

Short Communication: Diversity and distribution of termites in buildings in Pontianak, West Kalimantan, Indonesia

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Abstract. Indrayani Y, Takematsu Y, Yoshimura T. 2017. Diversity and distribution of termites in buildings in Pontianak, West Kalimantan, Indonesia. *Biodiversitas* 18: 954-957. This study aimed to map the distribution of termites in buildings in Pontianak, West Kalimantan, Indonesia. Forty-four infested buildings in Pontianak were chosen randomly as samples. Out of the buildings inspected, 10 buildings were aged less than 15 years, 13 buildings 16-30 years, 17 buildings for over 31 years, and 4 buildings were of unknown age. The altitude of the survey area was from 0.1 to 1.5 m above sea level. Soil types were clay, alluvial, humus, and organosol. The average temperature, average relative humidity, and annual precipitation at the survey site were 27.3°C, 84% and 340.6 mm, respectively. By direct observations, ten termite species were found: *Coptotermes curvignathus*, *Coptotermes kalshoveni*, *Cryptotermes* sp.1, *Cryptotermes* sp.2, *Cryptotermes domesticus*, *Cryptotermes cynocephalus*, *Nasutitermes havilandi*, *Schedorhinotermes medioobscurus*, *Microcerotermes havilandi*, and *Globitermes globosus*. *N. havilandi* was the most common species found in 26 buildings, followed by *Cryptotermes* sp.1. (9 buildings), *C. domesticus* (8 buildings) and *C. curvignathus* (8 buildings).

Keywords: Infestation in buildings, termite mapping, termite species diversity, West Kalimantan

INTRODUCTION

Wooden building construction is still dominant in many parts of the world. Although wood is considered an environmentally acceptable material, it is easily attacked by pest insects such as termites. About 3,106 species of termites have been identified, and there are still a hundred more that have not been identified (Eggleton 1999). Seventy to eighty termite species are listed as structural pests that cause damage to buildings, of which 50 are classified as serious pests that require management (Pearce 1997). The total annual economic losses caused by termite infestation on buildings and termite prevention worldwide were estimated in 2012 at 40 billion USD (Ghaly and Edwards 2011). Due to significant economic losses caused by termite attacks, the spreading of termites in urban areas is crucial for achieving a long service life of wooden houses.

Climatic and soil conditions in Indonesia strongly support termite life. Pontianak is the capital of West Kalimantan Province, with an annual average temperature of 30°C, average humidity of 76.29%, and average minimum and maximum solar radiation of 53% and 73%, respectively (BPS 2016). Such climatic conditions are favorable for termites, and the diversity, as well as an abundance of termites in this habitat, can cause serious damage to buildings. Half of the 26 economically damaging termite species in the world are subterranean termites (Evans 2011), and seven of them are *Coptotermes* species. The two most widespread species worldwide are *Coptotermes formosanus* are found mostly in temperate

regions such as China, Japan, Taiwan and the United State (Chouvenec et al. 2015), and *C. gestroi*, distributed in tropical and subtropical regions in 24 countries (Li et al. 2013). Six termite species, *Coptotermes curvignathus*, *Microtermes insperatus*, *Macrotermes gilvus*, *Capritermes mohri*, *Odontotermes javanicus*, and *Schedorhinotermes*, have been found cumulatively in ten cities in Indonesia such as Semarang, Banda Aceh, Sabang, Pandeglang, Serang, South Jakarta, West Jakarta, East Jakarta, West Tangerang, and Bogor (Nandika 2015). However, data about the distribution of termites in an urban area in Kalimantan have not yet been reported. The current study was initiated to map the distribution of termites in buildings in Pontianak, West Kalimantan, Indonesia. The data on termite diversity will be a crucial part of providing basic information on termite management.

MATERIALS AND METHODS

Study area

This study's termite survey focused on Pontianak, West Kalimantan, Indonesia (Figure 1). Pontianak has an area of 107.82 km², and is crossed by the equator line with the geographical location of 0°02' North Latitude-0°05' South Latitude and 109°16'-92°3' East Longitude. The altitude of the survey area was from 0.1 to 1.5 m above sea level (asl.), and types of soils are clay, alluvial, humus, and organosol. The average relative humidity of Pontianak was reported as maximum 99.6% and minimum 53% with

annual precipitation of 340.6 mm, and an average solar radiation of 53%-73% (BPS 2016).

