

PhD Defense

Pagi Toko

Ecological trends in geometrid moth communities along elevational gradients in tropical rainforests with lessons for tropical biodiversity conservation

Report by Assessor

Professor Roger Kitching AM

I have read the thesis materials submitted by Mr Toko and am happy to recommend that he be awarded the doctoral degree.

Mr Toko's material comprises a general introduction followed by three Chapters for publication. The first of these three Chapters has already been published in *Insect Conservation & Diversity* which is a high impact journal in the field of insect ecology. The second Chapter is a manuscript being prepared for publication. The thesis concludes with a manuscript that has been submitted to *Nature* and is in revision for reconsideration by that highly prestigious Journal. **This final contribution is one of the most important commentaries on tropical conservation that I have read and its content alone justifies Mr Toko's successful outcome.**

The Introduction These few pages introduce, on the one hand, the importance of altitudinal transects in ecology and, on the other, the family Geometridae. I find no fault with these comments except to remind Mr Toko that 'monotonous' and 'monotonic' are not the same thing.

Data Chapter 1. Ecological trends in moth communities (Geometridae, Lepidoptera) along a complete rainforest elevation gradient in Papua New Guinea

As noted above this Chapter has appeared in a major Journal. Accordingly I assume it has been submitted, refereed, revised and, subsequently, accepted. I have every confidence in this process and accept it as evidence of science of an internationally acceptable quality and interest.

Two things strike me about this paper. The first is that it is an additional data-set from one of the most complete altitudinal gradients that have been studied – this alone marks it out from many other such studies where the lower forested elevations are frequently absent or much modified. Second, and scientifically more important, Toko and his colleagues have shown how a molecular bar-coding approach can change the data-set collated using a simple morphospecies approach. This leads me to two inter-connected questions for the candidate.

- 1. How much difference to the statistical outcomes did the bar-coding 'corrections' make (in other words are the general conclusions of other studies that have NOT used bar-coding identifications to be questioned for that omission)?**
- 2. How much additional COST and EFFORT did the addition of bar-code confirmation of species identities demand – how practical is it to 'demand' this of future studies?**

Data Chapter 2. Composition and structure of rainforest moth (Geometridae, Lepidoptera) communities along an island elevational gradient in New Britain (Papua New Guinea)

This is a parallel altitudinal study on an adjacent smaller island designated 'oceanic' but, as oceanic islands go, quite large. The study is more modest than the Mt Wilhelm transects with four elevations used with an inter-elevation distance of 200m rather than 600m. The results represent the best information available about geometrids of New Britain. Each elevation was sampled using a single study site. Vegetation (tree) data was collected on three embedded 20x20m plots. Otherwise the strength of the study is the comparison with the Mt Wilhelm. Turnover patterns appeared steeper in the New Britain study. This is a competent if less comprehensive study than the Mt Wilhelm one and will no doubt find a publication home. A couple of questions:

1. **You found no difference in species richness between the two transects yet island biogeography theory would predict fewer species on New Britain. How do you explain this (and will you tackle smaller oceanic islands in the future)?**
2. **'Vegetation' and 'Temperature' are reasonably powerful explanatory variables in your CCAs. In terms of geometrid assemblages how do you see these two environmental variables acting – physiologically, through food-plant preferences, or what?**

Chapter 3. Biodiversity conservation with Indigenous peoples in tropics

This is a thoughtful and exciting essay on the role of Indigenous people in facilitating (or not) conservation of tropical biodiversity. It covers a lot of ground and raises many, many debating points. It deserves to be published in a journal with very high visibility. Here are a few questions.

1. **What do you see as the primary role of the western-trained but Indigenous *scientist* in improving tropical conservation outcomes?**
2. **Is 'development' ever going to be conservation-friendly?**
3. **How do we (or, indeed, can we) integrate Indigenous knowledge with the body of conventional scientific knowledge?**
4. **What is the role of language in defining 'knowledge'?**
5. **We speak a lot of the role of 'education' but does this 'education' actually destroy (through oversight) indigenous knowledge?**

NOTE: I DO NOT EXPECT THE CANDIDATE TO ANSWER ALL OF THESE QUESTIONS BUT PRESENT THEM AS A BASIS FOR DISCUSSION IN THE DEFENSE.

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