

Guidelines for conducting research on the nesting biology of Indian birds

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Barve, S., Raman, T. R. S., Datta, A., & Jathar, G., 2020. Draft guidelines for conducting research on the nesting biology of Indian birds. *Indian BIRDS* 16 (1): 10–11. Sahas Barve, Smithsonian National Museum of Natural History, 10th Street and Constitution Avenue NW, Washington, D.C. 20560.

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Manuscript received on 03 February 2020.

This document presents suggested guidelines for studying the nesting biology of Indian birds for professional or amateur bird researchers. They have been modified from, and adapted for, the Indian context from similar resources developed by the British Trust for Ornithology (BTO 2019) and the Cornell Lab of Ornithology (CLO 2019). This first version of these guidelines is being published here accompanying the Barve et al. (2020) paper in *Indian BIRDS* to solicit comments from birdwatchers, researchers, conservationists, and others interested in bird research and conservation. We especially encourage scientists that study raptors, wetland birds, ground-nesting birds and colony-nesting birds to contribute specifics related to those taxa. Please send your comments to the Editor, *Indian BIRDS* (editor.indianbirds@gmail.com) within three months from the publication of this version.

Guiding principle

Minimizing disturbance caused by the observer at nests is paramount. The observer should always put the safety and welfare of the bird(s) before the success of their research. Utmost care should be taken to make sure that research methods do not jeopardize the nest(s) or the birds in any way.

Recording the location of the nest

You may become aware of a nest when you see a bird with nesting material in its beak, or one carrying food in its beak (birds rarely fly around with food in their beaks except when they are feeding nestlings. An obvious exception is raptors, or birds that are engaged in courtship feeding, or carrying food items that are too large to swallow whole). If you are going to search for the nest, it is highly recommended to first try and learn the nesting habits of the species, to get a sense of where you should look for the nest. Always be very careful when walking through habitats like dense undergrowth or grassland so that you do not disturb, step upon, or dislodge nests of other birds.

When you find a nest that you want to follow, make detailed notes on the location of the nest. Nests, especially open cups, are notoriously good at hiding in plain sight and re-finding a nest can be surprisingly and annoyingly tricky. If possible, take a photograph or video of the nest's location. Taking a GPS location and flagging the nest with an artificial marker, e.g., a tape on a

tree or branch, at a considerable distance away from the nest, can act as a reminder for you. Natural markers, such as a heap of stones pointing in the direction, may also be used. Draw a diagram detailing the tree or plant species the nest is in, the height of the nest, and approximate location on the tree. Good notes on nest location also include details of nest such as branch orientation, any specific marks (e.g., the nest is c.2 m from the main stem, on a dead branch pointing north, c.6 m off the ground in a *Mangifera indica* tree). In essence, the notes on the location of the nest should be detailed enough to enable you, or anyone on your research team, to easily find the nest without walking around the nest location for too long.

Number of nest visits

The number of nest visits you need to make depends on the goal of the study but this should be planned well to minimize impact (Götmark 1992; Mayer-Cross et al. 1997). Some studies may require frequent visits at a certain nesting stage of interest; e.g., to ascertain fledging dates accurately. If the aim is to simply monitor the nest to follow its progress, then it should not be visited more than once every three to four days to minimize impact. Before visiting a nest, make sure you are well prepared with all the necessary equipment (e.g., data sheet, clipboard, research equipment, cameras, stopwatch, etc.), and that it is easily accessible so as to spend as little time as possible once you reach the nest site, or while you set up your observation post. Elevated platforms work well for nests high up in the trees. Concealing yourself in a portable hide, or wearing the same, or similar clothing during every visit, minimizes the stress you cause the nesting birds. Hole-nesting birds tend to have lower predation rates than open nesting species. Yet, observations at the nest, regardless of whether the species is hole-nesting or not, should be done from at least 12–15 m away.

