

## **IN204 The effects of forest disturbance on butterfly communities in lowland Indonesian forests**

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Butterflies are important species in forest ecosystems as they provide pollination services as well as being significant herbivores. They are frequently used as biodiversity indicators since many species have specific relationships with plant hosts, so it would be logical to assume that butterfly diversity relates to diversity in plants and other groups. However their value in this respect, and the relationship between disturbance and diversity is debated. Many groups of invertebrates actually increase their diversity and abundance in disturbed areas such as forest edges. In part this is because edge environments have a high density of potential food plants as well as providing niches for non-forest species that are not frequently recorded within the forest itself. Assessing change in the nature of butterfly *communities* as well as pure counts of species or measures of diversity is therefore important in assessing butterfly responses to forest disturbance.

Forest disturbance is itself a complicated phenomenon. There is no such thing as 'a disturbed forest', nor do 'undisturbed forests' exist anywhere. Disturbance is an inherent part of all ecosystems and all forests are subject to some level of natural or anthropogenic disturbance or both. Anthropogenic disturbance may in some instances be of a similar nature to natural disturbance and in other instances be very different. Furthermore, anthropogenic disturbance may make forests more susceptible to natural disturbance and vice versa. A forest disturbed by clearfelling will have different characteristics to one disturbed by selective logging, which will itself be different to one disturbed by harvesting of non-wood forest products like rattans. Understanding that disturbance is a complex phenomenon is fundamental to understanding how environmental change affects species in forest ecosystems. This project will therefore take an objective look at forest disturbance, assessing it through measuring characteristics of forest structure that indicate past disturbance, and relating it to butterfly diversity.

The Sulawesi region has 557 known butterfly species and 157 of these have been recorded on the island of Buton. Operation Wallacea teams working in the Lambusango forests have focussed on three of the most easily identified families: Papilionidae, Pieridae, Nymphalidae and have identified 76 species of these families.

Butterflies are most readily surveyed at landscape-scales in Lambusango using modified 'Pollard walks'. Transects are walked slowly identifying butterflies that are detected within 5 metres of either side of the transect or 5 metres above it. At intervals along the transect 10min point counts are carried out where all butterflies observed within a 5m hemisphere are recorded. More focused, small-scale studies can be carried out with point counts alone.

It is possible to trap butterflies using Van Sommeren type mesh traps baited with fruit (usually banana mixed with local wine and sugar), salt fish or cattle dung. However these traps are selective depending on bait and capture rate is usually low. So while they may provide relevant supporting information, it is unlikely that they will be suitable for the main data collection in your project.

Habitat surveys in association with point count sites and transects using standard methods allow us to relate butterfly diversity to forest structure characteristics.

Identifying butterflies without catching them is challenging, so any study of this nature requires some training first. The first week of your project work will therefore involve compiling a species list and identifying individual species through netting and direct observation. You will explore a range of

habitats from forest to forest edge, farmland and water courses to build as comprehensive a species list as possible.

Your main data collection will involve carrying out Pollard walks or point counts (or both in different areas of forest (and farmland, if your proposal includes this). Counts will be at our designated 'composite sites' which are stratified throughout the forest to ensure that they are adequately spatially independent of each other and represent a variety of forest types. It is likely that you will be carrying out surveys at at least one of the forest node camps, so will have to be prepared to live in basic conditions in a remote forest environment, though some of your time will be based in the village of Labundo bundo working in and around the forests near there.

You'll be provided with all the basic field equipment you need on site, but a pair of binoculars that have good close-focus may be useful additional equipment to help identify butterflies in the field. It will also be useful to have a camera to hand with a decent macro for taking photographs of butterflies in the hand.

## References

The list below is far from comprehensive but will give you a good starting point in your preparatory research.

Fermon, H., Waltert, M., Vane-Wright, R.I. & Mühlenberg, M. (2005) Forest use and vertical stratification in fruit-feeding butterflies of Sulawesi, Indonesia: impacts for conservation. *Biodiversity and Conservation*, **14**, 333-350.

Hill, J., Hamer, K., Tangah, J. & Dawood, M. (2001) Ecology of tropical butterflies in rainforest gaps. *Oecologia*, **128**, 294-302.

KOH, L.P. (2007) Impacts of land use change on South-east Asian forest butterflies: a review. *Journal of Applied Ecology*, **44**, 703-713.

Schulze, C.H., Waltert, M., Kessler, P.J.A., Pitopang, R., Veddeler, D., Mühlenberg, M., Gradstein, S.R., Leuschner, C., Steffan-Dewenter, I. & Tschardtke, T. (2004) BIODIVERSITY INDICATOR GROUPS OF TROPICAL LAND-USE SYSTEMS: COMPARING PLANTS, BIRDS, AND INSECTS. *Ecological Applications*, **14**, 1321-1333.

Vane-Wright & Jong. (2003) The butterflies of Sulawesi: annotated checklist for a critical island fauna. *Zoologische Verhandlungen*, **343**, 3-267.

Willott, S.J., Lim, D.C., Compton, S.G. & Sutton, S.L. (2000) Effects of Selective Logging on the Butterflies of a Bornean Rainforest. *Conservation Biology*, **14**, 1055-1065.