Some breeding aspects of Great Cormorant *Phalacrocorax carbo* in Periyar Lake, Kerala

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Introduction

The Great Cormorant *Phalacrocorax carbo* is an aquatic diving bird species that is distributed almost throughout the world (Orta et al. 2018). The species is found throughout India (Ali & Ripley 1987; Grimmett et al. 2011), and in Kerala it is resident and locally migratory (Neelakantan et al. 1993; Sashikumar et al. 2011). Since Great Cormorants feed primarily on fish, they are at the apex of the aquatic food chain and are good indicators of the health of the aquatic body that they inhabit.

Great Cormorants colonised the Periyar Lake in the late 1980's partially displacing the Oriental Darter *Anhinga melanogaster* (Robertson & Jackson 1992; Neelakantan et al. 1993; Srivastava et al. 1993). In fact, before the arrival of the Great Cormorant, Oriental Darters were breeding in the lake (Nair & Nair 1973). The construction of the Mullaperiyar Dam, and the emergent snags, proved beneficial for the species as it has established itself well in the lake and is able to breed there. Jafer Palot reported 196 birds in May 1992 (Neelakantan et al. 1993), and Robertson & Jackson (1992) reported upto 90 birds. During our monthly census in 2016–2018 we regularly count between 20 to 40 birds covering 50% of the lake.

In Kerala, in addition to Periyar Lake, Great Cormorant has been reported from the reservoirs along the hills and midlands from Peruvannamuzhi, Kakkayam, Banasura Sagar, Karappuzha, Kanjirappuzha, Siruvani, Malampuzha, Walayar, Meenkara, Chulliyar, Pothundy, Mangalam, Parambikulam, Perivarippalam, Thunkadavu, Vazhani, Peechi, Chimmony, Sholayar, Idamalayar, Bhoothethankettu, Idukki, Kullar(Gavi), Kochupampa, Kakki, Tenmala, Aruvikkara, Peppara, and Neyyar (eBird 2019)—breeding in small numbers in some of the larger and undisturbed reservoirs in the Western Ghats in Kerala (Sashikumar et al. 2011). There is a small resident population of Great Cormorants around the coastal wetlands of Vembanad-Kuttanad breeding in the Kumarakom heronry (Narayanan et al. 2006). There are a spate of reports from the remaining coastal regions of Kerala that are hard to assess due to a lack of convincing evidence; confusion with Indian Cormorants *P. fuscicollis* cannot be ruled out and birds are nowhere found regularly. Subramanya (2006), in his inventory that was collected in 1996, reported two other nesting sites along the coast: Karali Marsh (Kollam), and Kottayam town. However, a state-wide heronry count in 2015, during the monsoon season, reported only Kumarakom as the breeding site for this species (Roshnath et al. 2017). This makes the breeding colony in Periyar Lake the largest in Kerala. A nationwide inventory done in early 1990s reported nests from around 25 sites (Subramanya 1996).

Inspite of the fact that the Great Cormorant breeds in Periyar Lake, nesting details are lacking, except for some opportunistic observations published in the past (Robertson & Jackson 1992; Neelakantan et al. 1993). To fill this lacunae, a proper survey was undertaken in Periyar Lake during the two nesting seasons, 2016–2017, and 2017–2018, with the objective of collecting data on nest numbers, nest distribution, and nesting tree traits.

Study area

Periyar Lake lies within the boundary of the Periyar Tiger Reserve (925 sq. km) in the Idukki District of Kerala (Fig. 1). It is a large inland freshwater lake (26 sq. km) formed after the Mullayar and Periyar rivers were dammed in 1895. Boating is a major recreational activity and boats travel up to Paravalavu. The lake is mostly open water and is surrounded by forest. As a result of the construction of the dam, a considerable area of forest was submerged and dead trees emerged above the water surface. Great Cormorants use these trees to nest upon.

Methodology

To count Greater Cormorant nests and collect associated data, the entire stretch of the lake, from boat landing to Mullakudy (20 km), was navigated by boat once a month. Nest searches were carried out during two seasons (2016–2017 and 2017–2018). The southern parts of the lake (Kozhikanam, Aruvioda), and the northern parts (Puvarasu, Nellikampatty) were navigated in alternate months. If a nest was located, the following variables were noted down: tree height, nest height, position of the nest in the tree, and distance from the shore. The location of the nest tree was also marked using a GPS device.

