

# Riparian Reserves in Oil Palm Plantations: A Good Conservation Strategy?

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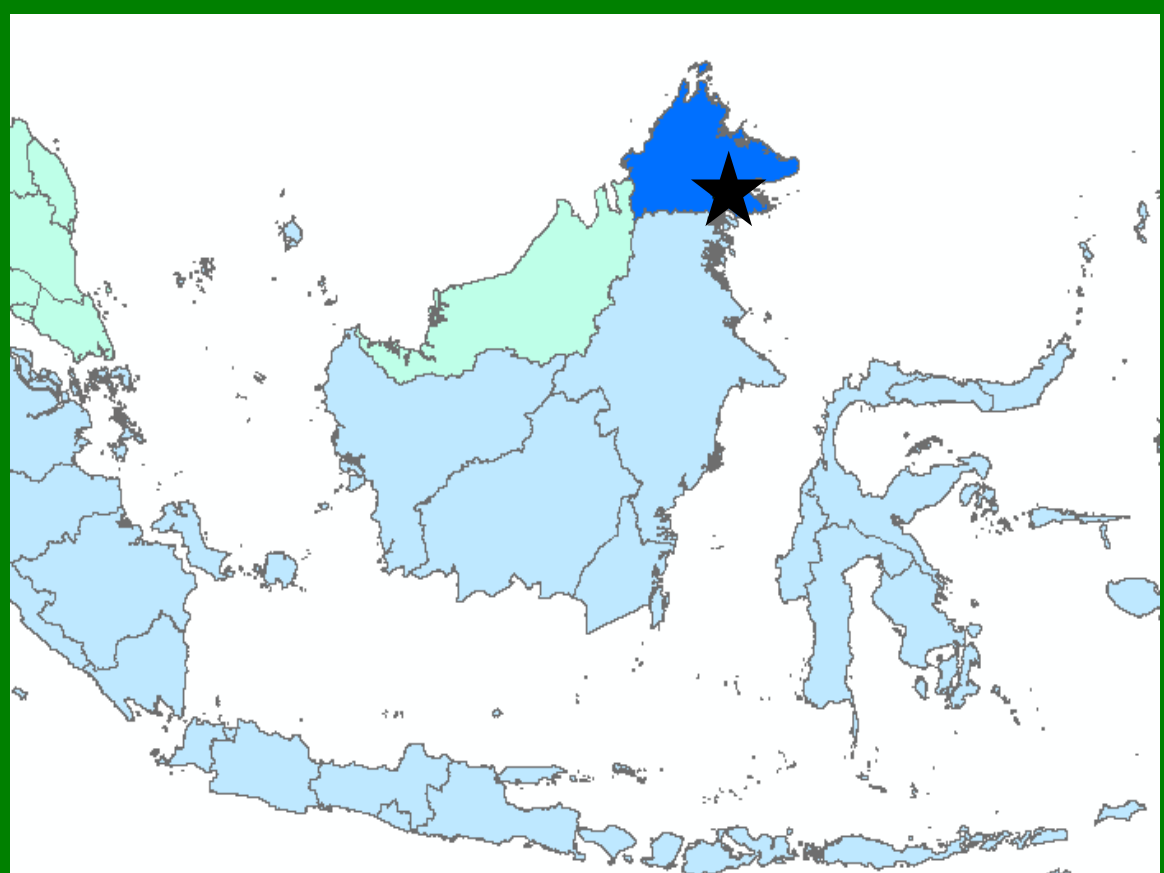
## Introduction

The expansion of the oil palm industry across the tropics is causing widespread declines in biodiversity (1). Strategies to mitigate this loss are therefore a priority for conservation.

In Malaysia, riparian forest corridors are protected by law, to maintain water quality (2). However, the contribution of these reserves to the conservation of forest species is poorly understood. Here, we examine the extent to which riparian reserves support dung beetle communities.

