

## Oral presentation

### What factors influence sustainable harvest of the medicinal plants *Phyllanthus emblica* and *Phyllanthus indofischerii* in South India?

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**Introduction.** Assessing the ecological sustainability of medicinal plant harvest is important from conservation, health and local livelihoods perspectives. However, evaluations of sustainable harvest often ignore the complexity of harvest systems and are typically based on demographic studies that are short-term, overlook spatial variation and assess impacts only on the harvested populations. This study assesses if the harvest of two of South India's most important medicinal plants, *Phyllanthus emblica* and *Phyllanthus indofischerii* is sustainable and identifies some of the environmental and management factors that may influence sustainability. The fruits of these species are important ingredients in Ayurvedic medicine and their harvest represents a significant source of income for indigenous harvesters.

**Objectives.** Our objectives were to 1) assess sustainability of fruit harvest of populations of *Phyllanthus emblica* and *Phyllanthus indofischerii* using 8 years of demographic data; 2) identify which environmental and management factors affect population persistence; and 3) assess if fruit harvest may have impacts on other frugivores.

**Methods.** Populations of *P. emblica* and *P. indofischerii* were monitored in 20, 10 x 100m transects from 1999-2007 in the Bilirigirangaswamy temple (BRT) wildlife sanctuary and in 17 1 ha plots throughout the Nilgiri Biosphere Reserve in 2006. Environmental and management variables were recorded in each plot. Fruit-take experiments were used to document patterns of frugivory. Matrix population models and multivariate analyses were used to estimate population growth rates and identify the variables influencing population growth and structure.

**Results.** *P. emblica* and *P. indofischerii* showed large temporal and spatial variation in rates of fruit production, fruit harvest, frugivory by other animals, and population growth. Stochastic models indicate that *P. indofischerii* populations are stable, but that *P. emblica* populations are declining significantly in BRT. This decline is not due to fruit harvest but instead to indirect impacts of interacting environmental and management variables including fire, hemiparasites and forest type.

**Conclusion.** This research illustrates how evaluation of harvest sustainability requires careful consideration of the social and ecological complexity of harvesting systems. Conservation of *P. emblica* populations in BRT cannot be achieved by prohibiting fruit harvest but rather by addressing the impacts of other forest management practices and policies.

Keywords: Non-timber forest products (NTFP), amla, population ecology, population modeling, Western Ghats

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