Survey methods

Forty-four buildings located in Pontianak, West Kalimantan, Indonesia were surveyed. All the buildings surveyed were a mixture of wood and reinforced concrete. The interior of each building and the surrounding area were examined for the presence of termites and termite related damages. Termite infestation assessments took note of damaged wooden structures such as windows, door frames, wooden walls and wooden furniture. Wooden fences and in outdoor courtyards were also inspected for the presences of termites. Termites found from the survey were stored in glass vials containing 90% ethanol and served for species identification.

Data analysis

Since this study was not a replicated experiment, only descriptive statistics such as means and percentages were used.

RESULTS AND DISCUSSION

Termite infestation in buildings

Out of 44 buildings inspected, 10 buildings (22.7%) were aged less than 15 years, 13 buildings (29.5%) were aged between 16-30 years, 17 buildings (38.6%) were aged over 31 years, and 4 buildings (9.1%) were of unknown age. A previous observation of the intensity of termite attacks in Pontianak reported that the buildings most frequently attacked by termites were over 31 years, and buildings aged less than 15 years were less infested by termites than those aged 16-30 years (Indrayani et al. 2014). This finding is supported by Jones (2004), who found the highest termite infestation rates in the oldest buildings (Jones 2004). Debelo and Degaga (2014) also demonstrated that houses over 7 years after construction were more frequently infested by termites than new houses. Compared with temperate and subtropical areas, tropical areas are more susceptible to termite damage since the diversity of termites in those areas is high (Kirton 2005).