Results and discussion

Nest and nesting period

Observations in Periyar Lake indicate that the Great Cormorant attains its breeding plumage in late July. Nesting started in August, in both the seasons, and new nests were recorded till December

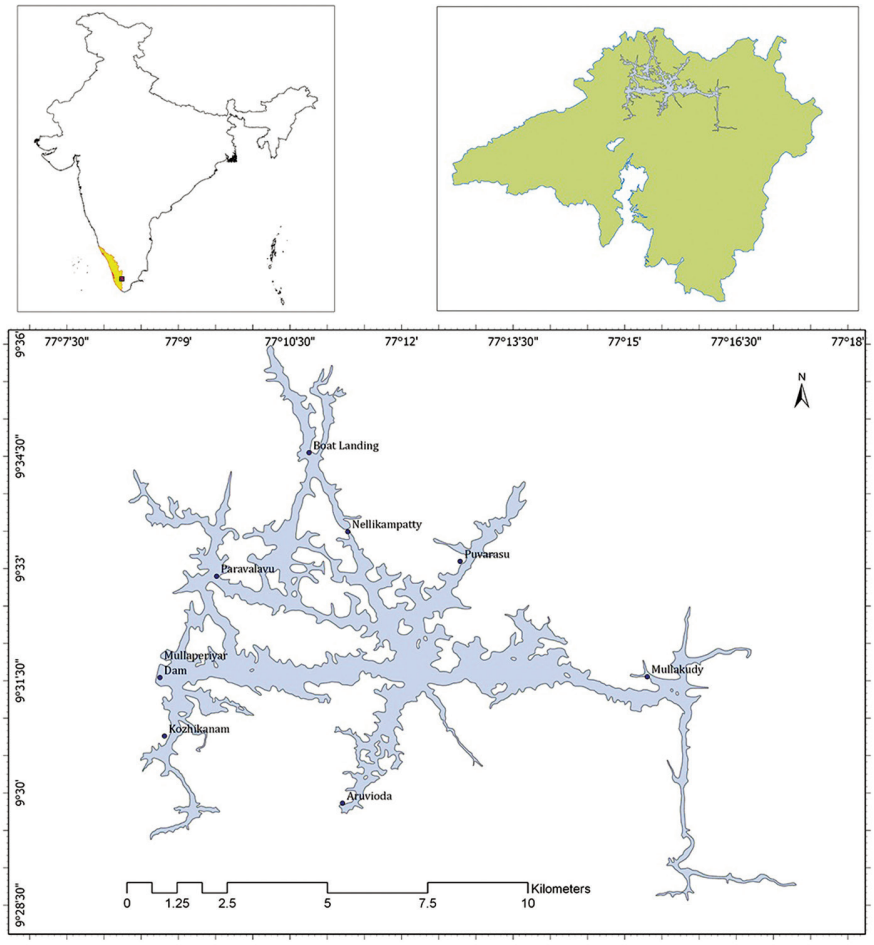

Fig.1. Location of Periyar Lake

during 2016–2017, and till January during 2017–2018. In 2017–2018, though new nests were encountered only till January, young ones were recorded in the nest till March.

The nest is a wide and deep platform constructed with grass shoots and dry sticks **[197]**, which are collected by diving underwater. Nests are placed either on tops of the trees, or in forked branches, or shallow depressions. The bird's nesting season preference in Periyar Lake may be an adaptation to escape the strong winds and heavy rains that prevail during the early south-western monsoon from June to July, or may be an adaptation to make use of the lake's abundant fish resource.

197. Great Cormorants on a nest.

Neelakantan et al. (1993) reported the nesting season in Periyar (the only breeding site then) occuring during December–May. In the Kuttanad wetland complex Narayanan (2014) recorded nesting from June to September. In other reservoirs in the district, breeding has been reported between January and March (Sashikumar et al. 2011): Chimmony (March), Banasurasagar (January), and Siruvani (February). In the adjacent state of Tamil Nadu, nesting occurred from September to March (Subramanya 2006). With the exception of the coastal breeding population, it appears that the Great Cormorants in the inland reservoirs prefer to start breeding after the monsoon's fury is over.

