

# **Predicting dispersal of auto-gyrating fruit in tropical trees: a case study from the Dipterocarpaceae**

## **Abstract**

Seed dispersal governs the distribution of plant propagules in the landscape and hence forms the template on which density-dependent processes act. Dispersal is therefore a vital component of many species coexistence and forest dynamics models and is of applied value in understanding forest regeneration. Research on the processes that facilitate forest regeneration and restoration is given further weight in the context of widespread loss and degradation of tropical forests, and provides impetus to improve estimates of seed dispersal for tropical forest trees. South-East Asian lowland rainforests, which have been subject to severe degradation, are dominated by trees of the Dipterocarpaceae family which constitute over 40% of forest biomass. Dipterocarp dispersal is generally considered to be poor given their large, gyration-dispersed fruits. However, there is wide variability in fruit size and morphology which we hypothesize mechanistically underpins dispersal potential through the lift provided to seeds mediated by the wings. We explored experimentally how the ratio of fruit wing area to mass ("inverse wing loading," IWL) explains variation in seed dispersal kernels among 13 dipterocarp species by releasing fruit from a canopy tower. Horizontal seed dispersal distances increased with IWL, especially at high wind speeds. Seed dispersal of all species was predominantly local, with 90% of seed dispersing <10 m, although maximum dispersal distances varied widely among species. We present a generic seed dispersal model for dipterocarps based on attributes of seed morphology and provide modeled seed dispersal kernels for all dipterocarp species with IWLs of 1–50, representing 75% of species in Borneo.