

## **The results of treating termites (Isoptera) in The Nam Hai Resort, Quang Nam province, Vietnam**

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### **Abstract**

The research was carried out in The Nam Hai resort since 2009 to determine the species composition of termites to treat them. The results showed 6 species belonging to 3 genera, 3 subfamilies were recorded in The Nam Hai resort. These were almost all species harmful to structural works. Among them, the genus *Coptotermes* had the highest encounter frequency (account for 80%), especially *Coptotermes formosanus* (account for 34.3%). Two remaining genera *Neotermes* and *Nasutitermes* were not found in the structure works, they were only recorded in the trees surrounding the resort. Thus, *Coptotermes* was the main harmful species in The Nam Hai resort and these was need to be treat by the integrated method. The method was applied to treat termites including directly bait in the works performing sign of termite activity, establish the bait system surrounding the works and eliminate termites outside the resort. After 4 years (2010 - 2013) applying the integrated method using BDM10 bait for treating termites, the number of works that were infested by termites decreased from 57 to 9 works, equal to 75% of the works infested by termites.

**Key words:** harmful species, integrated method, bait.

### **Introduction**

The Nam Hai belongs to Hoi An city, Quang Nam province, which is known as the luxury resort in the coast of Da Nang connecting to Hoi An. It contains 100 villas including 60 hotel villas, 40 pool villas along with Spa area and modern sport center, which is used many cellulose materials. Several years after opening, almost all works of the resort are seriously damaged by termites. The infested source is from termite nests underground of the construction and residential surrounding the Nam Hai resort. Therefore, there is need for an integrated method to control harmful termites in The Nam Hai resort.

In 2010, the BDM10 bait was successfully manufactured, which is effective to treat termites harmful construction. The product BDM10 was also evaluated as an advanced product by the Ministry of Agriculture and Development of Vietnam in 2011 (Ministry of Agriculture and Development, 2011; Nguyen, 2011).

According to the contract between the Indochina Corporation (Investor of the Nam Hai resort) and Institute of Ecology and Works protection, we had surveyed the level of damaging termites to establish the integrated method to control harmful termites in the Nam Hai resort.

## Materials and Methods

### Natural conditions, architecture characteristics and situation of termite infestation in the Nam Hai resort

#### *Natural conditions regarding to the distribution of termite in the Nam Hai resort*

The Nam Hai Resort, Quang Nam province is located in tropical climates, there are two seasons in a year, rainy and dry. The average temperature, humidity, rainfall are 25.4 °C, 84%, 2000-2500 mm, respectively. The area is approximately 400.000 m<sup>2</sup>, closely to the beach; the position, climate and sandy soil are the natural conditions for the development of termites in this area. The termite species composition contained 4 families: Hodotermitidae, Kalotermitidae, Rhinotermitidae, and Termitidae.

#### **Some architecture characteristics of the Nam Hai resort**

The works of The Nam Hai resort was used a lot of cellulose materials, especially plywood, pinewood, which are a favor food of termites. These materials were frequently directly contact to sunlight and moisture with high salt concentration making them susceptible to damage and termites easily invade into the works. Because of the close distance of works (about 20-50 meters), termites easily spread to other ones.

