
A Fijian rainforest tree requires bats to open its flowers - the strange evolutionary case of chiropteropistheusis, a new pollination system

Sophie "topa" Petit*^{†1}, Annette T. Scanlon¹, Alivereti Naikatini², Tara Pukala³, and Russell Schumann¹

¹University of South Australia [Adelaide] (UniSA) – Mawson Lakes, Australia

²University of the South Pacific (USP) – Suva, Fiji

³University of Adelaide – Adelaide, South Australia, 5005 Australia, Australia

Abstract

Dillenia biflora is an early succession tree of Fijian rainforests with important social and ecological values. Bats of three species trapped for two years on Vanua Levu (2009-2011) carried *D. biflora* pollen, including 70% of individual *Notopteris macdonaldi*, a cave-dependent threatened species. We examined the pollination of 19 trees on Vanua Levu in 2010-11 and 28 trees in November-December 2016 and June-July 2017 on Viti Levu, and determined that the large flowers with globose corollas did not open on their own and aborted when they remained closed (n = 100), indicating that they are not cleistogamous. Only flowers that were opened by bats resulted in fruits, as confirmed by video footage or direct observation (n = 11; all *N. macdonaldi*) and bite marks on corollas. Both self- and cross-pollination by hand after corolla removal produced fruits. Chiropteropistheusis (from the Greek "reliance on bats"- since pollination cannot take place before manipulation by bats) is a unique and previously undescribed pollination system. *Dillenia biflora* is closely adapted to pollination by *N. macdonaldi*, whose dentition appears to be perfectly suited for corolla removal. The evolution of this remarkable strategy, shielding nectar and reproductive organs from heavy rainfall and presumably excluding low-quality pollinators, implies a close overlap in distribution between the cave-dependent bat and the tree. The discovery has already been used to promote bat conservation in Fiji.

Keywords: conservation of bat, plant mutualism, evolution of unique pollination system, Fijian rainforests, pollination by bats, specialisation on bat pollination

*Speaker

[†]Corresponding author: sophie.petit@unisa.edu.au