Nest numbers and nesting tree traits

In total, we recorded 40 nests in 29 trees during the first season, and 36 nests in 33 trees during the second season. The total number of nests recorded during the monthly count is provided in Table 1. New nests were recorded till December during the first year, and January during the second year. During the first year, after December, no activity was recorded in the nest, while during the second year nestlings were recorded till March. This is slightly lesser than the number of nests in the 1992–1993 season, when Jafer Palot reported 50 nests (Neelakantan et al. 1993). Robertson & Jackson (1992) reported sighting of 20 nests; but it is not clear how comprehensive their counts were.

Table 1. Month-wise count of nests

Year	August	September	October	November	December	January
2016–2017	9	20	34	38	40	–
2017–2018	6	14	NC	29	34	36

NC=Not counted

The average tree height was 8 m (8±2.3) and the average nest height was 7.05 m (7.05±2.2) above water level (Fig. 2). However this is subject to change as water level fluctuates. The average distance of the nesting tree from the lake shore was 17.6 m (17.6±10.06). 55% of the nests were placed in between forked branches, and the remaining on tops of branches, or on tree tops. In Kumarakom, nests were located at a height of 12 m in *Terminalia catappa* trees (Narayanan et al. 2006).

The same sets of trees were used for nesting in both the years. Most of the nests were missing (broken) and new nests were constructed the subsequent year. Colonial nesting species tend to return to the same set of trees for nesting year after year and they abandon them only when the trees are lost to natural disasters or human interference (Subramanya 1996).

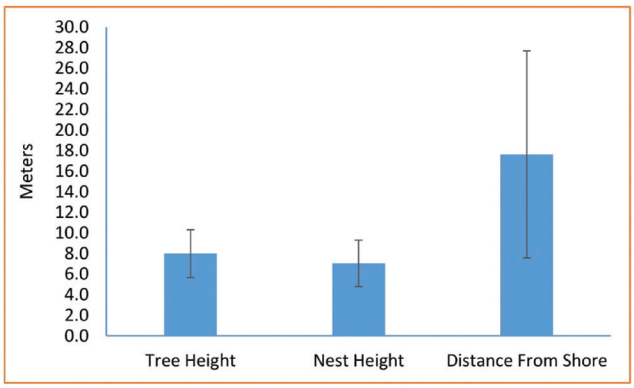

Fig. 2. Nesting tree traits

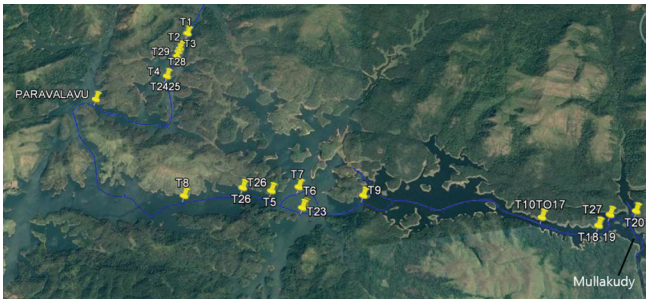

Fig. 3. Distribution of nests during the first year

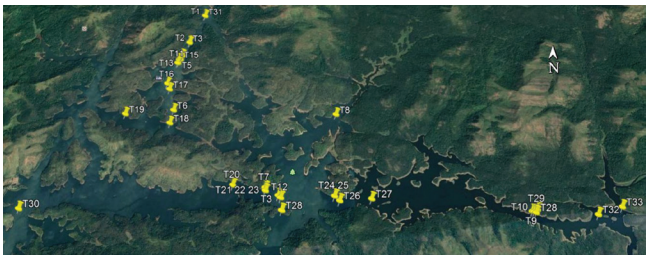

Fig. 4. Distribution of nests during the second year

Spatial distribution of nests

Nests were distributed mostly along the main stretch of the Lake, from Boat Landing area to Mullakudy (Figs. 3, 4). Great Cormorants avoided nesting in the lake's branching arms. 80% of the nests was located in the non-tourism zone where they are still well habituated to humans as this stretch of water is used by the forest department staff and fishermen.

There is a clustering of Great Cormorant nests in the Periyar Lake. Clustering might be a reflection of the colonial nesting habits of the species. For instance, during the first year, the first cluster of trees was located close to the boat landing (Trees 1–4, and 24, 25, 28, and 29). The first two trees were 1.4 km away from the boat landing, and the fourth tree was 2.6 km away. Tree numbers 5, 6, 7, 21, 22, 23, and 26 were within 1 km of each other and formed the second cluster. The fifth tree was 6 kms away from the boat landing and 3.7 km away from the fourth tree as the crow flies. Tree numbers 10–20, and 27 formed the third cluster, and were close to Mullakudy. The third cluster of trees was located within 2 km of each other.

