

## **IL210 Influence of habitat structure on herpetofaunal assemblage composition in Sulawesi, Indonesia**

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Reptiles and amphibians (herpetofauna) are important components of tropical ecosystems because: (i) they make up major components of tropical vertebrate diversity, comprising typically twice the number of mammalian species; (ii) they are often the dominant vertebrate biomass, thus providing important food resources to other species; (iii) they have a high diversity of life history strategies; (iv) exploit a wide range of microhabitats, including arboreal, aquatic and fossorial; (v) occupy a wide range of trophic niches from small invertebrate feeders through to large mammal predators; and (vi) they are ectothermic, which means that they are potentially much more sensitive to changes in microclimatic conditions within forests than other vertebrates. These characteristics mean that herpetofauna is a useful group for understanding the effects of a wide variety of environmental changes to tropical forests at the community level and on biodiversity more generally.

Despite these characteristics, herpetofauna remains relatively poorly studied in tropical forests compared with birds and mammals. New species of reptiles and amphibians continue to be discovered in tropical ecosystems at a much higher rate than any other vertebrate group.

A range of factors are known to influence reptile assemblage composition and community organisation. However influence of anthropogenic disturbances on forest reptile communities remains poorly studied. The effects of gross disturbances, such as the complete removal of habitat, have been well documented in both temperate and tropical environments, however the spatial and temporal effects of more subtle changes to forest structure, such as selective logging, removal of other forest products or other changes to forest structure, are poorly understood. Their effects are likely to affect different species with different life histories and microhabitat associations in different ways. Understanding these relationships is important for determining the overall long-term impacts of forest use and management on herpetofauna diversity.

Sulawesi is home to a large and diverse assemblage of reptiles and amphibians, many of which are endemic to Sulawesi or associated smaller islands. However, a large proportion of taxa remain undescribed or as yet undiscovered, making this region one of the poorest studied in the world for herpetofauna. Recent studies have indicated that many species actually comprise complexes of multiple taxa spread across different geographic regions of mainland Sulawesi and associated offshore islands, reflecting the complex geological history of formation of the land masses present today. These findings indicate that species richness and local levels of endemism are likely to be much higher than previously thought. This pattern is reflected on Buton Island, where Operation Wallacea has been undertaking research and inventory of herpetofauna for 12 years. At least 70 species of reptile and amphibian have been recorded on the island to date. Of these, at least nine species are new, and several are potentially endemic to Buton Island.

Previous herpetofaunal research on Buton Island suggests that, as with elsewhere in the world, many forest-dwelling species are displaced by gross alteration of forest habitats, such as intensive logging and clearing for plantations. However, the effects of moderate anthropogenic disturbance processes, such

as selective logging and rattan harvesting, have much less adverse effects on forest reptile assemblage composition. Some species are affected whilst others are not. Resilience to such disturbance processes has implications for the conservation value of non-pristine forest habitats for reptiles and amphibians. For instance, it may be possible to accommodate some levels of disturbances to tropical forests without losing significant amounts of diversity. However, temporal impacts of such disturbance processes remain unknown; the impacts of the disturbances these forests have so far experienced may not have had adequate time to manifest changes in herpetofauna community composition, and disturbance processes may be on-going or even increasing, resulting in further impacts in the future. Furthermore, the effects of different disturbances may be attenuated or exacerbated by habitat type or other landscape processes (such as distance to forest edge or pre-disturbance history).

A research and monitoring program has been established on Buton Island to examine these spatial and temporal patterns of herpetofauna assemblage composition and habitat structural change. A series of 40-50 sampling points have been established throughout the forest, extending from areas near human settlement and high accessibility out to areas in the forest interior with less evidence of anthropogenic disturbance. Some of these sites are near the village of Labundo Bundo, which is the main research base for Operation Wallacea on Buton Island, whilst other sites are near several node camps within the Lambusango Reserve to the south of Labundobundo.

Each year the herpetofauna is sampled at each site with a standardised set of sampling techniques. Pit-traps, each comprising five plastic buckets 60-85 L in volume and connected by a drift fence 50cm in height, are established at each sampling site. These traps are checked for animals and cleared every morning. Time-constrained nocturnal censuses are also conducted at each site each season. In addition all incidental observations of reptiles and amphibians made within a 25 m radius of the pitfall site are recorded. Collectively these data give us an assessment of comparative species richness and composition across the study area.

The general aim of this dissertation project will be to examine relationships between forest habitat structure and herpetofauna assemblage composition. As part of the above overall research and monitoring project, you will assist the herpetology scientist in the collection of herpetofauna data across 40-50 sampling sites stratified into areas with differing levels of forest disturbance. This will involve visiting the forest on a daily basis and assisting with the checking of a series of 12-15 traps in a given area, typically along a 5-10 km circuit. At night time, you will assist the scientist undertake nocturnal censuses at a subset of sampling sites, rotating through all sites over the course of the study period. A wide variety of small reptiles and amphibians are detected on a daily basis using these techniques.

These data would then be supplemented by taking habitat structural measurements at each site, using standard measurements previously developed and the spatial patterns of assemblage composition and individual species with respect to habitat characteristics determined. You will have the option of examining general relationships at the broad herpetofaunal community-level, or at specific groups of species, such as litter-dwelling snakes or scincid lizards, or nocturnal species (e.g. geckos). You will also have the option of examining specific effects of certain habitat structural characteristics of interest, such as importance of canopy cover, or availability of coarse woody debris.

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