

Fruit exocarp removal: a unique foraging behaviour in Narcondam Hornbills

Rohit Naniwadekar^{1*}, Sartaj Ghuman^{1,2}, Abhishek Gopal^{1,3}, and Navendu Page⁴

¹Nature Conservation Foundation, 1311, Amritha, 12th Main, Vijayanagar 1st Stage, Mysuru, Karnataka, India 570017

²2, Circular Road, Radha Krishan Colony, Batala, Gurdaspur, Punjab, India 143505

³Centre for Cellular and Molecular Biology, Uppal Road, Hyderabad, Telangana, India 500007

⁴Wildlife Institute of India, Post Box no. 18, Chandrabani, Dehradun, Uttarakhand, India 248001

*Corresponding Author: Rohit Naniwadekar (rohit@ncf-india.org)

Asian hornbills are predominantly frugivorous birds that feed on a diverse array of fruits – from small-seeded figs to large-seeded *Myristica* and *Canarium* (Kinnaird & O'Brien 2007, Poonswad *et al.*, 2013). Once on the tree, they carefully search for ripe fruits, which are then deftly plucked and swallowed. Until now, however, there have been no reports of hornbills removing the fruit exocarp before swallowing them.

During our stay on Narcondam Island between December 2019 and February 2020, we regularly found fruit exocarps under fruiting *Caryota mitis* palms. The island has a hyper abundance of rats, and we initially thought the rats were responsible for the fallen fruit exocarps. This was until we saw a flock of ~10 Narcondam Hornbills feeding on *Caryota mitis* fruits. We noticed that the hornbills appeared to be dropping something while feeding on *Caryota* fruits. Further observations during focal palm watches confirmed that it was indeed the hornbill removing the exocarp of the palm fruit before swallowing the pulp and the seed.

On visiting a fruiting *Caryota mitis* palm, the birds would carefully pluck a ripe fruit. It has a thick, leathery exocarp and a thin layer of



Fig. 1. Narcondam Hornbill pair on *Caryota mitis* palm. Art by Sartaj Ghuman.

pulp on a large seed (mean (SD): seed weight = 2.14 (0.1) g; seed length = 14.0 (0.36) mm; seed width = 15.83 (0.41) mm; n = 5). The fruit is first gently squeezed while being tossed and rotated, an action that probably helps separate the exocarp from the pulp. The fruit is then firmly squeezed, until the exocarp splits and the pulp-coated seed pops out. In that instant, the hornbill lets go of the exocarp and catches the pulp-coated seed. The hornbills were also almost always seen to vigorously shake their head immediately after swallowing the seed (<https://youtu.be/tH7KYdhVFB4>). This behaviour was not seen when hornbills were feeding on other fruit species (<https://www.youtube.com/watch?v=YBNhy9NfwCs>).

Handling *Caryota mitis* fruits and especially the fruit pulp when it comes in direct contact with the skin results in a mild to severe itching sensation for humans, a possible reaction to secondary compounds probably meant to protect the fruit from seed predators. Hornbills probably remove the fruit exocarp to avoid the secondary compounds. For example, *Caryota mitis* fruits are also known to have high concentrations of secondary metabolites (El-Akad *et al.*, 2021). On the island, we only saw Narcondam Hornbills feeding on the fruits of the *Caryota mitis* palm despite the island being home to *Ducula* pigeons—the Pied and the Green Imperial-pigeon—which are known to feed on medium- and large-seeded plants with relative ease (Naniwadekar *et al.*, 2019). In Singapore, diverse frugivores feed on *Caryota mitis* fruits, including the Pied Imperial-pigeons, Green-pigeons, hornbills, civets, macaques and squirrels (Quek *et al.*, 2020). Interestingly, none of the groups, except hornbills and Imperial-pigeons occur on Narcondam Island. It would be useful to observe how other animals feed on the fruits of *Caryota mitis* at other sites.

Hornbills often toss fruits in their beaks before swallowing. They also pry open closed dehiscent capsules of fruits belonging to Meliaceae and Myrsiticaceae before removing and swallowing the aril (with seed). We did observe the Narcondam Hornbill prying open a closed capsule of *Endocomia macrocomia* (Family: Myristicaceae) and removing the aril. However, we did not come across any other published literature on hornbills that documents the removing of fruit exocarp before ingestion. We also share a video of a Narcondam Hornbill pair feeding on *Caryota mitis* fruits (<https://youtu.be/tH7KYdhVFB4>).

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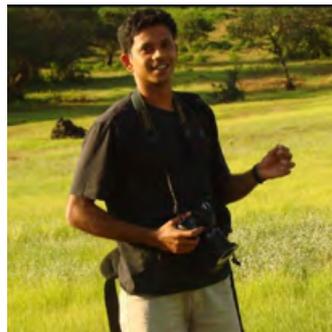
Rohit Naniwadekar



Sartaj Ghuman



Abhishek Gopal



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