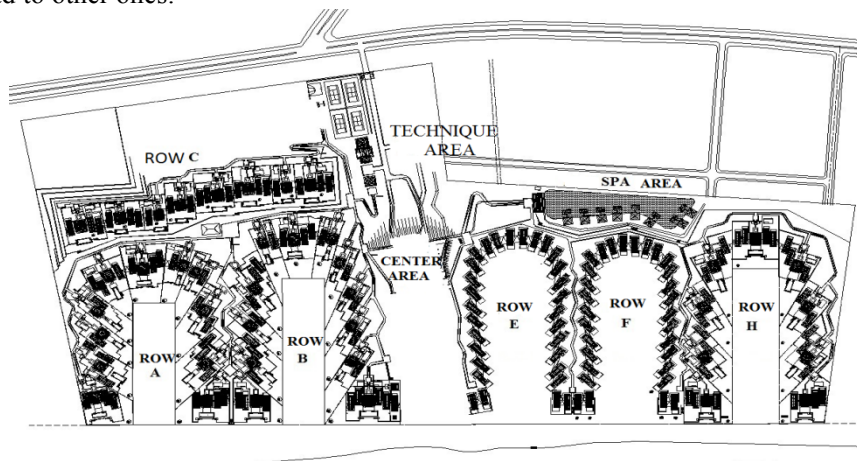


Figure 1. Map of the Nam Hai resort, Quang Nam province, Vietnam

### Level of damaging termites in The Nam Hai resort

#### *Species composition of termites in The Nam Hai resort*

The number of 35 specimens of termites was collected in some works including functional areas, technique areas, and trees in the garden and surrounding the resort. The results of analyzing termite species composition in the Nam Hai resort were shown in Table 1.

Table 1. Species composition of termites (Isoptera) in the Nam Hai resort

N	Scientific name	Number of specimens	Percentage (%)	Collected area
1	<i>Neotermes</i> sp.	4	11,4	Trees in the garden of villa B2, H3, H9, center area
2	<i>Coptotermes formosanus</i> Shiraki	12	34,3	Inside villas A3, A4, A10, B9, H2, center area, C2, C3, C7, E17, F28
3	<i>Coptotermes emersoni</i> Ahmad	9	25,7	Inside villas B1, B5, B8, B9, center area, C5, H1, F22, F20
4	<i>Coptotermes ceylonicus</i> Holmgren	4	11,4	Inside villas H8, center area, C6, F18
5	<i>Coptotermes</i> sp.	3	8,6	Inside villas B8, C1, E26
6	<i>Nasutitermes</i> sp.	3	8,6	Trees in the garden of villa H7, F12, center area
<b>sum</b>		<b>35</b>	<b>100</b>	

The number of 6 species belonging to 3 genera, 3 subfamilies were recognized in the Nam Hai resort. They are almost termite harmful structure work. Among them, *Coptotermes* had the highest encounter frequency (80%) and dominated in almost all habitats, especially *Coptotermes formosanus* (account for 34.3%). There were non-presence of two genera *Neotermes* and *Nasutitermes*, those are only available in trees surrounding the resort. Therefore, *Coptotermes* is the main harmful species in The Nam Hai resort, those are need to be treated by the integrated method.

*The damaging levels of Coptotermes in The Nam Hai resort from 2010*

The survey and termite sampling were carried out in December 2009 to assess the level of damaging termites, which was a basic information to provide a method for controlling termites in the resort. This survey was found 28 works having *Coptotermes* activity sign, then the addition of 29 works were found in 2010. Hence, the number of 57 works was damaged by *Coptotermes* in 2010 (the total of works were 109). Termites mostly invaded and damaged the door frame, bed, wardrobe and other wooden items.

