

Press release

For immediate release

Invertebrates as The Forest's Unsung Eco-Custodians

HKU Study Reveals Crucial Role of Invertebrates in Global Forest Litter Decomposition

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Image 1: Termites are crucial for maintaining a healthy ecosystem. Image credit: Shutterstock.

The University of Hong Kong (HKU) has studied the role of invertebrates in forest litter decomposition. The study, led by researchers PhD candidate Xiaoyi ZENG and Professor Louise A ASHTON from the School of Biological Sciences at HKU, illustrates the significant contribution of soil invertebrates, specifically termites, to forest litter decomposition in tropical and subtropical regions. The study was recently published in *Ecology Letters*, and the results are imperative for preserving healthy ecosystems and conserving invertebrates in the wake of widespread environmental change.

Research Background

Litter decomposition is a crucial process in carbon cycling and nutrient turnover. Microbes such as bacteria and fungi are widely considered the most important decomposers in nature. However, soil invertebrates contribute a large proportion of decomposing and nutrient turnover and are therefore important for functioning and healthy ecosystems. Most previous studies of decomposition and nutrient turnover are from temperate regions like Europe and North America, so there bias and large knowledge gaps on the roles of invertebrates in global ecosystem processes.

A major invertebrate decomposer in the tropics are termites, which are often viewed only as pests to humans, but are important ecological engineers in the tropics, helping to break down organic matter and redistribute nutrients. Termite dominance in the tropics, but not temperate regions should result in differences across regions for invertebrate-decomposition, but this has not been well established.

Findings

In this study, the HKU research team included 476 case studies from 93 sites across the globe. A meta-analysis approach was used to assess the regional differences in forest litter decomposition mediated by invertebrates. The results showed that invertebrates contributed 31% to global forest litter decomposition, and the contribution of soil invertebrates in tropical and subtropical forests was 1.4 times higher than that in temperate and boreal forests. Termites, together with warm and humid climate contributed to the greater decomposition in tropical and subtropical forests.

This study highlights the global importance of invertebrates in driving the decomposition of forest litter, particularly in tropical and subtropical regions. However, the contribution of invertebrates to forest litter decomposition may be underestimated due to the current regional sampling bias. Additionally, this study highlights the importance of termites in nutrient cycling. Many still consider termites as crop pests and widely use insecticides to reduce termite abundance. Conservation of invertebrates in tropical and subtropical regions is crucial for maintaining ecosystem services, given the widespread environmental change in these areas.

Therefore, this study stresses the need to integrate invertebrate functions into earth system models as they contribute around 31% of global forest litter decomposition. An extensive and standardised data collection is of great value to develop global database of soil biodiversity and improve predicting power of earth system models. Furthermore, forest management approaches that focus on insecticide use to control termite populations may have unintended consequences on ecosystem functioning (e.g. nutrient cycling). Instead, forest managers should consider conservation strategies that protect invertebrate populations and promote sustainable forest management practices.

‘This study shows that invertebrates are essential for decomposition, keeping ecosystems working by breaking down dead organic material. Invertebrates like termites are particularly important in the tropics and sub-tropics where most biodiversity occurs. Invertebrate biodiversity is threatened by human activities such as climate change, habitat loss and pollution. It is essential we mitigate biodiversity loss in order to maintain healthy, functioning ecosystems into the future,’ said Professor Louise Ashton, Assistant Professor of HKU School of Biological Sciences.

The journal paper ‘**Global contribution of invertebrates to forest litter decomposition**’ can be accessed at:

<http://dx.doi.org/10.1111/ele.14423>

Authorship

This study conducted by the Biodiversity and Environmental Change Lab at the University of Hong Kong (HKU) (www.louiseashton.net). The Biodiversity and Environmental Change Lab is led by Professor Louise A Ashton. The lab is dedicated to research exploring insect biodiversity and ecosystem function and understanding ecological responses to environmental change. This study was conducted by Xiaoyi Zeng (PhD student) as the first author and Professor Louise Ashton as the corresponding author. The co-authors include Huilin Gao from the Faculty of Business and Economics (HKU), Runxi Wang and Bartosz Majcher from the School of Biological Sciences (HKU), Dr Cheng Wenda at Sun Yat-sen University, and research teams from the University of Liverpool, the Natural History Museum, London, and the University of Bristol in the UK. This research was supported by the General Research Fund from the Hong Kong Research Grants Council.

