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Identification of Keystone Plant Species Supporting Avifauna of Alagar Hills, Eastern Ghats, India

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Abstract: The paper explains the identification of keystone plant species supporting avifauna of Alagar Hills, Eastern Ghats, India. Extended feeding observations were made on three Ficus species namely *Ficus benghalensis, Ficus racemosa* and *Ficus religiosa*. A total of eleven bird species were feeding on figs (3 species). Highest number of bird species was observed on *Ficus benghalensis* (9 species) followed by 7 species on *Ficus racemosa,* and 6 species on *Ficus religiosa.* 466 feeding observations were made on the three Ficus species, *Ficus benghalensis* constituted (209), *Ficus racemosa* constituted (137) and *Ficus religiosa* constituted (120) in 36 hours individually.

Key words: Ficus, keystone species, Avifauna, Alagar hills, Eastern Ghats, India

I.INTRODUCTION

Fig trees (*Ficus* spp., Moraceae) are a group of mainly tropical and subtropical plants that are considered as keystone species [1, 2, 3, 4, 5, 6, 7, 8, 9]. The angiosperm genus Ficus (commonly known as the figs) belongs to the family Moraceae and is distributed throughout the tropics and subtropics [10]. Ficus is relatively large with about 735 species distributed globally [10], exhibiting a myriad of growth forms which include shrubs, trees, climbers, epiphytes as well as hemi epiphytic stranglers, making it the world's most diverse woody plant genus [11]. Ficus species are characterised by their large quantities of latex in the bark, branches and leaves, presence of hood-like stipules covering new buds at the twig tips, ring scars on their twigs left by the stipules that have fallen off, and a specialised reproductive structure known as the syconium which are inwardly forming inflorescences with numerous florets that develop later into fruits [12]. Their keystone status reflects the importance of figs in the diets of many avian frugivores, with more vertebrates recorded as eating figs than any other fleshy fruits [7, 13].The importance of figs for vertebrates is a result of several biological features: fig trees can be abundant, they can produce large crops, figs are easy to eat and have a high calcium content, different species of fig trees produce figs that vary in size and location, thereby favouring different groups of vertebrates, and figs are often produced at times of the year when few other fruits are available [2, 7, 14, 15]. Many tropical and subtropical trees display a sub-annual, synchronised flowering pattern [16, 17]. This contrasts with the year-round fruiting displayed by many fig trees, which is seen as being a particularly significant trait because it means that they can support frugivore populations through periods of shortage when little other food is available [18, 19, 20]. Fig species are widely reputed as a keystone resource in the tropical rainforests of Southeast Asia. Keystone resources are important plants that other animals in the community depend heavily on. These species are so crucial that their removal from the community is likely to cause the extirpation of dependent animals such as pollinators and seed dispersers [21]. Declines in frugivore diversity due to habitat fragmentation have been documented in some earlier reports [22, 23]. Large-scale reforestation is considered necessary to offset ecological degradation in extensively-cleared tropical and subtropical landscapes [24]. In India, very few studies have been done on Identification of keystone plant species that attracts avian frugivores. With this background and understanding, Identification of keystone plant species is need of the hour in Alagar hills, to restore the forest from fragmentation due to anthropogenic pressure.

II.OBJECTIVES

To identify the keystone plant species in Alagar hills, Eastern Ghats, India

III.STUDY AREA

The reserve forest of Alagar hills is 20 km North – East of Madurai city and its elevation reaches 880 mts. The Alagar hills lies approximately between 77º 30' and 78º 20' East longitude and 10º 05' – 10º 09' North latitude. The area of the hill is 6813 hectares and there are two springs, Garuda theertham, a seasonal one and the perennial Nupuragangai. The deciduous forests of Alagar hill are composed of both disturbed and protected vegetation. The highest peak, Thalaianaiparai (879m) is situated in the centre of the reserve forest. The valley that connects the foot hills and

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Nupuragangai is called Silambar valley, and it lies to the south west of Thalaianaiparai (6km). Another famous pilgrim centre, a temple of Lord Muruga is situated (350m) in the middle of this valley, just below Nupuragangai. Silambar valley, being a pathway to both pilgrim centres is subjected to heavy anthropogenic stress.