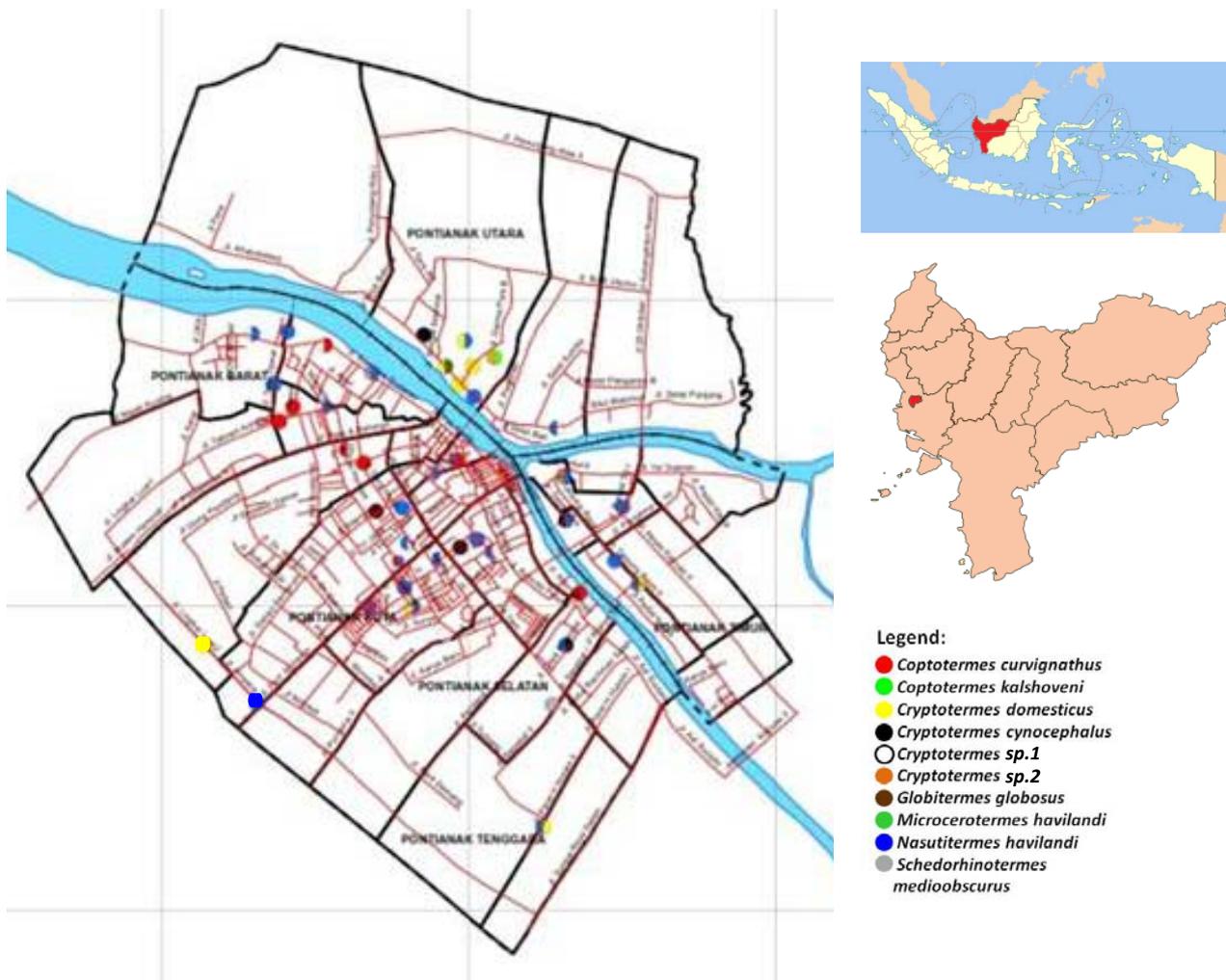


Figure 1. Termite species in buildings in Pontianak, West Kalimantan, Indonesia

Table 1. Termite species found in buildings in Pontianak, West Kalimantan, Indonesia

Termite species	Number of buildings
<i>Nasutitermes havilandi</i>	26
<i>Cryptotermes</i> sp.1	9
<i>Cryptotermes domesticus</i>	8
<i>Coptotermes curvignathus</i>	8
<i>Cryptotermes cynocephalus</i>	4
<i>Schedorhinotermes medioobscurus</i>	4
<i>Cryptotermes</i> sp.2	2
<i>Coptotermes kalshoveni</i>	1
<i>Globitermes globosus</i>	1
<i>Microcerotermes havilandi</i>	1

Note: Data collected from 44 buildings

The survey shows that the infestation rate of each of six districts varied from 9.1% to 22.7%. The highest termite infestation rate was found in Pontianak (22.7%) followed by the districts of West Pontianak (20.45%), South and North Pontianak (18.2%), East Pontianak (11.4%), and Southeast Pontianak (9.1%). The typical tropical termite species diversity was enhanced by the survey area only being 0.1 to 1.5 m asl., termites are generally very fond of damp areas. This finding is compatible with Syaokani (2013), who found the termite's species richness and distribution in areas only a few meters above sea level, and is supported by Gathorne-Hardy et al. (2000), who found that the diversity of species of termites in Sumatra was greatest, below altitudes of 100 m.

Diversity of termite species in buildings

A total of ten termites species were detected through the survey. The species were *Nasutitermes havilandi*, *Cryptotermes* sp.1, *Cryptotermes* sp.2, *Cryptotermes cynocephalus*, *Cryptotermes domesticus*, *Coptotermes curvignathus*, *Coptotermes kalshoveni*, *Schedorhinotermes medioobscurus*, *Globitermes globosus* and *Microcerotermes havilandi*.

Nasutitermes havilandi was the most common species found in the 26 buildings, followed by *Cryptotermes* sp.1 (9 buildings), *C. domesticus* (8 buildings) and *Coptotermes curvignathus* (8 buildings) (Table 1).

As shown in Figure 1, there was a particular distribution pattern for each species. *Nasutitermes havilandi* (blue circles), *C. domesticus* (yellow circles) and *C. cynocephalus* (black circles) were found throughout the city at the greatest abundances.