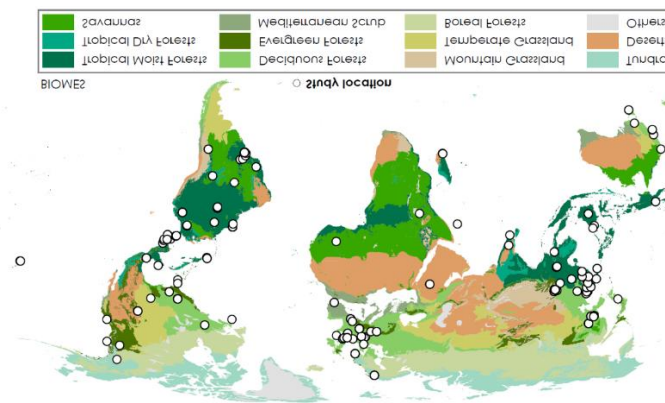


Figure 2. Global distribution of forest leaf litter decomposition experiment used in this study. (Illustration adapted from respective paper)

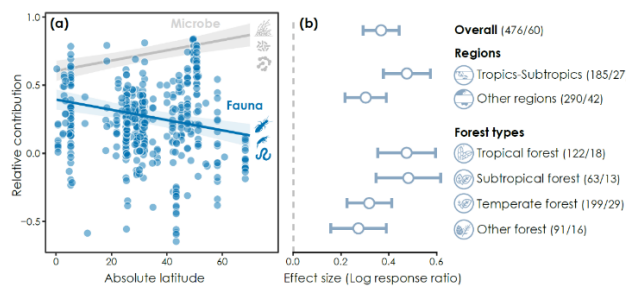


Figure 3. Soil invertebrate contributions to forest litter decomposition across regions. (a) Relative contributions of invertebrates (blue) and microorganisms (grey) to forest litter decomposition against absolute latitude. (b) Effect sizes of invertebrates on forest litter decomposition at global, regional, and biome scales. (Illustration adapted from respective paper)

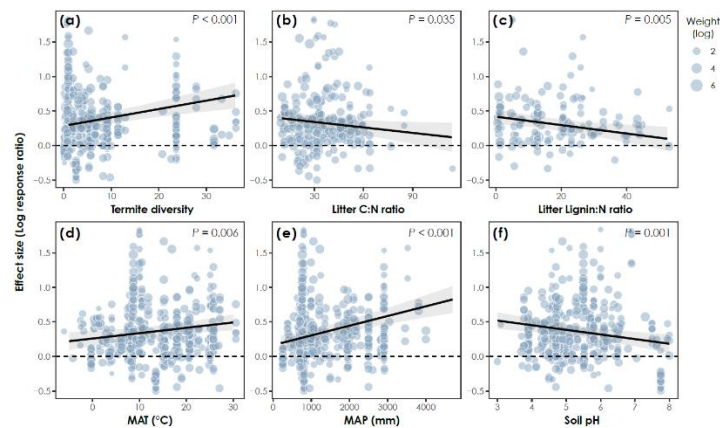


Figure 4. Influence of (a) termite diversity, (b) litter C: N ratio, (c) litter lignin: N ratio, (d) mean annual temperature (MAT), (e) mean annual precipitation (MAP), and (f) soil pH on invertebrate effect sizes determined using mixed-effect meta regressions. (Illustration adapted from respective paper)



Image 2,3: Termites in Sabah, Malaysia (Photo courtesy: Louise Ashton)

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