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Sampling micromolluscs in tropical forests: one size does not fit all

THOR-SENG LIEW[1,3], REUBEN CLEMENTS[2,4] & MENNO SCHILTHUIZEN[1,3]

[1] *Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Locked Bag 2073, 88999 Kota Kinabalu, Malaysia*
[2] *World Wide Fund for Nature-Malaysia, 49, Jalan SS23/15, 47400 Petaling Jaya Selangor, Singapore,*

[3] *National Museum of Natural History 'Naturalis', P.O. Box 9517, 2300 RA Leiden, the Netherlands,*

[4] *Corresponding author*

Abstract

Micromolluscs comprise a significant proportion of terrestrial malacofaunas in the tropics. As such, inventories and ecological sampling protocols must endeavor to maximize the capture of micromolluscs. Sampling protocols (*i.e.*, appropriate number of sampling plots) for micromolluscs, however, still require refinement to improve sampling effectiveness. Apart from describing our recommended sampling protocols for micromolluscs, we compared completeness ratios (as a proxy for sampling effectiveness) and species densities and diversities across different vegetation types (*i.e.*, limestone karst forests [LKFs] and non-limestone karst forest [NKF]) and geographies (*i.e.*, inland and offshore) in Malaysia. Our results showed that completeness ratios at LKFs were significantly higher than NKFs, but no significant differences were detected among plots at inland and offshore localities. In order to optimize resources for sampling micromolluscs, plot sizes at LKFs could therefore be reduced from frequently used 400 m^2 plots to 8 m^2, while the number of plots at LKFs may range between three to six plots per locality. Having determined that the abundance of micromolluscs in sampling plots was positively correlated with species density, we controlled for abundance and subsequently found no significant differences in micromollusc species diversity between NKFs and LKFs. However, inland localities had significantly higher species diversities than offshore localities. As such, NKFs (due to lower completeness ratios) and offshore localities (due to lower species diversities) probably require more sampling plots to achieve high completeness ratios (and improve sampling effectiveness). Ultimately, the development of a unified sampling strategy must consider variables such as vegetation types and geographies to ensure effective and comparable sampling across a broad array of ecological and geographical situations.

Keywords: Gastropod, island, Mollusca, Borneo, snail

Introduction

Until a decade ago, micromolluscs received comparatively less research attention than species with larger shells (> 5 mm). With the aid of microscopy, micromolluscs are now easier to identify and their sheer numbers have greatly augmented species lists. Malacologists now realize they cannot overlook the contribution of micromolluscs to species compositions of terrestrial habitats (Emberton *et al.*

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