

## Conservation of bats

As a rejoinder to the letter by Mahato *et al.*<sup>1</sup> regarding the fruit bats, Nathan *et al.*<sup>2</sup> have presented a complacent view about the overall progress regarding the conservation efforts and the research work. Though the fruit bats are distributed throughout India, active research and conservation are going on only in certain pockets of the country. The authors<sup>2</sup>, highlight the research that is being carried out in the southern parts of Tamil Nadu. In this regard though several roost sites are found in and around Thanjavur in the Cauvery delta, there is a dearth of scientific data on this ecologically important species which is under the Least Concern category of the IUCN Red List at present<sup>3</sup>.

Though a number of signboards warning against hunting of fruit bats have been placed by forest officials, these may not have the desired effect. Few people continue to hunt the fruit bats for medicinal purposes as well as for meat. It is not uncommon to see the clandestine sale of a pair of bats for Rs 100 along road-sides.

At the same time, it is important to mention the conservation efforts made by villagers in Salem, Namakkal and Kanchipuram districts of Tamil Nadu. In these

villages where roosts for bats are abundantly found, people strictly avoid the use of crackers during festivals like Diwali. This kind of conservation effort is being practised by these villagers for more than two decades out of their sheer love and concern for the bats.

However, the cities present an entirely different scenario. For example, a roost of *Pteropus giganteus* is found in the palace complex of Thanjavur city (Figure 1). Here more than 500 bats are found in colonies inhabiting five trees. Though this area is disturbed by human activities such as traffic and frequent flow of tourists, the bats have adapted to living under



**Figure 1.** *Pteropus giganteus* in the palace complex of Thanjavur city.

this condition, inhabiting the area for more than three decades. During the last years's Diwali, people unthinkingly burst crackers which greatly troubled the bats. Such kind of disturbance continued even after the festival. Naturally when the conservation effort is part of the life it is easy to implement in villages, but in cities effective implementation is difficult without creating awareness.

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## Climate change matters because the oaks cannot move upward

Spatial distribution and oligoarchic nature of the species of *Quercus* (oaks; family Fagaceae) along an altitudinal gradient in the mountains of Uttarakhand is a peculiar and adaptive phenomenon. *Quercus leucotrichophora* (vern. Banj) and *Quercus glauca* (vern. Harinj) are found distributed from 800 to 2500 m amsl in the state. Beyond that, *Quercus lanata* (vern. Rai-Banj), *Quercus semecarpifolia* (vern. Kharsu) and *Quercus floribunda* (vern. Moru) may reach up to subalpine–timberline forest. High-altitude species of oaks are among canopy-dominant broadleaf trees in the subalpine forests<sup>1</sup>. Forests dominated by the oaks species are considered as established and climax<sup>2</sup>. Source of green leafy fodder and quality fuel wood during winter is a pivotal ecosystem service provided by

the oaks in the harsh and inhospitable mountain areas. Soil and water conservation is considered as an useful ecological significance of the oak species.

Climate change or variations in relatively consistent local or global weather conditions due to abiotic and biotic forces may alter the responses of the biological clock. Temperature, precipitation and evapotranspiration are key determinants for the exchange of energy and mass in the ecosystem<sup>3</sup>. Increase in temperatures and decrease in precipitation may lead to global warming. It has been estimated that the average temperature of the Earth has increased by 0.6°C during the past century<sup>4</sup>. Also, elevated levels of carbon dioxide and ozone can cause physiological anomalies in plants<sup>4</sup>. Impacts of climate change on the coastal

areas have received considerable attention; however, climate change may have drastic impacts on the highlands ecosystems. In the conical mountain areas along



*Quercus floribunda* (Photo: D. S. Rawat).

