

## The influence of agricultural system, stand structural complexity and landscape context on foraging birds in oil palm landscapes

### ABSTRACT

Functional diversity, an important element of avian biodiversity, can be examined by quantifying foraging guild composition. Understanding the ecological processes that underpin functional diversity of birds in oil palm *Elaeis guineensis* landscapes is important because different foraging guilds are likely to be influenced in different ways by land use practices. We surveyed birds at 55 sites within oil palm landscapes and at 20 sites within logged peat swamp forest, recording 208 species belonging to 19 foraging guilds. Oil palm landscapes supported a lower abundance of insectivorous, granivorous and omnivorous birds than did logged peat swamp forest despite the latter being severely degraded due to intensive timber extraction. However, abundances of other groups of foraging birds, such as raptors and wetland taxa, were higher in oil palm landscapes than logged peat swamp forest. Frugivorous species were more abundant in smallholdings than plantation estates, probably because of the presence of native trees. Foraging guild diversity was explained by stand-level attributes such as stand age, vegetation cover, epiphyte persistence and canopy cover. However, each foraging guild exhibited unique responses to different oil palm management regimes and stand-level attributes. Only arboreal omnivores and terrestrial frugivores were affected by the proximity of nearby natural forest. This diversity of responses implies that the occurrence of particular avian foraging guilds may not be a suitable ecological indicator of best-practice palm oil production. Our study also suggests that multiple conservation measures will be needed in oil palm landscapes irrespective of management regimes, including: (1) the maintenance of ground layer vegetation cover; (2) the pruning of oil palm canopy to permit light penetration to the ground layer; (3) re-vegetation of parts of oil palm landscapes with native trees; and (4) retention of natural and/or secondary forest patches within the boundaries of plantations.

**Keyword:** Foraging guilds; Logging; Peat swamp forest; Plantation estates; Smallholdings