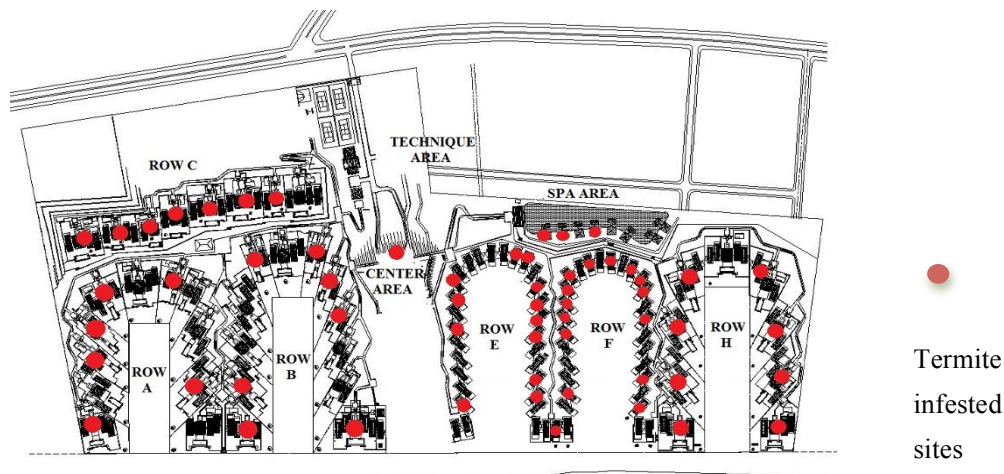


Figure 2. The levels of termite damaged works in the Nam Hai resort in 2010

The survey also found that termites damaged almost the entire row C (7/8 villas) with some villas seriously damaged. Because of the close distance, termites can easily spread to another works. In addition, termites in the garden could also be the source of this remarkable infestation.

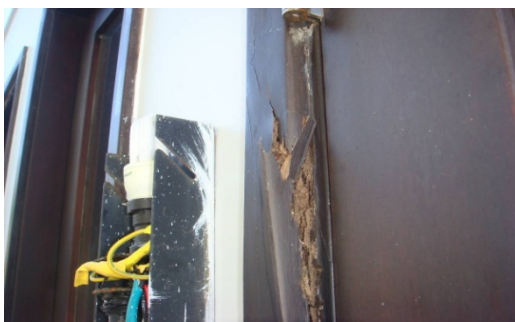


Figure 3. Sign of *Coptoteremes* damaging kitchen door of villa 6020



Figure 4. Sign of *Coptoteremes* damaging kitchen door of villa 2090

### **The integrated method for controlling termites in The Nam Hai resort**

After conducting, identifying the termite species composition in The Nam Hai resort, the result indicated that *Coptoteremes* was the main harmful genus for the construction. Therefore, the integrated method for controlling termites at The Nam Hai resort had planned with 3 contents: (1) eliminating all *Coptoteremes* nest which was presented in construction by using BDM10 bait method, (2) establishing termite barriers by bait stations surrounding constructions to prevent *Coptoteremes* from returning the works; (3) eliminating *Coptoteremes* nest surrounding area in order to limit the formation of the new ones.

#### **Eliminating *Coptoteremes* by bait**

The method of eliminating termites using BDM10 bait, the product of Institute of Ecology and Works protection, is highly effective in treating termites, especially subterranean termites

(Coptotermes). As termite workers eat BDM10 bait, they spread out toxic contained in baits for other individuals in colony. It leads termite queens to be killed. The steps of BDM10 bait method as follows:

- Step 1: Examining termite levels, position and arena in construction of The Nam Hai.
- Step 2: Setup bait stations in the termite damage position, the number of bait stations depends on the location and damage levels of termites in construction.
- Step 3: Monitoring the amount of termites entering the attractive stations and adding stations as needed (about 15-30 days).
- Step 4: When the amount of termites entering the attractive station is reached requirement, the bait BDM10 is put into the station (about 15-30 gram depending on the amount of termites).
- Step 5: Checking the treating efficiency and adding bait to stations as necessary (about 10-15 days).
- Step 6: Tidy up and restore the ground after testing for non-termite sign at the station position and construction.

#### **Establish a termite bait system**

The construction of The Nam Hai resort was designed with high density, the adjacent middle of the works is only about 20-50m. The range of Coptotermes termite activities up to 100m around the origin nest, so their ability of spreading is very high. Therefore, after treating termites, it is important to prevent the migration termites. Termite bait system were established by burying the attractive station underground with the distance between two stations is 2 m, next to the wall. The stations were regularly checked every two months in order to detect termite entering stations and treating with BDM10 bait before entering the building

