

Chapter 1

Relationship of Oriental darter *Anhinga melanogaster* Pennant, 1769 with *Ficus* species

Niraj Kumar¹, Pradeep Kumar², Sohan Lal³, Subhalakshmi Rout⁴
Sanjeet Kumar⁴ and Parminder Singh Dehar^{5*},

¹Department of Zoology, LND College, Motihari, East Champaran (B.R. Ambedkar Bihar University, Muzaffarpur), Bihar, India

²Department of Zoology, GLA College, Daltonganj, Jharkhand, India

³Department of Botany, Govt. G.S.G. P.G. College, Balod, Chhattisgarh, India

⁴Ambika Prasad Research Foundation, Odisha, India

⁵Dept of School Education, Govt of Punjab, GHS Kamalpur Sangrur, Punjab, India

*Email-Id: inderdehar08@gmail.com

Abstract

A wetland is an essential ecosystem for smaller faunal species, megafaunal species, and humans. They provide several services to every organism found in that environment. Oriental darters heavily depend on the wetlands for nesting and rivers for food as they are obligate piscivores. They prefer to make nests on tall trees with flattened spreading branches supporting them. However, the population of Oriental darters is now threatened and declining due to unavailability of the nesting trees for the birds along with other anthropogenic issues that the nesting habits of the birds. Keeping the issue of the threatened population of Oriental darters in mind, an attempt has been made to observe the nesting habits of the darters near the Mahanadi River areas at Naraj, Cuttack, Odisha. The survey revealed a few nests on *Ficus benghalensis* and *Ficus religiosa* trees in May 2024 and an effort has been taken to list out other preferred nesting trees of the birds so that these listed plants can be planted near the Mahanadi River areas to conserve the declining population of the oriental darters.

Keywords: *Ficus benghalensis*, *Ficus religiosa*, wetland ecosystem, nesting behaviour, conservation, afforestation

Introduction

Nesting is a very critical and essential step in the lifecycle of birds for the continuation of life process on Earth and keeping the individual's race from becoming extinct. Therefore, nature plays a vital role in smoothening the process for the organisms (Guchhait *et al.*, 2023). However, human actions negatively influence the natural biological rhythm of ecological processes (Sharma *et al.*, 2023; Devi *et al.*, 2024). Oriental Darter *Anhinga melanogaster* belonging to the family Anhingidae are colonial nesters. They usually make nests on flattened tree branches near water bodies for easy access to surplus amount of food for the newly hatched offspring. Darters use small twigs to build their nests and soften the nest using leaves and grasses for eggs and young ones. It is the only species listed as globally Near Threatened with a declining population and it is legally protected under Schedule IV of the Indian Wildlife (Protection) Act, 1972 (Niangthianhoi and Khudsar, 2015). The population decline can be due to several reasons but mainly breeding failure is responsible for this decreasing population. Previously, the darters had to protect their eggs and young ones from natural predators, but now they are facing massive issues like the unavailability of tall trees for nesting, low availability of fish for feeding, pollution, drying up of water bodies, poaching, etc.

They are mainly piscivores and heronry nesting species found singly, in pairs or small flocks, rarely in large flocks, and inhabit shallow inland wetlands including lakes, rivers, swamps, mangroves, coastal lagoons, estuaries, and reservoirs (Narayanan *et al.*, 2012). Therefore, wetland plays a crucial role in the nesting of the darters and their preservation should be taken as a top priority to maintain proper feeding and nesting ground for the birds. Keeping in mind the declining and threatened population of Oriental darters, a survey was done near the Mahanadi River areas at Naraj, Cuttack, Odisha in May 2024 to document the nesting habitats of the darters. An extensive literature survey was done to list out the preferred nesting trees of the birds and the study also suggests the plantation of the listed and observed trees like *F. benghalensis* and *F. religiosa* trees near the Mahanadi River areas to protect the threatened population of the Oriental darters (Figure 3).

Morphology of *Ficus benghalensis*

Ficus benghalensis is a large tree belonging to the family Moraceae, epiphytic when young; branches sending down roots that form into accessory trunks; bark grey; new branchlets pubescent. Leaves approximate near the ends of the branchlets, ovate to elliptic, 10-15 x 8-12 cm, coriaceous, old glabrous or slightly pubescent beneath, young softly pubescent and often reddish, base rounded or subcordate, 3-5 nerved, secondary nerves 5-8 above the basal ones, looping close to the margin and united by numerous closes tertiaries and reticulate nervules which are not raised; petiole 2-4.2 cm long, eglandular or mostly with a large flat, smooth gland beneath near the confluence of the main nerves; stipules 2-2.5 cm long. Figs sessile, in pairs, globose or subglobose, 1.2-1.7 cm diameter, scarlet when ripe, puberulous, with 2-4, more or less connate, broad, obtuse bracts at the base. Figs are available all year round, ripening during April-June and December-February (Saxena and Brahman, 1995).