## Field Sites

Sabah, Malaysian Borneo



location of sites



7 logged forest sites



8 riparian reserves



6 oil palm sites

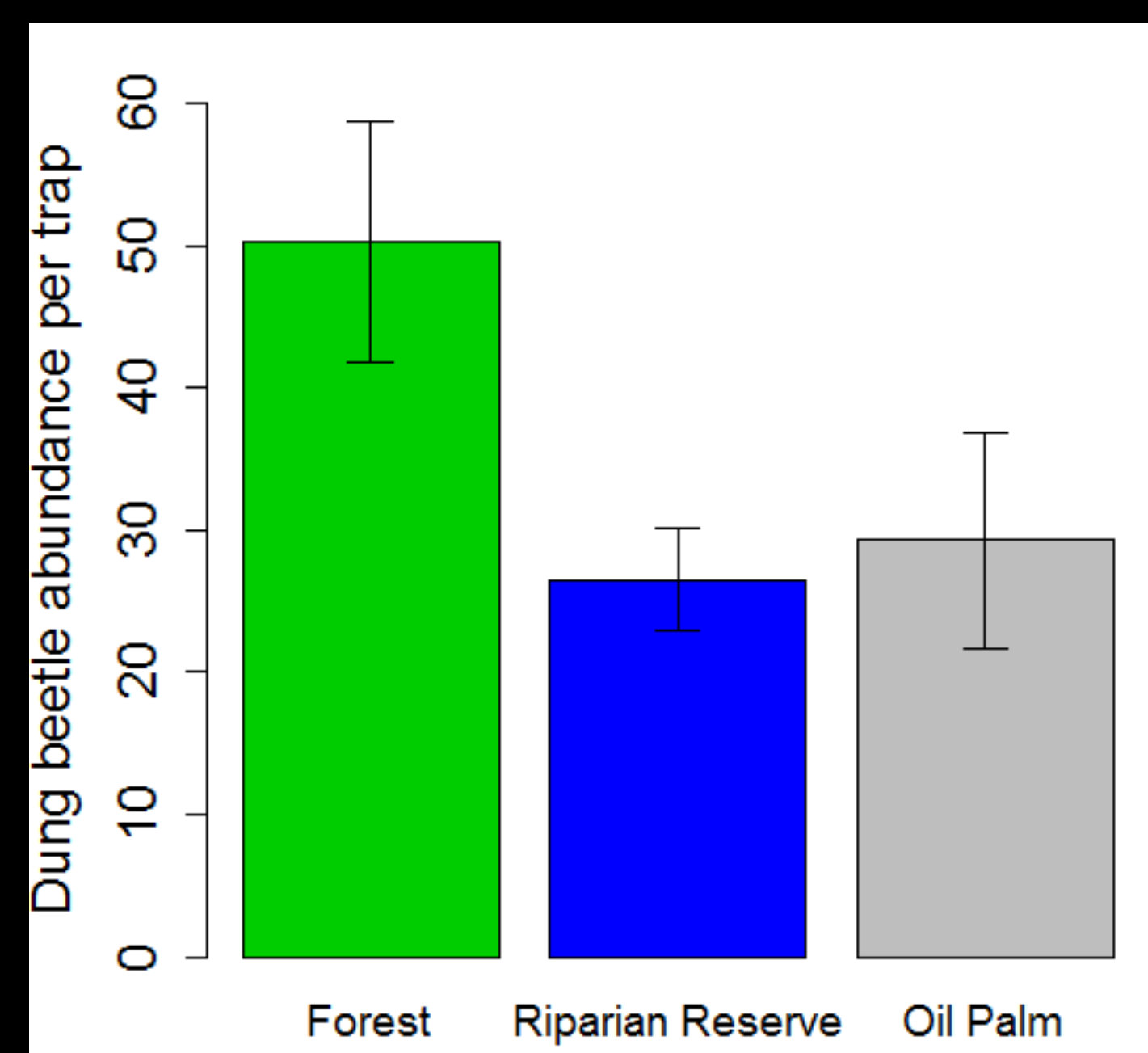
## Methods

- At each site we set 4 traps at each of three distances from the river bank (0m, 50m, 100m). All traps were baited with 25g human dung and collected after 48 hours.
- Due to variation in riparian reserve width, only traps next to the river were always within forest at riparian reserve sites. Therefore only 0m traps were used to compare beetle abundance, species richness and community composition across the three land cover types.
- The entire grid of 12 traps was used to analyse the effect of reserve width on dung beetle community.