#### **Eliminating Coptotermes nest in surrounding environments**

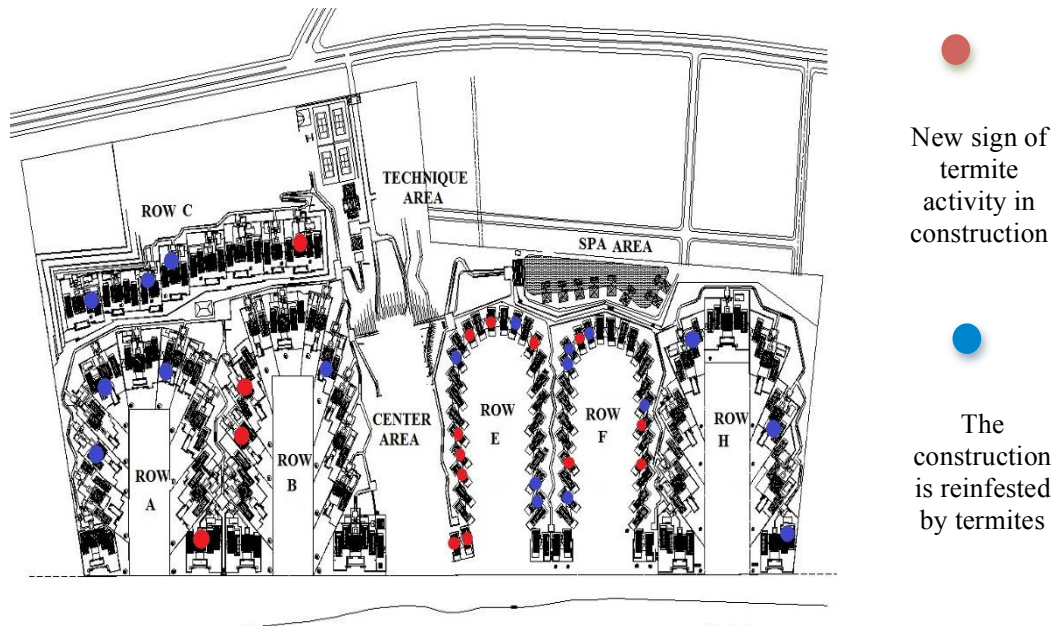
Termites enter the construction of the The Nam Hai resort by 2 ways such as foraging and swarming. The infection source was not only from the termite nest inside the resort, but also from the nests in external environments. In fact, The Nam Hai resort located next to the beach with frequent strong winds, so the range of alate dispersal from the surrounding environment to the resort is very high. Therefore, we eliminated both the Coptotermes nest in the resort and the surrounding area (local houses to prevent termites from entering the resort).

### **Results and Discussion**

We applied the integrated method for controlling Coptotermes at The Nam Hai resort from 2010 to now. The result was to reduce the harmful termites Coptotermes year by year. Specifically:

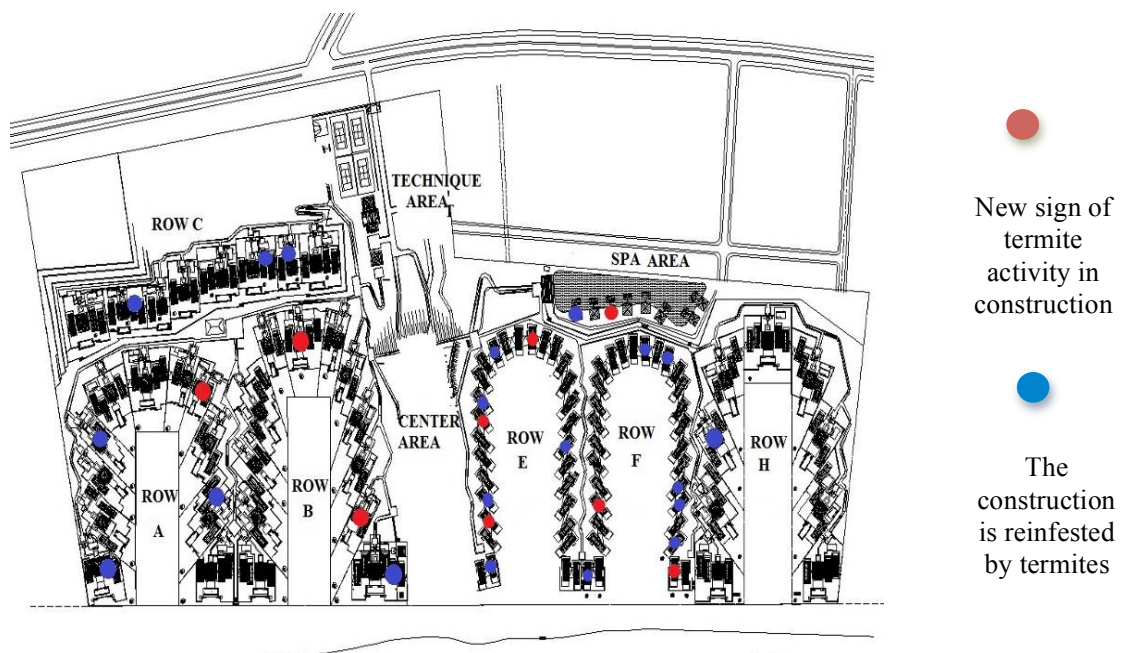
- In 2011, we reduced the amount of termite damage works from 57 to 37 in total of 109. Among the 37 works, 21 were handled in 2010 and 16 were new found.