Appropriate time for visiting nests

Optimal times for visiting nests vary according to the bird species in question. As far as possible, do not visit nests early in the morning. Many passerines lay eggs in the morning and may be disturbed while doing so. Most birds lay one egg every day so if you are interested in knowing the final clutch size of the nest, plan your next nest visit depending on how many eggs are in the nest already and how many eggs are typically laid

by the species according to literature. For example, if you visit the nest on 11 March and see one egg in it, and the species is known to lay five eggs on average, going to the nest on 17 March and finding five eggs will give you the first egg's laying date, and that of the last one (in this case 15 March), and the size of the final clutch. Parents also tend to feed nestlings more actively in the morning since they have not been fed since the previous evening. It is also not advisable to check nests late in the evening when parents may be returning to the nest to brood the eggs, or the nestlings, for the night. It is a good practice to visit nests in the late morning or afternoon. Avoid nest visits for open-cup nesting species on rainy days or when it is cold. Parents will often sit over nestlings to keep them dry and warm but will flee on your arrival, leaving the nestlings exposed to the elements, or even to predation. Food, especially insects, may be harder to find on cold/rainy days, and so nestlings may be more stressed during inclement weather. For most birds, including ground-nesting birds, open-cup nesters, cavity nesters, and water birds nesting in colonies, observe the nest(s) in question from far to make sure that a parent is not sitting on the nest, and only approach it when the bird leaves on its own. Approaching the nest when the nestlings are close to fledging, but not fully ready to fledge, can cause 'forced-fledging', or young leaving the nest prematurely, which significantly increases the risk of predation for the young. When young are close to fledging, observe from a safe distance to avoid premature fledging behaviour. Ground-nesting birds are particularly vulnerable to predators, and hence nest visits should be made when predators are least active.

Avoiding revealing the location of the nest to predators

Avoid leaving tracks that can lead predators to the nest (Ibáñez-Álamo et al. 2012). Avoid trampling the vegetation around the nest, which may make the nest more visible. Nest predators are everywhere. These include, avian predators such as members of the crow family (Corvidae), coucals (*Centropus* spp.), and raptors (Accipitridae) to name a few; mammalian predators such as mongooses (Herpestidae), civets (Viverridae), cats (Felidae), rodents such as rats (Muridae) and squirrels (Sciuridae), and several species of snakes. Especially if visiting the nest often, avoid visiting it at the same time on each visit; do a 'walk-by' of the nest rather than approaching it in a straight line and retreating on the same path. Choose a track that generally disturbs the vegetation as little as possible. In general, keep nest visits to a minimum and do your best to ascertain that you are not being watched by a predator. When visiting nests that are in water or on an island, do not create a path of rocks, or a bridge that leads to the nest, as it may make it easy for a land predator to get to the nest(s).

Measurements of nests and nestlings

Any physical measurements of nests (size, or nesting materials used) should be done after the nestlings have fledged from the nest. Removing nests for study requires appropriate permits. Many birds, especially tropical species, nest multiple times in a year, and many species (e.g., drongos, Dicruridae) reuse old nests, or nesting materials, so care should be taken when studying nests such that they are not harmed in any way. Hole-nesting

birds show very high fidelity to nest sites, especially where they have successfully fledged young in previous nesting attempts, and will reuse these sites multiple times. The dimensions of the nest cavity entrance that is selected or made by the bird reduces the chances of a predator entering the cavity, or a larger, more dominant species, usurping the cavity. When studying hole nests, the entrance of the cavity should not be modified in any way. A flex-metal tape or bamboo strip can be used to measure the inner dimensions of a nest. Nestlings should not be handled without the appropriate permits. Care should be taken to use appropriate methods and obtain training in their correct use. Although the number of times the nestlings are handled or measured will depend on the research question, getting the research methods approved by a research ethics committee can help ensure that maximal information can be gathered with the least amount of handling. Many birds, especially large, group-living or colony nesting birds are known to mob predators. Mobbing may involve alarm calls and defecation, but may also include flying close to and/or pecking predators. Researchers visiting the nests of such birds may elicit a similar behavioral response and should wear proper clothing (hard hats or helmets) to protect themselves from injury.

What to do when you find an abandoned nest

If you find a nest with eggs or nestlings and no parents, verify that the nest is in fact abandoned. Birds may leave eggs abandoned for several minutes or even hours, especially before incubation. Nestlings may also be left for several hours by their parents. Birds may be hesitant to return to the nest for several minutes or hours after your visit. Frequent visits to the nest may also cause nest desertion, especially among birds breeding for the first time.

1. Do not assume the nest is abandoned just because you don't see the parent birds in the vicinity for several minutes or even hours.
2. Do not touch the eggs or nestlings. This is most likely illegal without the right permits.
3. Do not try to raise nestlings on your own. Other than it being illegal, wild birds are very difficult to take care of. Bring them to a local wildlife rehabilitator who may have the right permit to temporarily house them and the knowledge of caring for them.

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