an altitudinal gradient, as the altitude increases the net surface area decreases for floristic growth. Consequently, the competition for space and nutrients required for the growth and development will increase. If the upward movement of temperate plants begins due to increasing temperature, possibly the subalpine and alpine habitats may face the additional threats of global warming<sup>5</sup>. Increase in temperature could enhance evapotranspiration, while low precipitation may induce water stress. Also, sporadic precipitation will favour bog conditions in moist and shaded habitats. Rise in temperature may also increase the growing season (snow-free period) in the highland ecosystems. The changes in received volume of snowfall and duration may hamper regular chilling and post-chilling phenomena. Thus, a small shift in the consistent weather conditions of a unit area and at a specific time may be indeterminate variable for driving phenology, growth and reproduction of mountain vegetation. Sometimes unique features of plants may also hinder them while coping with the variation in ambient climatic conditions.

Phenological events in the oaks growing in subalpine–timberline forest are triggered with the commencement of favourable growth season<sup>1</sup>. Simultaneously occurring leaf fall and emergence of new leaves, overall growth and development, regeneration and distribution of oaks in their specialized habitats are governed by the ambient conditions<sup>6</sup>. Interrupted regeneration, susceptibility to frugivory and viviparous germination are the key features in some species of oaks. If the mast fruiting year is not accompanied by satisfactory precipitation, the viviparous species may lose the opportunity for regeneration due to desiccation

or water stress. Shift in the required weather conditions in due course of seed maturation and leaf emergence may either enforce the retarded investments in leaf production or may induce changes in the regular process of seed development. Emergence and establishment of seedlings in the oaks under their habitat conditions is reported to be unsatisfactory<sup>7</sup>. Massive lopping for fodder, habitat degradation and trampling damages caused by grazers and browsers are considerable factors for poor regeneration of oaks in the mountain regions. Vertically upward or downward and randomly the mid opening in the oak forests seem to be caused by biotic factors. In future, due to meagre regeneration and climate change, it will be merely possible to find the identical oak forest replaced by its next generation. Growth and reproduction in the highland ecosystem are controlled by temperature and with increasing temperature, tree species and other vegetation will start moving upward<sup>4</sup>. The morphology of acorn in majority of oaks is not compatible to upward or wind-aided migration. Despite the possibilities of dwelling-down of morphologically round or conical acorn, high-altitude oaks species are rarely observed to flourish at lower altitudes. Therefore, the acclimatization of oaks in their specialized habitats may rarely follow the variation in ambient conditions.

Therefore, the effects of climate change may be drastic to the species of oaks. Because the oaks are well adapted to their peculiar growth habitats, seed production strategy and germination behaviour in their specialized habitats. Degradation of these ecologically vital tree species and replacement colonization of uncertain and unknown species will certainly alter future ecological functioning

of the present oak forest. Protection of oak forests with rotational approach, mass production and planting of seedlings in their natural habitats, and preventing movement of grazing animals during seedling emergence and establishment may be useful conservation plans for oak forests in the mountain areas. Despite the incidence of climate change, currently we are comfortable with our ecosystem and its important components. Maintaining its serenity will be useful for combating the impacts of climate change. In view of some physiological and morphological characters, and biotic and abiotic pressure, oaks are certainly vulnerable to climate change.

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## Clonal seed production technology – alluring prospects for temperate mulberry genotypes

Sericulture is being practised in Kashmir for decades. Also, Jammu & Kashmir (J&K) is the only exclusive bivoltine area and a leading producer of bivoltine silk among the North Indian states of the country. The region indeed forms an important belt for sericulture. The oldest historical chronicle of Kashmir, *Raj*

*Tarangni* also provides a reference to silk in Kashmir.

The state offers immense scope for increasing the production of high grade bivoltine silk. Presently, raw silk production in J&K is around 115 metric tonnes (mt)/yr (2011–12) as against 102 mt/yr in 2006–07, with an increase of 12.75%.

Sericulture is an important component of the state economy, besides tourism. Kashmir valley, with temperate climate offers a salubrious environment for production of bivoltine silk. Rearing of livestock, production and manufacture of handicrafts, shawls, carpets and embroidery also contribute to the state economy.