Figure 5. Damage levels of *Coptotermes* in The Nam Hai resort in 2011



- In 2012, the number of termite damaging works was continuously decline to 17. The number of new invasive and treated structures which termites reinfested decreased to 11 and 6 works respectively, in compare to 2011. For the termite harmful structure works, the newly discovered termite nests are located distance away from the previous treated ones. Thus, according to our assessment, these new termite nests may be the youth ones which had not been detected in the previous year. The details of the position of works damaged by *Coptotermes* are shown in Figure 6.

Figure 6. Damage levels of *Coptotermes* in The Nam Hai resort in 2012



- In 2013: As noted in November 2013 the number of works being infested in The Nam Hai resort was only nine ones. Position of works being damaged by *Coptotermes* was shown in Figure 7.

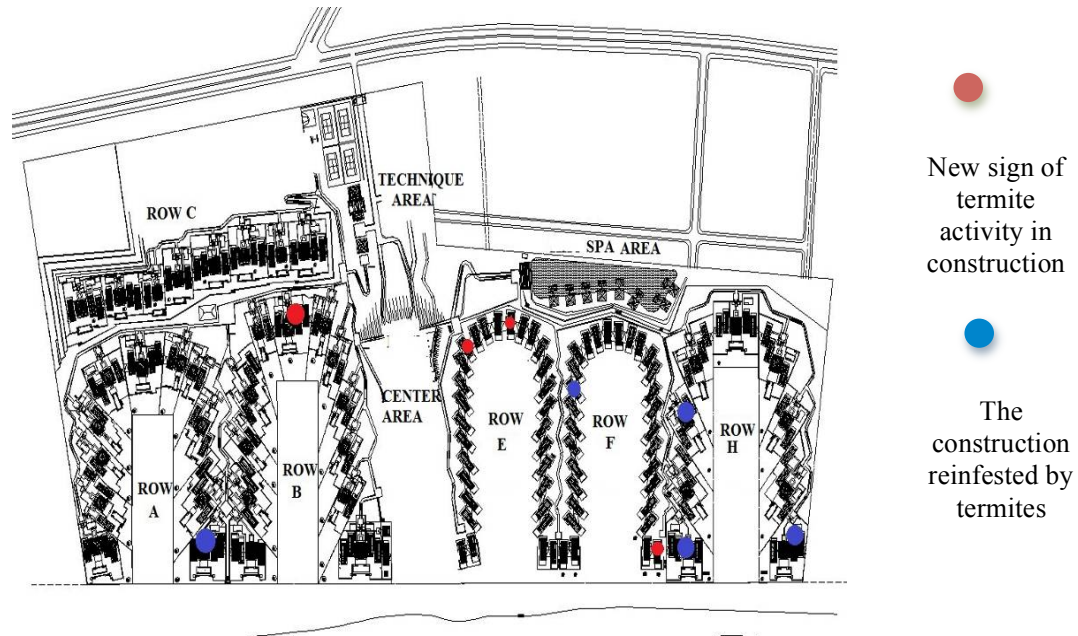


Figure 7. Situation of *Coptotermes* termites harm resort The Nam Hai in 2013

The results showed that, after 4 years of applying integrated method for termite controlling in The Nam Hai resort, the number of termite damaged structure works reduced from 57 to 9 ones, equivalent to 75% of reduction. In addition to completely eliminate termite nest in construction, the method of establishing termite barrier system and eliminating the surrounding nests were effective method to reduce the number of newly nest formation in the treated and untreated construction yearly.