## Results

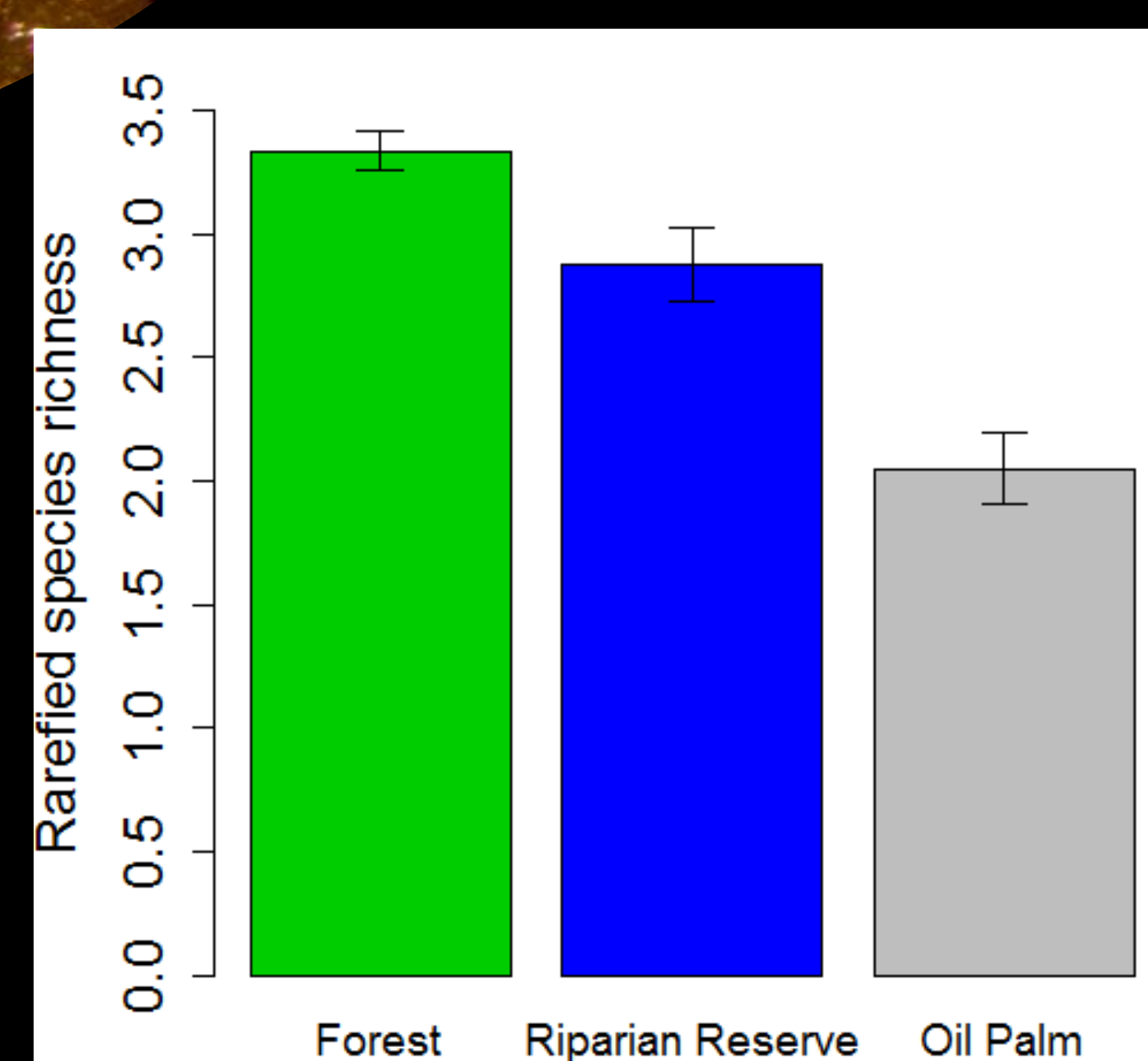
- Dung beetle abundance in riparian reserves is the same as oil palm (Fig.1).
- Species richness in riparian reserves is higher than oil palm but lower than logged forest (Fig. 2).
- Community composition of reserves remains similar to forest (Fig.3).
- There is a positive correlation between riparian reserve width and species richness (Fig. 4).

### Abundance



**Fig. 1.** Beetle abundance varies across land cover types: GLM,  $F_{2,18} = 3.96$ ,  $p = 0.037$ . Plot shows mean  $\pm$  s.e.