Nasutitermes is a genus of family Termitidae, and *N. havilandi* was the most frequently encountered species in this study (Table 1, Figure 1). In their survey of West Sumatra, Indonesia, Handru et al. (2016) also found that *Nasutitermes* was the most common genus. This species was collected from many habitats such as at ground level, trees and buildings of the survey sites. This species feeds on a variety of materials such as trees, roots, wood, and furniture. Adams and Levings (1987) found that the

foraging territory of *N. corniger* as extended (as far as 5000 m) from their nest. Furthermore, Thorne and Haverty (2000) found many species from the genus *Nasutitermes* nesting on tree trunks or building galleries from one nest to other parts of the tree, or on the underside of branches to connect the nest with food sources.

Cryptotermes is a genus of family Kalotermitidae. They have pellets as their excrement which accumulating under the infested wood. *Cryptotermes* species were found to be widely distributed throughout Pontianak. The dominant species were *C. cynocephalus*, spread evenly throughout Pontianak, and *C. domesticus* found only in the northern part. Two other *Cryptotermes* species, *Cryptotermes* sp.1 and *Cryptotermes* sp.2 (Table 1), again only presence only in the northern part of the City (Figure 1). The *Cryptotermes* species were collected from infested furniture and rarely found from structural timbers. It might be explained that *Cryptotermes* species prefer dried wood. The infestation pattern of this genus is completely different from the other Kalotermitidae members, such as *Incisitermes*, which attacks structural timbers rather than furniture (Indrayani et al. 2004, 2005).

Coptotermes is a genus of family Rhinotermitidae. Two species, *C. curvignathus* and *C. kalshoveni* were found in this study. The distribution intensity of genus *Coptotermes* in this survey was moderate, perhaps because the survey area was located in the lowlands, between 0.1-1.5 m asl. The *Coptotermes* species were found either in the yard of the building or inside the building in this survey. This is supported by Gentz et al. (2008), who stated that the workers of the genus *Coptotermes* forage underground and move to rooftops through covered tunnels built along the vertical surfaces of materials. *Coptotermes* seems to be potentially harmful species not only in buildings but also in trees.

Schedorhinotermes is a genus of Rhinotermitidae, and *S. medioobscurus* was found in this survey. These species mainly attack dead trees and tree stumps. None of the living trees was attacked by *S. medioobscurus*. These results are similar to those described by Cheng et al. (2008), who found that *Schedorhinotermes* species only attacked dead trees and other dead plants in an oil palm plantation. This finding is also supported by Faszly et al. (2005), who said that *Schedorhinotermes* is a species categorized as low-level termite, and classified the genus into group I, which feeds on dead plant materials.

Microcerotermes is a genus of family Termitidae. One species, *Microcerotermes havilandi* was found in Pontianak, only in one location in the northern area (Figure 1). Species in *Microcerotermes* have small soldiers similar in size to their workers. Active mounds of *Microcerotermes* were present in the fields of the survey area. *Microcerotermes* species construct small mounds and consume dead plant materials. There was no evidence of *Microcerotermes* infestation inside the building surveyed.

Globitermes is a genus of family Termitidae. This genus includes three species, *G. brachycerastes*, *G. globosus*, and *G. sulphureus*. In the present study, *Globitermes globosus* was found around buildings. *Globitermes globosus* does

not build mounds of soil but nests on the ground. This species was found in only one survey site in Pontianak (Figure 1). Ngee and Lee (2001) and Abdul Hafiz and Abu Hassan (2005) also reported that *Globitermes sulphureus* attack building structures in Peninsular Malaysia. Furthermore, Abdul Hafiz and Abu Hassan (2009) stated that the infestation of *G. globosus* occurred around the window frame, under the carpet, wooden wall and wooden pillars.

The present observations revealed that the termite infestation risk is higher in western and southern parts of Pontianak. The number of termite species found in urban areas in Kalimantan is comparable to those Semarang, Banda Aceh, Sabang, Pandeglang, Serang, South Jakarta, West Jakarta, East Jakarta, West Tangerang, and Bogor (Nandika 2015). One not-yet-known species of the genus *Cryptotermes* was found. This paper is expected to provide basic data on termites in Kalimantan to establish more effective management strategies.

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