Conservation requirements

Since Periyar Lake lies within the boundary of the Periyar Tiger Reserve, the breeding colony of Great Cormorant is protected. This protected area status, availability of dead trees for nesting, less competition for nesting space, and availability of food in abundance has sustained the population of Great Cormorant for three decades in Periyar Lake. There are a few recommendations for the long term conservation of the species in Periyar Lake that are listed below:

1. The standing dead trees in the lake are vital for the nesting of the Great Cormorant and must be consistently monitored for their structural strength.
2. An assessment of fish diversity and abundance during the nesting period, and impact of commercial fishing on birds. e.g., fishermen leave their nets in water even during the day, and fishing nets have been found entangled around the beaks of other aquatic bird species (though not Great Cormorants).
3. Patrolling along the lake's fringes should be strengthened during the nesting period, especially to monitor the nesting trees located close to the fringes.

References

Ali, S., & Ripley, S. D., 1987. *Compact handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka.* 2nd ed. Delhi: Oxford University Press. Pp. i–xlii, 1 l., 1–737, 52 ll.

eBird 2019. Website URL: ebird.org/species/grecor/IN-KL.

Grimmett, R., Inskipp, C., & Inskipp, T., 2011. *Birds of the Indian Subcontinent.* 2nd ed. London: Oxford University Press & Christopher Helm. Pp. 1–528.

Nair, N. R., & Nair, V., 1973. A note on the breeding of darters in the Periyar Lake. *Indian Forester* 99 (10): 621–622.

Narayanan, S. P., Raju, D. V., Unnikrishnan, N., Vasan, S., & Sreekumar, B., 2006. Do Great Cormorants *Phalacrocorax carbo* displace other colonial nesting waterbirds at Kumarakom heronry (Kerala)? *Indian Birds* 2 (5): 138.

Narayanan, S. P., 2014. A study on the status, ecology and conservation of Oriental Darter *Anhinga melanogaster* in Kuttanad wetland, Kerala. PhD thesis, Mahatma Gandhi University, Kottayam, Kerala. Pp. 163.

Neelakantan, K. K., Sashikumar, C., & Venugopalan, R., 1993. *A book of Kerala birds. Part 1.* Trivandrum: World Wide Fund for Nature-India. Kerala State Committee. Pp. i–xxxii, 1–146.

Orta, J., Garcia, E. F. J., Jutglar, F., Kirwan, G. M., & Boesman, P., 2018. Great Cormorant (*Phalacrocorax carbo*). In: *Handbook of the Birds of the World Alive*. Lynx Edicions, Barcelona. del Hoyo, J., Elliott, A., Sargatal, J., Christie, D.A. & de Juana, E. (eds.). Website URL: https://www.hbw.com/node/52629. [Accessed on 25 November 2018.]

Robertson, A., & Jackson, M. C. A., 1992. *Birds of Periyar. An Aid to Birdwatching in Periyar Sanctuary, Kerala, S. India.* 1st ed. [Jaipur]: Tourism and Wildlife Society of India. Pp. i–xviii, 1–100.

Roshnath, R., Sashikumar, C., P. Greeshma C., Mannar, H., B. Sreekumar, Mavelikara, H., & Aivakumar, A. K., 2017. Heronries of Kerala 2015—a summary of the Heronry Census. *Malabar Trogon* 15 (3): 40–45.

Sashikumar, C., Praveen J., Palot, M. J., & Nameer, P. O., 2011. *Birds of Kerala: status and distribution.* 1st ed. Kottayam, Kerala: DC Books. Pp. 1–835.

Srivastava, K. K., Zacharias, V. J., Bhardwaj, A. K., & Jafer, P. M., 1993. Birds of Periyar Tiger Reserve, Kerala, South India. *Indian Forester* 119 (10): 816–827.

Subramanya, S., 1996. Distribution, status and conservation of Indian heronries. *Journal of the Bombay Natural History Society* 93 (3): 459–486.

Subramanya, S., 2006. Heronries of Tamil Nadu. *Indian Birds* 1 (6): 126–140 (2005).