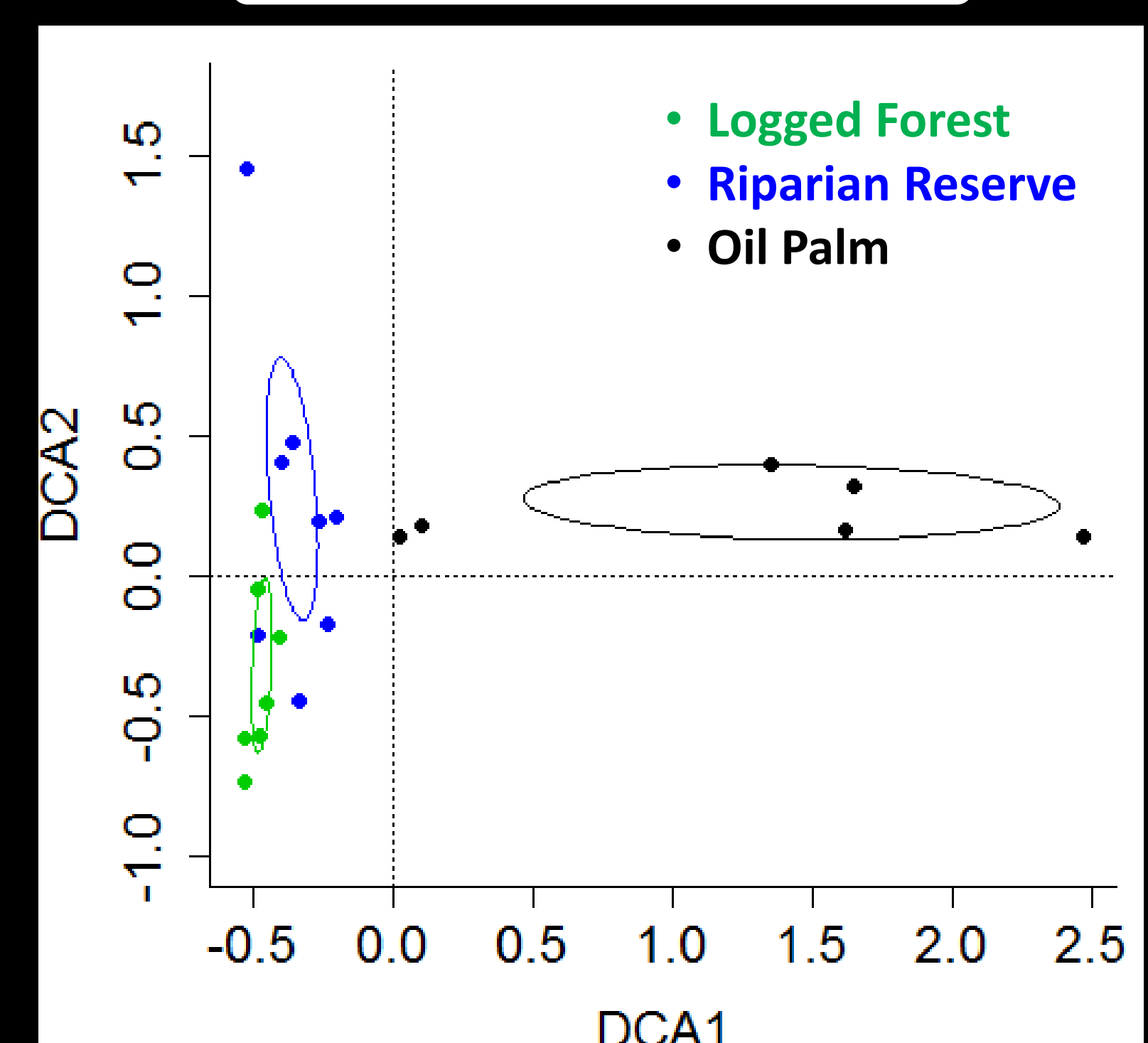
### Species Richness



**Fig. 2.** Beetles species richness varies across land cover types. GLMM with land cover as fixed factor and site as random factor provided better fit than null model ( $\chi^2 = 16.6$ ,  $df = 2$ ,  $p = 0.001$ ). Plot shows mean  $\pm$  s.e.

