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Research

Sampling

Diversity of Platygastridae in Leaf Litter and Understory Layers of Tropical Rainforests of the Western Ghats Biodiversity Hotspot, India

K. Manoj,[1] T. P. Rajesh,[1] U. Prashanth Ballullaya,[1] K. M. Meharabi,[1] V. K. Shibil,[1] K. Rajmohana,[2] and Palatty Allesh Sinu[1,3,4]

[1]Department of Animal Science, Central University of Kerala, Padannakad PO 671 314, Kasaragod, Kerala, India (k.manoj878@gmail.com; rajeshbichu@gmail.com; pbu648694@gmail.com; meharabikm@gmail.com; shibilvk@gmail.com; sinu@cukerala.ac.in), [2]Zoological Survey of India, M Block, New Alipore PO, Kolkata 700053, West Bengal, India (mohanaskumar@gmail.com), [3]Department of Ecology and Evolutionary Biology, University of Arizona, Tucson 85721, AZ, USA and [4]Corresponding author, e-mail: sinu@cukerala.ac.in

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Abstract

Platygastridae is the third largest family of parasitic Hymenoptera in the world. It includes important egg and larval parasitoids of insects and spiders. Therefore, Platygastridae is functionally important in maintaining the stability of tropical rainforests and agroecosystems. Although the diversity of Platygastridae is relatively well-known in agroecosystems, we know little about their diversity in tropical rainforests, and particularly about that of the leaf litter layer. Here, we address the importance of monitoring Platygastridae in tropical rainforests, using data from the relic primary forests of the sacred groves of the Western Ghats. First, we demonstrate that pitfall traps allow us to catch a wide array of representative diversity of Platygastridae of the tropical rainforests, and we establish an efficient collection method to study Platygastridae of leaf litter layer. Second, we demonstrate that the community structure and composition of Platygastridae of the leaf litter layer is different from that seen in the understory of the forests. This indirectly informs us that the Malaise traps capture only a minor subset of the species active in the rainforests. Third, we find that the dry and wet seasons captured dissimilar community of Platygastridae, suggesting that the season might alter the potential host species or host stages. We conclude that monitoring parasitic Hymenoptera in the leaf litter layer of tropical rainforests can provide fresh insights on the species distribution of both the parasitoids and their hosts, and allows us to examine the current state of the tropical rainforests from a functional point of view.

Key words: ecosystem function, leaf litter layer, Malaise trap, monitoring, parasitic Hymenoptera

Although tropical terrestrial biodiversity conservation decisions are being taken on the characteristics of plant diversity, such as threat level and endemism rate (Myers et al. 2000), monitoring the plant diversity alone has limitations to inform the current state of tropical rainforests. On the other hand, the rather short-lived, multivoltine insects (Wilson 1987), and the associated above-ground and below-ground insect–plant interactions, have pivotal roles in shaping the structure and composition of tropical rainforests (Coley and Barone 1996, Morante-Filho et al. 2016). Insect populations and community interactions in tropical rainforests are stronger at different ecosystem functional levels, such as herbivory, predation, competition, and parasitism (Coley and Barone 1996, Didham et al. 2012). Simultaneously, they are sensitive to subtle global changes. Therefore, inventorying and monitoring insects frequently can inform the current status and predict the future structure and composition of tropical rainforests, which might be useful to suggest appropriate forest management measures and conservation planning (Hughes et al. 2000, Pimm et al. 2014). Due to the lack of taxonomic expertise and gaps in our knowledge on the biology and ecology of many functionally important insects of tropical rainforests, several lesser-known tropical insects are still underrepresented in monitoring studies. However, this scenario has been gradually changing (Basset et al. 2012, 2015). As studies monitoring several lesser-known tropical insects of different layers of tropical rainforests have been cumulating now, we have an improved understanding on the distribution of species across space (both vertical and horizontal) and time and the species interactions in tropical rainforests (Erwin 1982; Raven and Yeates 2007; Basset et al. 2012, 2015; Lucas et al. 2016). These studies also suggest the relevant use of unconventional sampling methods and exploring novel sites and niches of rainforests for a fair assessment of insect biodiversity.