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Relationship between ant and termite nesting and CO_2 emission from soil in Southeast Asian rainforest

Y. Maekawa [1], Y. Hashimoto [2], S.K. Yamane [3], T. Kume [4], S. Hasin [5], H. Iwayama [1] and M. Ohashi [1].*

[1] School of Human Science and Environment, University of Hyogo, Himeji, Hyogo 670-0092, Japan

[2] Division of Phylogenetics, Museum of Nature and Human Activities, University of Hyogo, Sanda 669-1546, Japan,

[3] Haruyama-cho 1054-1, Kagoshima-shi 899-2704, Japan,

[4] School of Forestry and Resource Conservation, National Taiwan University, Taipei 106-17, Taiwan,

[3]Center for Advanced Studies in Tropical Natural Resources, NRU-KU, Kasetsart University, Bangkok 10900, Thailand

Abstract

Soil respiration, which is originated from microbial activity, root respiration and other soil living organisms, is the second largest flow of CO_2 in the carbon cycling. Since tropical forests are characterized by high biomass and diversity of ants and termites, their nests could be an important component of soil respiration. In this study, we set out to compare CO_2 emissions from their nests with those of the surrounding soil respiration in a tropical rainforest (Lambir Hills National Park) in Malaysia. We also determined the impact of environmental factors on the amount of CO_2 released from the nests. We measured CO_2 emissions and

* *Corresponding Author*

environmental factors at 137 nests of ants (115) and termites (22) in the site. The CO_2 emission from nests was higher than that of surrounding soil (Paired t-test, $P < 0.05$). We found a weak negative correlation between the surrounding soil respiration and soil moisture content (regression analysis $r = -0.26$, $p < 0.05$). However, no significant correlation was observed between the CO_2 emission and soil moisture content in the nests of ants and termites. No relationship was observed between the surrounding soil respiration and soil temperature. However, a weak positive correlation (regression analysis: $r = 0.43$, $p < 0.05$) was observed between the CO_2 emission and soil moisture content in the termite nests. Our results showed that the amount of CO_2 increased in the locations where social insects are nesting. In addition, it was shown that the relationship between CO_2 emissions and soil environmental factors may change depending on the nesting activity of ants and the termites.

Key words: ant, termite, carbon cycling, tropical rain forest, soil respiration