IV.METHODOLOGY

Bird foraging observations

Foraging observation was made by extended bird feeding watches on three species of Ficus namely *Ficus benghalensis*, *Ficus racemosa* and *Ficus religiosa*. Plants with good visibility were selected for extended feeding watches. Observations were made between 6.00 and 9.00 hours on the bird visitation to the focal tree, with the help of binoculars. The visit by each individual bird followed by pecking/swallowing of fruits were considered as a fruit-feeding visit by a bird Certain birds, particularly carnivores and insectivores simply perching on trees were not included in this observation as they are not frugivores. For each species of plant, three individuals were observed for 12 hours each. Thus, a total of 36 hours of observations was made for each plant species.

V.RESULTS AND DISCUSSION

A total of eleven bird species were feeding on figs (3 species). Highest number of bird species was observed on *Ficus benghalensis* (9 species) followed by 7 species on *Ficus racemosa*, and 6 species on *Ficus religiosa.* 466 feeding observations were made on the three Ficus species, *Ficus benghalensis* constituted (209), *Ficus racemosa* constituted (137) and *Ficus religiosa* constituted (120) in 36 hours individually (Fig.1).

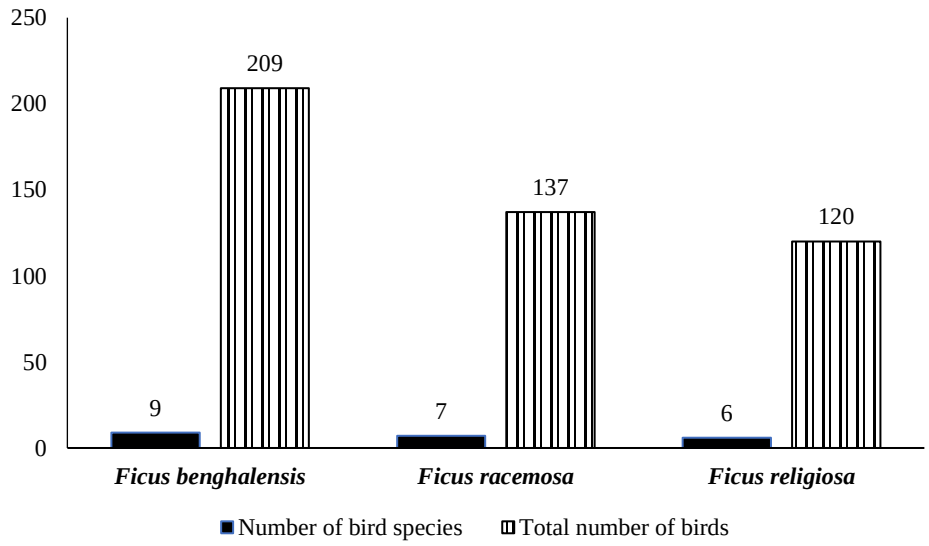

Fig.1 Comparison of number of feeding visits and bird species visiting the different *Ficus sp.*

A. Ficus benghalensis

A total of 209 feeding visits were recorded on *Ficus benghalensis.* The most common species that fed on *Ficus benghalensis* was Common Myna (*Acridotheres tristis) (23%)* of the family Sturnidae followed by Red-vented Bulbul *(Pycnonotus cafer) (20 %)* of the family Pycnonotidae, White-headed Babbler (*Turdoides affinis)* of the family Muscicapidae contributed 17 % visits (Fig.2).

