nesting behaviour (Lack, 1968; Burger, 1982). Predation also plays a role in the
nesting success of waterfowl (Vijayan, 1996). Predation by mammals or birds causes nest losses and may cause the total destruction of a colony (Manry, 1978; Parson, 1977; Olmes, 1990). Among Ciconiiformes, there is no group or individual defense behaviour and even low predation is apparently capable of destroying very large colonies (Shields and Parnell, 1986; Rodgers, 1987). The nesting period is an extremely vulnerable stage for the colonial herons (Fellowes et al., 2001). Colonial breeding waterbirds are particularly susceptible to human disturbance because of the high density nesting habits (Rodgers and Smith, 1995). This will be detrimental to reproductive success including loss of egg and young, nest evacuation, reduced nestling body mass and slower growth, premature fledging and modified adult behaviour.

Cormorants, ibises, egrets, herons and certain occasions Oriental Darter deserted the nest at the approach of man; later the eggs in the nests were predated by the House Crow *Corvus splendens*. 29 observations on the egg predation were spotted from the study area. But no specific predation of the nests of Darter has been recorded. Both crows House Crow *Corvus splendens* and Indian Jungle Crow *Corvus culminatus*, appeared to be the most important nest predators in the area. The presence of predators can cause panic among incubating and brooding adults (Nisbet, 1975; Nisbet and Wetlton, 1984). Predation has been reported to be a major limiting factor for the reproductive success of wetland birds (Wolford and Boag, 1984; Tremblay and Ellison, 1980; Henny et al., 1984; Blus et al., 1997).

Maximum egg predation was observed when the human activities disturbed the brooding birds. Jayson (2004) reported that House Crow and the Common Rat-snake *Ptyas mucosus* were the most prominent predators in Mangalavanam, Kochi and Brahminy Kite *Haliastur indus*, Black Kite *Milvus migrans*, House Crow and Jungle Crow are the major predators at Ramanattukara heronry (Chozhiyattel, 2009). But Crows were the major predators in the Keoladeo National Park during the egg laying period, but birds of prey belonging to the genera *Aquila* and *Circus* replaced during nestling period (Vijayan, 1991). Corvid species cause major threat to heronry nesting species in other parts of the world too (Drachmann et al., 2002; Punta et al., 2003; Hothem and Hatch, 2004). Other potential predators like Oriental Ratsnake *Ptyas mucosa* and avian predators such as Rufous Treepie *Dendrocitta vagabunda* and Southern Coucal
Centropus sinensis were very common in the study area. Reptilian predators such as Indian Python Python molurus and Bengal Monitor Varanus bengalensis were also present in the study area. But no specific observations of attack of these animals were reported during the study period at any of the heronries.

During the study period 32 broken eggs of various species and 8 nestlings of Oriental Darter were found below nesting trees. Among these, three were live ones. Nestling fall down from the tree, might be due to the attack of predators, or losing the grip and slip from the tree or due to the harsh storms as part of the heavy South-West monsoon. According to the local people lot of nestlings died due to the heavy wind and rainfall in the monsoon (Narayanan, 2004). Similar kind of death of chicks is also reported in Spot-billed Pelicans Pelecanus philippensis from Nelpattu Bird Sanctuary of Andhra Pradesh (Sahrma and Raghavaiah, 2002).

Unattended or discarded net can also be a threat to the Darter in its foraging areas. One dead hanging individual of a Darter was recorded from the Chennithala - Upper Kuttanad region with fragments of entangled fishing net in its beak (Fig. 6.6).
6.3 Conservation action plan

Proper management is obligatory from the viewpoint of conservation of near threatened and other species (Jha, 2012). Hence, for the protection of Oriental Darter, other wetland birds and heronries the following action plan is proposed for their conservation in Kuttanad wetland.

- Active patrolling should be carried out by the forest department, at least five groups with four forest guards, at different parts of the Kuttanad area to stop poaching, especially during the breeding and migratory seasons.
- Nature awareness programmes explaining the ecosystem services rendered by the wetlands with its fauna and flora are to be given to the public.
- A protected area has to be created including KTDC Tourist Complex heronry and near by Pathiramanal Island where once Oriental Darter used to nest. The forest department, local Panchayaths, NGO’s and various stakeholders are to be involved in the protection and management.
- To avoid the disturbance at heronry like pruning or felling of the nesting trees, incentives to be provided to the people who are having active heronry in his/her backyard. It was initiated by Kerala Forest Department, but eventually stopped. Hence, the protection of heronries should be restarted again.
- Regulation of inflow and outflow from the Thanneermukkom saltwater barrage should be done properly according to the management strategies proposed in the earlier published works.
- Reclamation of wetlands for industrial, settlement, plantation and cultivation purposes should be restricted and Government departments should be persuaded to have strict environmental impact assessment (EIA) before the implementation of any new projects in the area.
- Restoration of mangroves in the area should be executed. For the production of new plants, vegetative propagation and tissue culture methods can be opted.
- Remaining sacred groves must be preserved under the guidance of forest department and local owners like temple authorities.
• For the effective management of exotic weeds adequate removal methods (mechanical) have to be implemented.

• Solid waste and wastewater treatment facilities must be developed in all tourist resorts in the Vembanad region.

• All tourist establishments must provide a fraction of money from their yearly profit for the restoration activities of the Kuttanad wetlands through government and local NGO’s.

• Mobile checking facilities should be initiated to seize polluting boats and its license should be withheld.

• Detailed study on the movements of the wetland birds of this area should be conducted to determine the spatial and temporal pattern of bird migration and ecological requirements should be identified to determine the drastic reduction in the population of many bird groups.

• Stringent implementation of the Coastal Regulation Zone Act under 6 (1) category (CRZ1) for this area is required.

As observed in other parts of India, many of the heronries have started as roosting sites (Subramanya, 1996), as the basic requirements of both the roosting and nesting sites of large wetlands birds are almost the same (Subramanya, 2005a). Most of the heronries start as small nascent breeding colonies with fewer nesting birds, but given adequate protection, the colony grows in size both in terms of number of nesting species and their numbers (Subramanya, 2005b). At the same instance lack of protection and continued disturbance to the nesting activity of the birds can spell doom to any nesting colony (Subramanya 2005a).