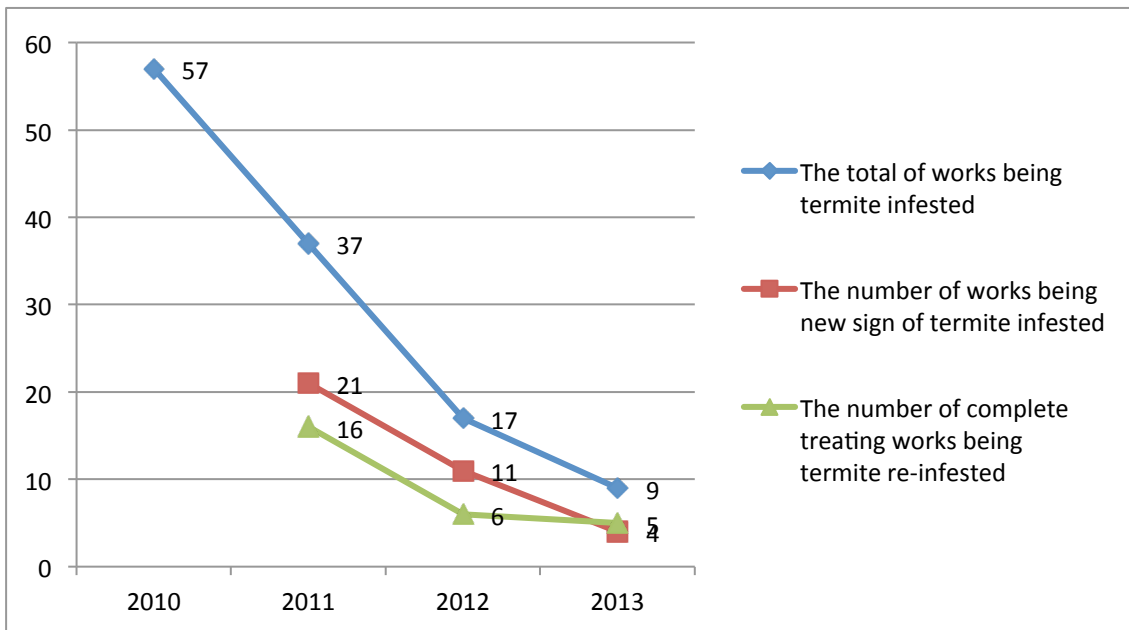


Figure 8. The number of termite damaging works in The Nam Hai resort form 2010 to 12/2013

A number of treated structures have been re-infested due to the difficulty in preventing new sources which arised from the environment around construction, especially in an open-environment and operation resort as The Nam Hai. By dint of this, the process of controlling termites in The Nam Hai resort must be conducted periodically, frequently, and continuously in order to control and minimize the harmful termites in the resort.

### Conclusion

The composition of harmful species of The Nam Hai resort contained 6 species belonging to 3 families Kalotermitidae, Rhinotermitidae and Termitidae. Among these, *Coptotermes formosanus* belonging to family Rhinotermitidae was the main harmful species. The building materials and furniture of The Nam Hai resort used many wood materials. However, the method of controlling temrites was not applied and led to a result heavy damage. There were 57 of the 109 works which were damaged by termites (account for 52%). After 4 years (2010-2013) of applying the integrated method of using BDM10 bait to treat termites in The Nam Hai resort, the number of works infesting by termites decreased by 85% in which decreasing from 52% (57 works in 2010) to 8% (9 works in 2013).

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