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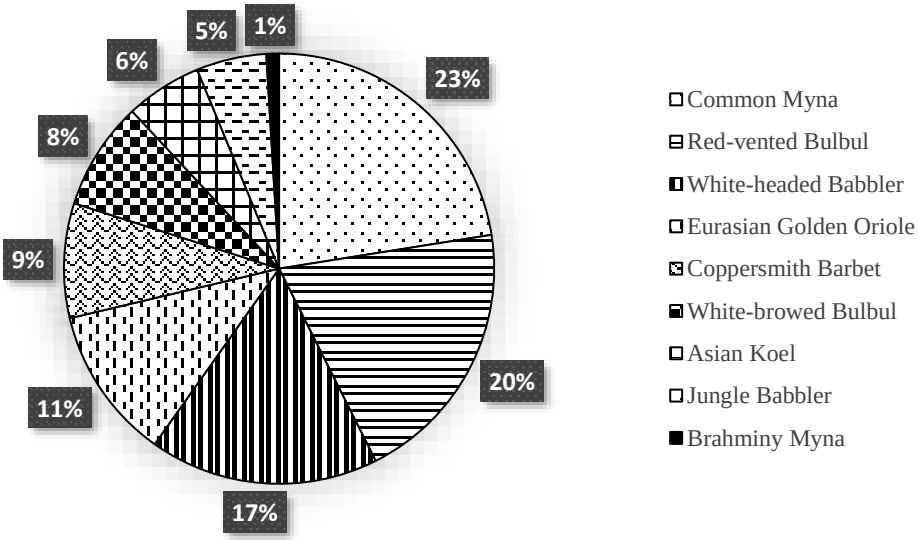

Fig 2. % of Birds visiting *Ficus benghalensis*

B. Ficus racemosa

A total of 137 feeding visits were recorded on *Ficus racemosa*. The most frequent visitors include Red-vented Bulbul *(Pycnonotus cafer) (29%)* of the family Pycnonotidae followed by Common Myna (*Acridotheres tristis) (26%)* of the family Sturnidae, White-headed Babbler (*Turdoides affinis)* of the family Muscicapidae contributed 23 % visits (Fig.3).

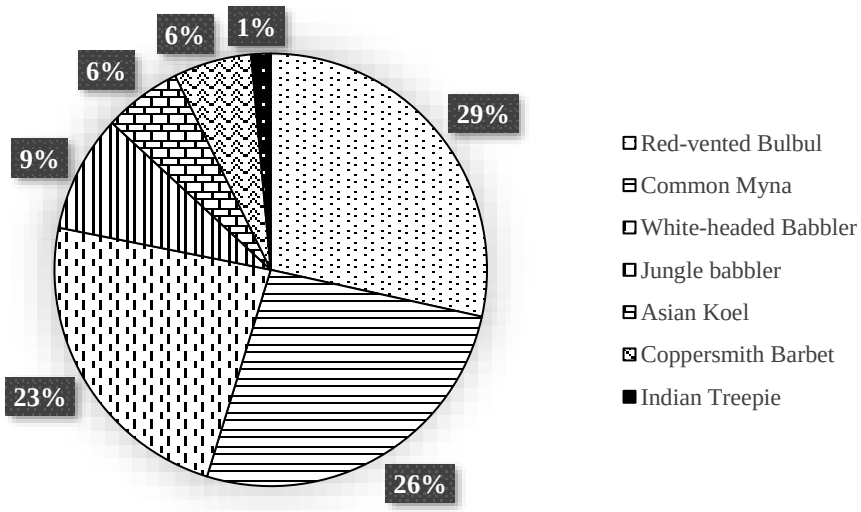

Fig.3 % of Birds visiting *Ficus racemosa*

C. Ficus religiosa

A total of 120 feeding visits were recorded on *Ficus religiosa*. The most frequent visitors include Red-vented Bulbul *(Pycnonotus cafer) (28%)* of the family Pycnonotidae followed by Common Myna (*Acridotheres tristis) (27%)* of the family Sturnidae, White-headed Babbler (*Turdoides affinis)* of the family Muscicapidae contributed 24 % visits (Fig.4).

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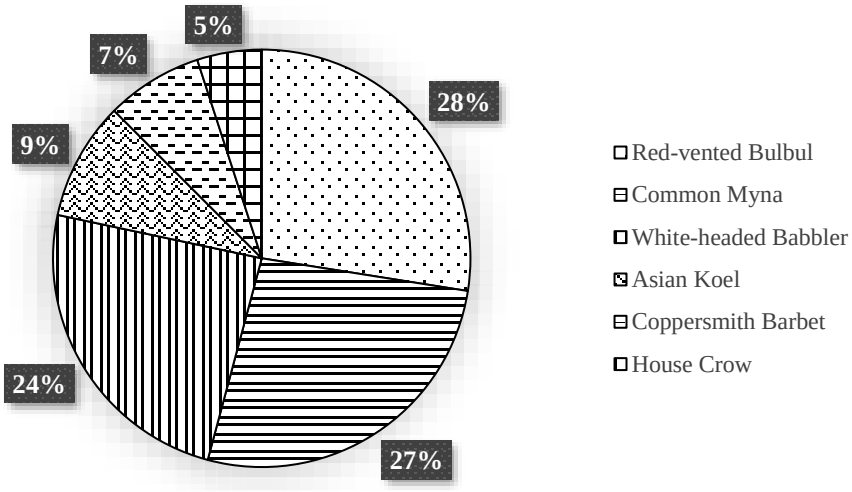

