Termite assemblages in the four forest types in southern China

by

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Abstract

Termites are ecosystem engineers in tropical and sub-tropical environments, but termite assemblages in the lower subtropical forests have not been determinedconcerned. To examine the relationship between lower subtropical forest types and the composition of termite assemblages, species diversity and assemblage structure of termite were investigated using with active searching transects in different forest types, including a pine forest (PF), a pine and broad-leaved mixed forest (MF), a monsoon evergreen broad-leaved forest (MEBF) and a eucalyptus forest (EF). In the lower subtropical forest, the dominant group wais the wood-feeders of in the family Termitidae family, and the mixed forest hosted the highest numbers of species and encounters. Termite assemblages reflected the differences among the four forest types, and termites may be act as an indicator for different forest types.

Key words: Termite assemblage, lower subtropical forest, community structure, southern China

Introduction

Termites (Blattodea: Termitidoidae) play an important role in soil processes, energy flow and matter cycling as ecosystem engineers, and are major decomposers in tropical and subtropical regions (Holt and Lepage 2000, Sugimoto et al. 2000, Schuurman 2005 THE HIGHLIGHTED CITATIONS ARE NOT IN THE REFERRENCES SECTION). ）。These functions are largely dependent on the species composition of the termite assemblage, and different feeding habits termites have as different ecological functions (Donovan et al. 2002). However, the study of termite ecology is greatly constrained by sampling difficulties and lack of sampling protocols (Dawes-Gromadzki 2003, Davies et al. 2010). With the development of sampling method (Jones and Eggleton, 2000), the comparisons of the termite assemblages at the different scales were reported (Gathorne-Hardy et al. 2001, Donovan et al. 2002), and many studies havewere focused on the influence of human disturbance（Davies 2002, Sena et al. 2003, Eggleton et al. 2002, Bandeira et al. 2003, Jones et al. 2003, Ackerman et al. 2009). For the lower subtropical forest ecosystems, the termite assemblages have not been investigated. The aims of this study were (1) to compare the termite composition, relative abundances and assemblage structure of different forest types in southern China; (2) to analyseanalyze the termite assemblage structures; (3) to discuss the bioindicator function of termites.

Materials and Methods

Sampling was conducted in four distinct forest vegetation types. A pine forest (PF), a pine and broad-leaved mixed forest (MF), and a monsoon evergreen broad-leaved forest (MEBF) are in the Dinghu Mountain Nature Reserve, Guangdong Province, China. In addition, eucalyptus trees are now common in have almost dotted the southern China today, so a eucalyptus forest (EF) of Boluo county, Guangdong Province, China was selected to act as another kind of forest type.

Termite assemblages were sampled using a protocol similar to the active searching transects (Jones and Eggleton, 2000). Each transect consisted of a 100 m×2 m strip and was divided into ten 5 m×2 m sections with 5 m spacing among them. Twelve transects were sampled in each site in October 2011, and each section was searched for termites for twenty person minutes. All termite species were recorded as well as the number of occurrences, and an occurrence wais recorded when a population of termites of one species inat one section of a transect wais sampled.

All sampled termites were identified to species using soldier castes according to the Fauna Sinica (Huang et al., 2000), and confirmed at the Termite Collection of Guangdong entomological institute, China. Voucher specimens are lodged at Guangdong entomological institute, China. After the identification, each species was placed into one of the termite feeding groups ((Donovan et al. 2001).

Differences in termite assemblage composition were compared between forest types. And, assemblage structures were analysedanalyzed using both CLUSTER and non-metric Muti-Dimensional Scaling (MDS) multivariate analyses in Primer v. 6 (Clarke & Gorley 2006).

Result and Discussion

General characteristics of the overall termite assemblages included a. A total of 20 species from 9 genera and 2 families were collected in the four forests. These species belonged to 5 sub-families and 3 feeding groups. The dominant family wais Termitidea, and 15 species were identified (Fig.1). Nasutitermitinae wais the dominant subfamily, then Macrotermitinae. *Reticulitermes* wais a common group, and the genera *Nasutitermes* and *Reticulitermes* contained the most diverse species, with athe proportion of 25% and 20% respectively. The *Nasutitermes* and *Odontotermes* weare dominant genera, and the dominant species comprised *Odontotermes formosanus* and *Nasutitermes curtinasus*, representing 16.8% and 15.4% of the total relative abundance, respectively.

