

## CORRESPONDENCE

also used as marker traits for establishing varietal identity<sup>9</sup>. In commercial proportions, vivipary in coconut does not seem to be economical, as it will not allow seed storage, result in loss of kernel quality, and less copra quality, thus reducing the marketability of the nuts. However, it is useful in producing early seedlings which may be useful in the creation of new variability for earliness in coconut. The occurrence of vivipary in *C. nucifera* L. var. Andaman Green Dwarf can be interpreted as an adaptive reproductive strategy that enables seedlings to establish more rapidly and subsequent dispersal by water or other means. Coconut has been reported to be dispersed by sea-water currents around the world<sup>1</sup>. The viviparous germinated nuts would not have been suitable for this long-distance sea dispersal and hence a natural selection for non-viviparous types might have been predominant during the dispersal of coconut. Hence,

vivipary in coconut can be considered as a rare trait exhibited after reselection and planting of Andaman Green Dwarf for earliness over generations. The present report on vivipary in coconut would therefore give ample scope for further studies on the ecological and evolutionary significance in coconut.

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## Barail Wildlife Sanctuary, Assam: an eco-climatic reservoir of diverse liverworts of North East India

The North East (NE) region of India contains a globally significant proportion of wild flora and fauna as it falls under the Indo-Burma biodiversity hotspot<sup>1</sup>. Barail Wildlife Sanctuary (BWS), a unique piece of vibrant NE Indian landscape, is situated amongst the lofty hills and undulating hillocks of southern Assam. The sanctuary is situated in the northern part of Cachar district, Assam and lies along the foothills of North Cachar and Barail Hills between 24°58'–25°5'N lat. and 92°46'–92°52'E long., covering an area of 326.24 sq. km. It enjoys tropical humid climate with average annual rainfall of 3,383.5 mm and average humidity of 78% (ref. 2). Unique geographical position, variable eco-climatic conditions with variation in elevation and high precipitation have blessed the area as one of the richest treasure-houses of floral and faunal wealth including rich bryofloral diversity. In an ongoing study on the group Marchantiophyta (liverworts), we surveyed four localities within the sanctuary, viz. Malidar (ca. 70 m), Damcherra (ca. 200 m), Marwacherra (ca. 50 m) and Kumba (ca. 70 m). A total of 11 families of liverworts have been iden-

tified, among which Jungermanniaceae, Lejeuneaceae, Pallaviciniaceae and Marchantiaceae are the most dominant. Diversity of taxa is richest in the family Lejeuneaceae with five genera, viz. *Archilejeunea* (Spruce) Schiffn., *Cololejeunea* (Spruce) Schiffn., *Lejeunea* Lib., *Leptolejeunea* (Spruce) Schiffn. and *Lopholejeunea* (Spruce) Schiffn. The sanctuary harbours a number of taxa which are endemic to India (*Chiloscyphus campanulatus* Steph.)<sup>3</sup> or new for Assam [*Heteroscyphus pandei* S.C. Srivast. & Abha Srivast., *Bazzania sumbavensis* (Gottsche ex Steph.) Steph.]<sup>4</sup>. The species are both as terrestrials (on soil and rock) and epiphytes. Epiphytes are found to grow mainly on barks of angiospermic host plants like *Anthocephalus* sp., *Terminalia* sp., *Mangifera indica*, *Alstonia scholaris*, etc.<sup>5</sup>. We could not locate any truly epiphyllous taxa in the four localities surveyed, except one partially foliicolous species of genus *Jungermannia* L. During the survey, we noticed several hazardous effects on the liverworts growing in Marwacherra and Malidar due to construction of highways and bridges. At

Marwacherra, the Silchar–Haflong Highway passing through the sanctuary is under construction. Cutting of roadside rock walls and destruction of forests are gradually wiping out the liverworts and other bryophytic flora inhabiting the region (Figure 1). We collected *Heteroscyphus pandei* from a single locality at Marwacherra during our first visit to the area. But, during our second visit to the same area, we could not relocate the species in its earlier habitat. At Malidar, the plants are facing the same kind of threat



**Figure 1.** Cutting of rock walls in Barail Wildlife Sanctuary for construction of roads at Marwacherra.

due to bridge construction over the River Boleswar. Also, due to loose sandy soil texture of the sanctuary, landslide is a common phenomenon during monsoon and post-monsoon seasons. This has a detrimental effect on the liverworts growing in BWS. Thus proper *ex situ* conservation of these threatened taxa is urgently needed in BWS.

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## Vulture decline in Bikaner, Jorbeer, Rajasthan

The recent conservation studies and some ecological research have strongly recommended complete withdrawal of Diclofenac (30 and 100 ml) from the local market<sup>1–3</sup>. A major concern of the study is the widespread availability of Diclofenac for veterinary use in India, even after its ban in June 2006. Surveys conducted from September 2007 to March 2008 in four states (Rajasthan, Maharashtra, Madhya Pradesh and Gujarat) show that Diclofenac was sold for veterinary use in 43% of the pharmacies.

Other surveys done from August 2009 to June 2010 in Rajasthan, Maharashtra and Uttarakhand show that Diclofenac

meant for human use was sold for veterinary use in 47% of pharmacies, indicating that despite the ban, the drug remains widely available for sale. All the multi-use injectable formulations of Diclofenac offered for sale were for human use. The death of 80 vultures from the Jorbeer dead animal dumping site was reported due to poisoning effects which included Himalayan griffon (*Gyps himalayensis*), Eurasian griffon (*Gyps fulvus*) (Figure 1), Cinereous vulture (*Aegypius monachus*) and Egyptian vulture (*Neophron percnopterus*) and 17 steppe eagle. We have rescued 26 vultures and handed them over to the local zoo for treatment. Now vulture conservation has totally changed because of the available *in situ* methods. Recently, a large decline in vulture population is noticed in Jorbeer and their mortality has increased. We need a research study for long-term conservation for knowing vulture migration. The central zoo authority has no programme for the protection of local vultures, Egyptian vulture (*N. percnopterus*) and other species of *Gyps* like Eurasian and Himalayan griffon.

We suggest the following measures for vulture restoration and protection. Setting up a safe food zone in different locations on migratory pathways, maintenance of all required safety facilities, maintain a step for providing food with a standard protocol for small lethal dose of Diclofenac and other poisonous factor. Proper consultation with a veterinarian

before throwing out carcasses that have been treated with any non-steroidal anti-inflammation drugs such as Diclofenac, should be done as a precautionary measure. The carcass must be split along the abdomen and inside the legs to facilitate easy access and its surrounding environment should be cleared of items like ear-tags, bullets, pieces of glass, porcelain, pottery, plastic, etc. In India, concern for carcass is very less and there is no maintenance of records regarding animal types, death case, death durability, proper place and utilization level. For this, a vulture conservation system must be put into place with help of the local Municipal Corporation and the Forest Department. It is more important to protect several species of vultures in India by avoiding any kind of poisonous decline of vultures.

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Figure 1. Eurasian griffon (*Gyps fulvus*) in winter at Jorbeer dumping site.