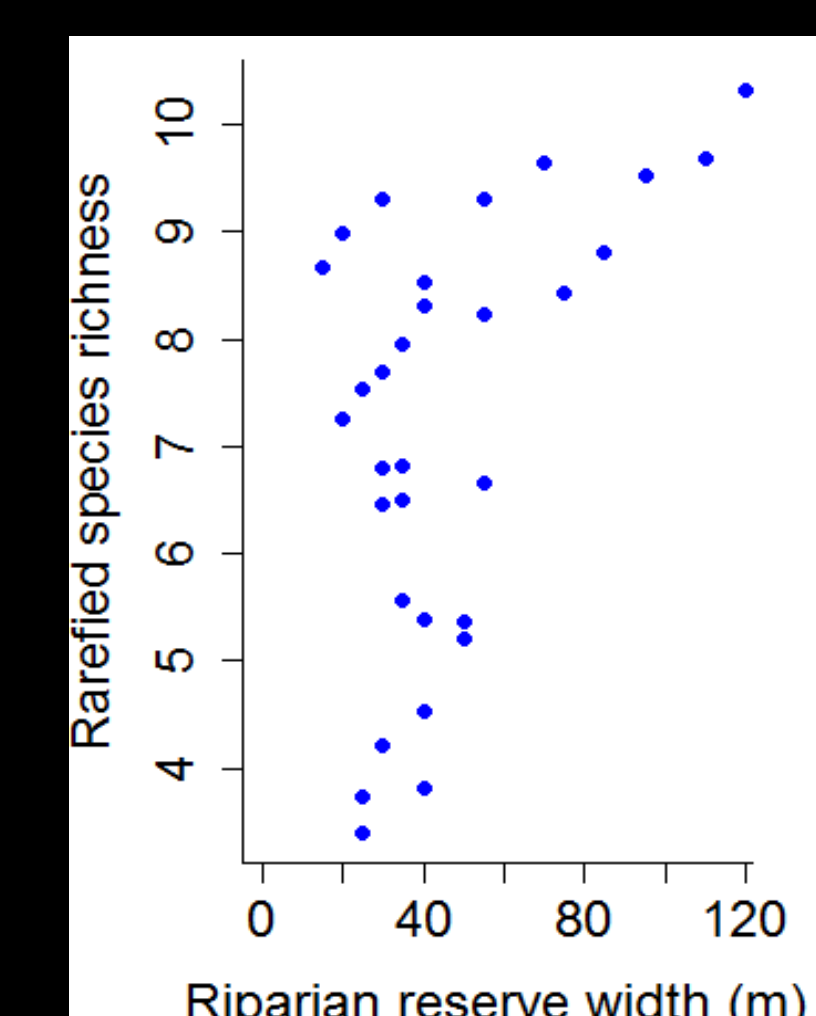
Model	AIC	BIC	Log Lik
1 + (1 Site)	144.4	151.5	-69.2
Landuse + (1 Site)	134.7	146.6	-62.4

### Community Composition



**Fig. 3** Detrended Correspondence Analysis results. Ellipses show 95% confidence interval for s.e. of the mean axis values.

### Effect of reserve width



**Fig. 4.** Species richness increases with reserve width. GLMM with width as fixed factor and site as random factor provided better fit than null model. ( $\chi^2 = 6.7$ ,  $df = 1$ ,  $p = 0.009$ )

Model	AIC	BIC	Log Lik
1 + (Width Site)	130.5	137.9	-60.3
Width + (Width Site)	125.8	134.6	-56.9

## Conclusion

Riparian reserves are an important habitat for forest-dependent dung beetles. To retain species richness, the width of these reserves should be maximised. As dung beetles are a good indicator for the presence of other taxa, e.g. mammals (3), it is likely that riparian reserves also provide valuable habitat for these animals.

## Other Research Questions

- Does dung removal function differ between these land cover types?
- Do riparian reserves conserve ant diversity and ant foraging activity?
- Do riparian reserves provide pest control services to surrounding oil palm?

## References

- (1) Fitzherbert, E.B. et al., 2008. *Trends in Ecology & Evolution*, 23(10), 538–545
- (2) Sabah Water Resources Enactment 1998
- (3) Barlow, J. et al., 2010. *Journal of Applied Ecology*, 47, 779 – 788

Photos by Claudia Gray and Max Gray