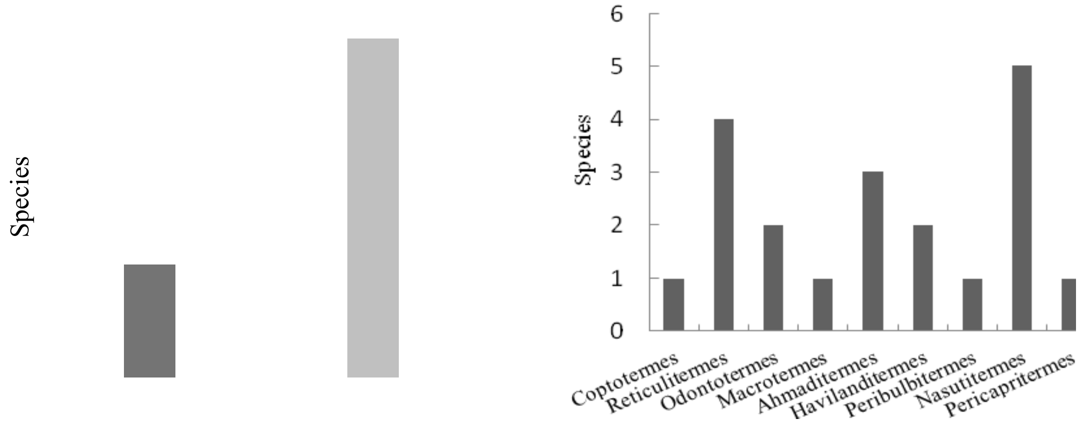

Fig. 1 Sampled termite species richness in different families and genera.

The termite assemblages in the different forest types including b. Both the number of species and relative abundance in MEBF were similar to that of in MF (Fig. 2,3). MF had 4 exclusive species, and the dominant species were *Odontotermes formosanus* and *Nasutitermes curtinasus*. In MEBF*, Reticulitermes dinghuensis* and *Havilanditermes orthonasus* were found only, and *Macrotermes barneyi* and *Nasutitermes curtinasus* were the dominant termites. However, the termite diversities in PF and EF were low. *Reticulitermes dichrous* was the dominant species in PF, whereas *Odontotermes formosanus* and *Reticulitermes flaviceps* were the dominant species in EF.

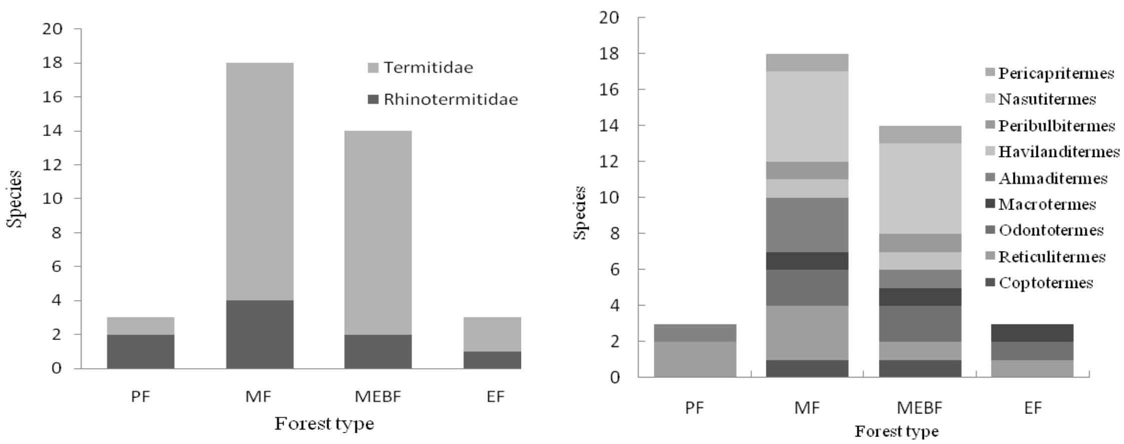

Fig. 2 Sampled species richness from families and genera in four forest types.