Morphology of *Ficus religiosa*

Ficus religiosa is a large tree belonging to the family Moraceae, epiphytic when young; all parts except the bracts glabrous; bark grey, smooth, and irregularly pitted when old. Leaves more or less pendulous, broadly ovate, 12-25 x 8-16 cm, margin often repand, very long-caudate, coriaceous, dark green and shining above, base cordate or truncate with 3 strong principal nerves and 2-4 weaker ones, secondary nerves 8-10, looped within the margin, acumen many nerved; petiole slender, 4-10 cm long; stipules linear subulate, 4-7.5 cm long. Figs axillary, geminate, sessile, depressed-globose, 1-1.5 cm diameter, smooth, glabrous, dark purple when ripe, basal bracts 3, broad, rounded, spreading, ciliate or pubescent, 3.8-6 mm long. The fruiting period is from June to October (Saxena and Brahman, 1995).

Morphology of Oriental darter

Oriental darter has a bill slender, straight, and very sharp-pointed, with both margins of commissure toothed near the tip; no lateral groove; nostrils small, basal, linear; neck very slender, with a bend at the 8th and 9th vertebrae which enables the bird to capture fishes with its bill, by suddenly straightening the neck. Wing pointed, 3rd quill longest; scapulars elongate and lanceolate. Tail long, cuneate, of 12 rigid feathers. The crown and neck are brown in colour, all the feathers have pale edges, back of

the neck is blackish; the chin, throat, and a line commencing above the gape, and continuing about halfway down each side of the neck are white; a minute white streak also above the eye; upper back black, the feathers with brown edges; lower back, rump, tail-coverts, tail-feathers, primary and secondary quills, and lower parts from the neck glossy black; scapulars, wing-coverts, and tertiaries black, with conspicuous silvery-white shaft-stripes; last tertiary in each wing and two middle pairs of tail-feathers with the outer web ribbed. In immature birds, the neck is pale brown, whitish beneath, with indistinct lateral stripes. The black on the lower back, rump, breast, and abdomen is sooty or brownish, and the silvery stripes on the upper plumage are tinged yellow (Blanford, 1898).

Methodology

During the floral diversity study near the Mahanadi River areas, a flock of Oriental darters was sighted building nests on *F. benghalensis* and *F. religiosa* trees in Brijbiharipur village at Naraj, Cuttack, Odisha in May 2024. Knowing the near-threatened population status of Oriental darters, the nesting pattern of the birds was recorded through direct observation and interviewing the people living in the nearby villages through semi-structured questionnaires.

Literature studies were done to list the most preferred plants of Oriental darters for their nesting so that these trees could be planted more and more to conserve the population of these threatened birds. The authors identified the observed plants and bird species through available literature (Grimmett *et al.*, 2011; Kumar *et al.*, 2022).

Observations

In the present study, nests of oriental darters were observed on *F. benghalensis* and *F. religiosa* indicating the tree as the most preferred tree for nesting (Figure 1 & 2). Oriental darters prefer tall trees with spreading branches facilitating their nest formation. They like to build nests on the trees near the water bodies with a surplus supply of fish for their feeding. The darters were seen collecting twigs from the nearby areas to build nests on the old branches of the trees to strengthen the nests.



Figure 1: A group of oriental darters on the nesting tree, *Ficus benghalensis*



Figure 2: Nest of oriental darter on *Ficus benghalensis*

They are generally found nesting with little egrets, little cormorants, grey herons, etc. The interviews with local people highlighted the issues of the declining population of the oriental darters due to the unavailability of these big trees for hampering the nesting of these birds. Several other anthropogenic activities like excessive fish-catching, plastic pollution, sand mining, global warming, climate changes, urbanization, etc. are responsible for the decreasing fish population indirectly playing a vast role in the decline in the population of the darters. From the literature study, the authors found that 30 trees like *Samanea saman*, *Tamarindus indica*, *Alstonia scholaris*, *Ficus benghalensis*, *Ficus religiosa*, and other trees listed in Table 1 are some of the preferred nesting trees of Oriental darter.