Fig. 4 % of Birds visiting *Ficus religiosa*

Among the three Ficus species observed *Ficus benghalensis* attracted more avian frugivores than *Ficus racemosa* and *Ficus religiosa*. Being abundant and always available throughout the year, figs constitute an important diet for many frugivorous animals when other food resources (e.g., insects) are scarce [4]. Globally, a staggering number of vertebrates over 1200 species feed on Ficus [7]. Ficus have a disproportionately large influence over their ecosystem in relation to both their abundance and biomass. At the population level, figs exhibit fruiting asynchrony and are a critical year-round food source when other fruits are not available. Lambert and Marshall in 1991[2] argued that figs play an important role in maintaining populations of frugivores such as Flowerpeckers (Dicaeidae) and Green Pigeons (*Treron* spp.) during periods of general fruit scarcity. Fig trees have several attributes in addition to seasonality that make them a unique and extremely important of bird dispersed fruit resources. Due to the fact that birds are generally more abundant than mammals, birds tend to remove large quantities of seeds, favouring specialization of dispersal syndromes towards their group. As fruit production fluctuates in many tropical forests, certain species fruiting during periods of fruit scarcity may become "keystone species" [25]. Throughout the tropics, fig fruiting occurs year-round making figs an indispensable resource for tropical frugivores [26].

Ficus is heavily dependent on the frugivores to disperse their seeds [27]. Seed dispersal by animals ensures the long-term survival of many Ficus species. Such ecological processes provided by the frugivores may also determine the Ficus species and genetic composition in the disturbed landscapes [28]. Thus, the patterns of visit by frugivores may influence the succession in disturbed areas such as the forest edge or gaps. On the other hand, the presence of fruiting trees in the disturbed landscapes may maintain the frugivorous faunal communities in these areas [29]. Understanding such ecological processes is essential for the conservation of biodiversity and restoration of the disturbed landscapes. Many fig species are pioneers and play a significant role in forest succession in the tropics [30]. It is suggested that the establishment of Ficus in a critical phase in the reassembly of forests, with plant colonization accelerating after the first figs begin to fruit and thereby to attract seed dispersers carrying the seeds of other species in their guts. They are thus an important resource for maintaining biodiversity outside protected areas, and their loss may result in undesirable ecological regime shifts. It is recommended to plant these three Ficus species in the fragmented patches of Alagar hills to increase the green cover as well as to improve the faunal biodiversity of the area.

VI. Summary and Conclusion

Among the three Ficus species observed *Ficus benghalensis* attracted more avian frugivores than *Ficus racemosa* and *Ficus religiosa*. Being abundant and always available throughout the year, figs constitute an important diet for many frugivorous animals when other food resources (e.g., insects) are scarce. Deletions of keystone plant species would potentially result in the extinction of frugivores which depend on them during periods of resource scarcity. Such extinctions could have further repercussions for the ecosystem, such as the eventual loss of other plants which were dependent on seed dispersal by these frugivorous species. Such a scenario obviously has serious implications for forest management and conservation. It is suggested that the establishment of *Ficus* in a critical phase in the reassembly of forests, with plant colonization accelerating after the first figs begin to fruit and thereby to attract seed dispersers carrying the seeds of other species in their guts. They are thus an important resource for maintaining biodiversity outside protected areas, and their loss may result in undesirable ecological regime shifts. It is recommended to plant these three Ficus species in the fragmented patches of Alagar hills to increase the green cover as well as to improve the faunal biodiversity of the area.

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