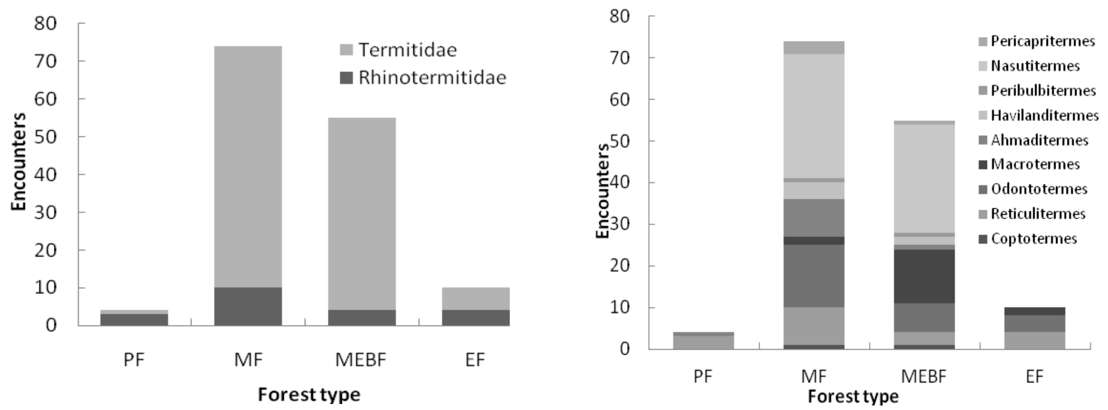

Fig. 3 Sampled encounters from families and genera in four forest types.

As for feeding groups, wood-feeding termites were the dominant group, and soil-feeding termites were absent. The highestr species richness was in Group II that hads higher species richness in MEBF, MF and EG, and Group III was lackinged in PF and EF. MEBF was very similar to MF in number of relative abundance (Fig. 4).

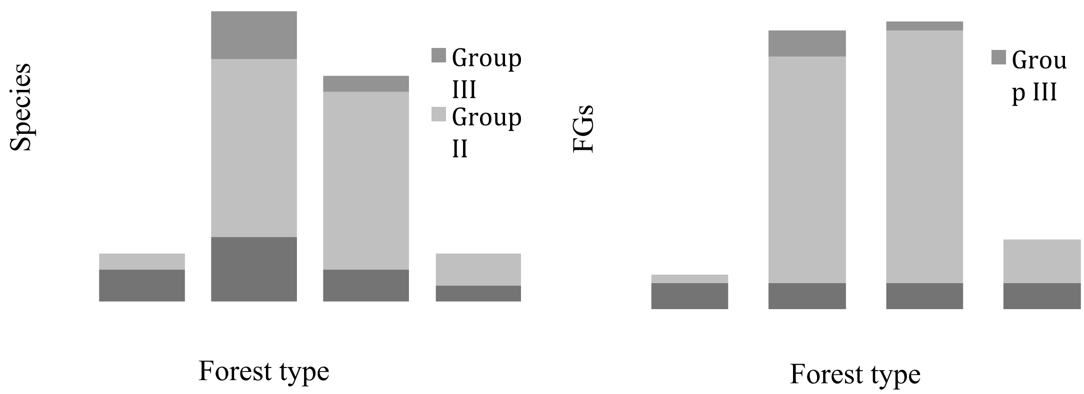

Fig. 4 Species richness and Encounters of different feeding groups in four forest types

Similarity of termite assemblage structure was evident in. tThe structure of the termite assemblages was affected by forest types. The results of the CLUSTER and MDS analyses showed that there were high similarity (> 60%) in termite assemblage structure between MEBF and MF, whereas both PF and EF belonged to separated termite assemblages. The termite assemblage in PF was different from that of the other forest types, and the similarity was below 20% (Fig. 5,6).