Figure 3: Plantation of *Ficus religiosa*

Table 1: Nesting trees of Oriental darter

Scientific name	Common name	Family	Source
<i>Acacia nilotica</i>	Babool	Fabaceae	Niangthianhoi and Khudsar, (2015)
<i>Alstonia scholaris</i>	Blackboard tree	Apocynaceae	Ajitha and Jose, (2015)
<i>Anacardium occidentale</i>	Cashew	Anacardiaceae	Roshnath and Sinu, (2017)
<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae	Roshnath and Sinu, (2017)
<i>Azadirachta indica</i>	Neem	Meliaceae	Frank <i>et al.</i> , (2021)
<i>Bambusa bambos</i>	Indian thorny bamboo	Poaceae	Frank <i>et al.</i> , (2021)
<i>Barringtonia acutangula</i>	Mangopine	Lecythidaceae	Frank <i>et al.</i> , (2021)
<i>Borassus flabellifer</i>	Toddy palm	Arecaceae	Frank <i>et al.</i> , (2021)
<i>Cassia fistula</i>	Golden shower tree	Fabaceae	Roshnath and Sinu, (2017)
<i>Casuarina equisetifolia</i>	Ironwood	Casuarinaceae	Roshnath and Sinu, (2017)
<i>Cocos nucifera</i>	Coconut tree	Arecaceae	Roshnath and Sinu, (2017)
<i>Dolichandrone spathacea</i>	Mangrove trumpet tree	Bignoniaceae	Roshnath and Sinu, (2017)
<i>Eucalyptus tereticornis</i>	Forest red gum	Myrtaceae	Niangthianhoi and Khudsar, (2015)
<i>Ficus benghalensis</i>	Banyan tree	Moraceae	Roshnath and Sinu, (2017)
<i>Ficus religiosa</i>	Peepal	Moraceae	Roshnath and Sinu, (2017)
<i>Gliricidia sepium</i>	Mother of cocoa	Fabaceae	Roshnath and Sinu, (2017)
<i>Hibiscus mutabilis</i>	Cotton rose	Malvaceae	Roshnath and Sinu, (2017)
<i>Macaranga peltata</i>	Chandada	Euphorbiaceae	Roshnath and Sinu, (2017)
<i>Madhuca longifolia</i>	Mahua tree	Sapotaceae	Frank <i>et al.</i> , (2021)

<i>Madhuca neriifolia</i>		Sapotaceae	Roshnath and Sinu, (2017)
<i>Mangifera indica</i>	Mango	Anacardiaceae	Roshnath <i>et al.</i> , (2018)
<i>Peltophorum pterocarpum</i>	Copper pod	Fabaceae	Roshnath and Sinu, (2017)
<i>Polyalthia longifolia</i>	False ashoka tree	Annonaceae	Roshnath and Sinu, (2017)
<i>Prosopis juliflora</i>	Mesquite	Fabaceae	Frank <i>et al.</i> , (2021)
<i>Samanea saman</i>	Rain tree	Fabaceae	Ajitha and Jose, (2015)
<i>Strychnos nux-vomica</i>	Strychnine tree	Loganiaceae	Roshnath and Sinu, (2017)
<i>Swietenia mahagoni</i>	Small-leaved mahogany	Meliaceae	Roshnath and Sinu, (2017)
<i>Tamarindus indica</i>	Tamarind	Fabaceae	Ajitha and Jose, (2015)
<i>Tectona grandis</i>	Teak	Lamiaceae	Roshnath and Sinu, (2017)
<i>Terminalia catappa</i>	Indian almond	Combretaceae	Roshnath and Sinu, (2017)

Conclusion

From the study, it was concluded that oriental darters being one of the threatened bird species have to be conserved and special attention should be given to the nesting pattern of the bird species to protect their population. The present study highlighted using *Ficus benghalensis* and *Ficus religiosa* trees by the darters for building nests. However, the unavailability of tall trees in urban areas due to urbanization, agricultural lands, industrialization, etc. plays a significant role in the failure of breeding in these birds as these birds prefer a calm and sound environment for their nesting. The low availability of fish for feeding can also be one of the reasons for the decline in the population of the darters which may be due to the drying up of the Mahanadi River, sand mining, conversion of wetlands into agricultural lands, excessive fishing, etc. Therefore, conserving the darter population is necessary through the plantation of *F. benghalensis*, *F. religiosa*, and other listed plants near the Mahanadi River areas.

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