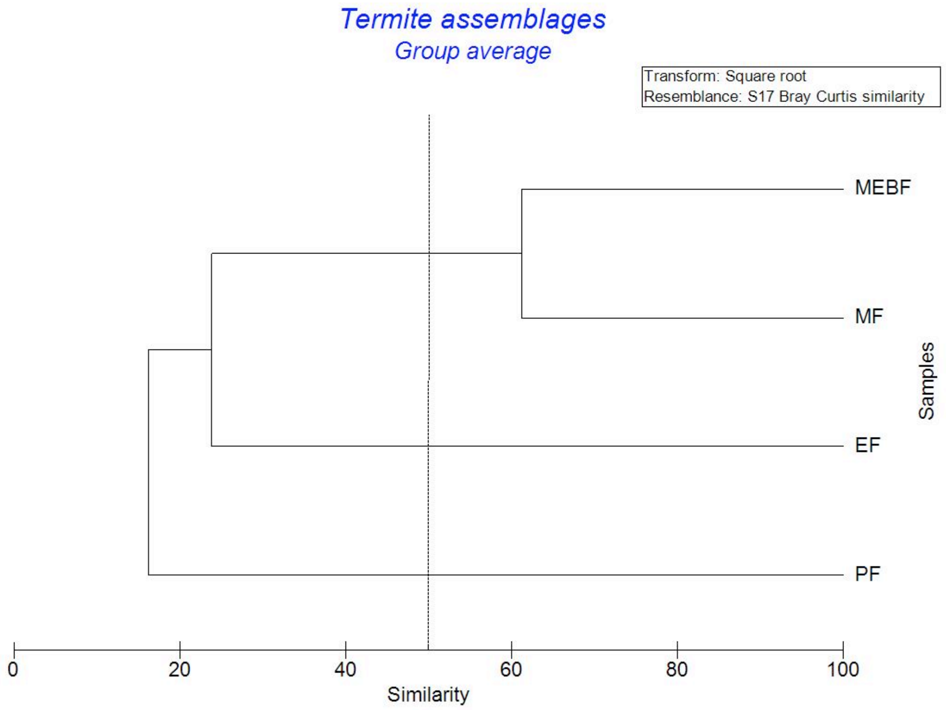

Fig. 5 Dendrogram of forest types using group average clustering from Bray-Curtis similarity

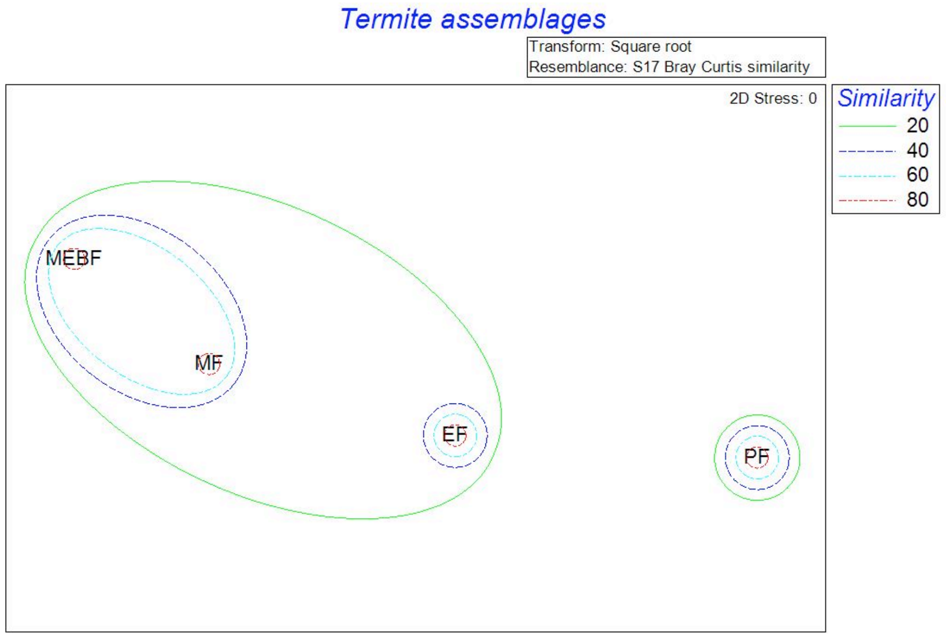

Fig. 6 2-dimensional MDS configuration of the forest types at different similarity levels

Conclusions

Termite assemblages are considered as complex systems, which can respond to the differences of weather conditions and vegetation types (Bignell and Eggleton 2000, Davies et al. 2003; Inoue et al. 2006). Five major biomes (tropical rain forest, tropical savanna woodland, semi-desert, temperate woodland and temperate rain forest) have different termite assemblages (Jones and Eggleton, 2011), and in thise study, different lower subtropical forests in China had also showed different termite assemblages. Especially, great changes inof termite assemblages haved taken place from PF to MF. For feeding groups, it was reported that Asian hasd a higher proportion of wood-feeding termite species (Davies et al. 2003), and our results similarly showed that wood-feeding termites were the dominant group without providing any soil-feeding termites.

Many studies have shown of the variations in theof termite assemblages according to the level of habitat disturbance indicatinged that termite assemblages were considerably affected in both termite diversity and abundance by different disturbances (Davies 2002; Jones et al., 2003; Attignon et al., 2005; Vasconcellos et al., 2010; Dosso, Yéo et al., 2012). Accordingly, termite assemblages have a bioindicative function relative toof environmental variations, with a reduction in termite diversity and abundance from the best preserved site to the most disturbed site (Davies et al. 2003; Eggleton et al. 1995, 1996). In the lower sub-tropical forest, termite assemblages were sensitive and may also be used to indicate different forest types. However, the data from this study are were not enough in the study, and more sampling is needed to been done in the future.

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