

COCKROACH SURVEYS IN THE NORTHERN REGION OF THAILAND AND GUANGXI PROVINCE OF CHINA

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Abstract. Cockroach surveys were carried out in three provinces of the Northern region of Thailand: Chiang Mai, Chiang Rai, and Mae Hong Son, and three cities of Guangxi Province of the People's Republic of China: Nanning, Huangjiang, and Hechi. Sticky traps were used for cockroach sampling in these surveys. At least 30 houses in each province or city were randomly sampled. Traps were placed in kitchen areas for 2 nights. In Thailand, a total of 214 cockroaches was caught in 65 of 112 houses (59.4%) with an average of 1.9 cockroaches/house. There were 5 species of cockroach caught: *Periplaneta americana* (32.7%), *Pycnoscelus surinamensis* (29%), *Periplaneta australasiae* (18.2%), *Periplaneta brunnea* (17.3%), and *Periplaneta fuliginosa* (2.8%). In China, a total of 198 cockroaches was caught in 67 of 99 houses (67.5%) with an average of 2 cockroaches/house. There were 6 species of cockroaches caught: *P. americana* (53%), *Py. surinamensis* (12.6%), *P. brunnea* (12.1%), *P. australasiae* (12.1%), *P. fuliginosa* (9.6%), and *Neostylopyga rhombifolia* (0.6%). According to the surveys in this study, there were no significant differences among the number of cockroaches caught in the six locations of the two countries ($p > 0.05$). *P. americana* was the most abundant cockroach species in both countries.

INTRODUCTION

Cockroaches are tropical in origin and live in parts of houses and other buildings where warmth, moisture, and food are adequate. They are mostly active at night; in the daytime, they hide in cracks and crevices in walls and other hiding places. Their behavior, to disgorge a portion of their partially digested food at intervals and drop feces (WHO, 1997), spreads infectious agents. Many pathogens, including bacteria, viruses, fungi, protozoa and helminths are transmitted by cockroaches. These can cause diarrhea, dysentery, cholera, leprosy and typhoid fever. Cockroach infestations are also a major contributor to asthma throughout the world. Several studies have shown that large numbers of asthmatic patients were sensitive to cockroach allergens (Tuchinda *et al.*, 1987; Kongpanichkul *et al.*, 1997; Pumhirun *et al.*, 1997), in many parts of Asia. It was found that asthmatic patients were sensitized to cockroach allergens in China (Leung *et al.*, 1997), Malaysia (Leung *et al.*, 1997), and Thailand (Kongpanichkul *et al.*, 1997). These countries have tropical and sub-tropical climates suitable for the propagation of cockroaches. Control strategies, therefore, involve a long-term commitment to a rational extermination process.

This study reports surveys of cockroach species found in three provinces of the northern region of Thailand and three cities in Guangxi Province, China. The surveys provided baseline information on the major cockroach species and their prevalence. This information will be used in developing control measures and managing allergic conditions.

MATERIALS AND METHODS

Cockroach surveys

A sticky trap known as that HOY HOY caught more cockroaches than the octagonal plastic box trap (Tawatsin *et al.*, 2001), and was used in the cockroach surveys. The surveys were carried out in three provinces of northern Thailand: Chiang Mai, Chiang Rai, and Mae Hong Son, and three cities in Guangxi Province, China: Nanning, Huangjiang, and Hechi. At least 30 houses in each province or city were randomly sampled for cockroaches; traps were laid in kitchens, the preferred habitat (Tawatsin *et al.*, 2001). The traps were left for 2 nights. The cockroaches caught in each house were identified to species following the handbook of domiciliary cockroach species in Thailand (Asahina, 1983), and other relevant references (Cornwell, 1968; Bell, 1981; Cochran, 1982) and then counted.

Data analysis

The numbers of cockroaches caught in each location were compared by one-way ANOVA; if

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statistical significance was observed, the mean number of cockroaches was then compared by Duncan's test. The number of cockroaches caught in each house was transformed to $\sqrt{x + 0.5}$ data prior to statistical comparison. The accepted level of significance for comparison was $p \leq 0.05$. Analysis was carried out using the SPSS Program for Windows, version 9.0.

RESULTS

The cockroach surveys were carried out in two countries. In the three provinces of northern Thailand, a total of 214 cockroaches was caught in 65 of 112 houses (59.4%), with an average of 1.9 cockroaches/house (Table 1). In the three cities of Guangxi Province, a total of 198 cockroaches was caught in 67 of 99 houses (67.5%), with an average of 2.0 cockroaches/house (Table 2). There were no significant differences among the numbers of cockroaches caught in the six locations of the two countries ($p > 0.05$).

The 5 species of cockroaches caught from the three provinces of northern Thailand were: *Periplaneta americana* (32.7%), *Py. surinamensis* (29.0%), *P. australasiae* (18.2%), *P. brunnea* (17.3%), and *P. fuliginosa* (2.8%) (Table 3). Five species were found in Chiang Mai, whereas only three species were obtained in Mae Hong Son. According to the species composition in each province, *P. americana*, *P.*

brunnea, and *Py. surinamensis* were captured in all three provinces, *P. americana*, *P. australasiae*, and *Py. surinamensis* were the most abundant species in Chiang Mai (73.3%), Chiang Rai (57.6%), and Mae Hong Son (50.8%), respectively. However, the 6 species of cockroaches caught in the three cities of Guangxi Province were: *P. americana* (53.0%), *Pycnoscelus surinamensis* (12.6%), *P. brunnea* (12.1%), *P. australasiae* (12.1%), *P. fuliginosa* (9.6%), and *N. rhombifolia* (0.6%) (Table 4). Five species were found in Huangjiang and Hechi, whereas four species were obtained in Nanning. For the species composition in each city, *P. americana*, *P. brunnea*, and *Py. surinamensis* were captured in all three cities, and *P. americana* was the most abundant species in Nanning (55.7%), Hechi (53.4%), and Huangjiang (49.0%).

DISCUSSION

Cockroach surveys were conducted in urban areas of Thailand and China. The data in Tables 1 and 2 showed that cockroaches were a common pest infesting homes throughout urban areas in the two countries. In Thailand, the average was 59.4% infested houses with 1.9 cockroaches/house, and 67.5% infested houses with 2.0 cockroaches/house in China. The cockroach density in the two countries was low. This was due to several reasons: in Thailand, the people practiced good

Table 1
Cockroach surveys carried out in houses in three provinces of northern Thailand.

Provinces	Total	Positive (%)	Total cockroaches caught	Density (No./house)
Chiang Mai	42	54.8	90	2.1
Chiang Rai	40	50.0	59	1.5
Mae Hong Son	30	73.3	65	2.2
Overall	112	59.4	214	1.9

Table 2
Cockroach surveys carried out in houses in three cities of Guangxi Province, China.

Cities	Total	Positive (%)	Total cockroaches caught	Density (No./house)
Nanning	34	73.5	70	2.1
Huangjiang	33	69.7	53	1.6
Hechi	32	59.4	75	2.3
Overall	99	67.5	198	2.0

Table 3
Species composition of cockroaches found in three provinces of the northern region of Thailand.

Provinces	No. of cockroaches by species (%)				
	<i>P. americana</i>	<i>P. brunnea</i>	<i>P. australasiae</i>	<i>P. fuliginosa</i>	<i>Py. surinamensis</i>
Chiang Mai	66 (73.3)	2 (2.2)	5 (5.6)	6 (6.7)	11 (12.2)
Chiang Rai	3 (5.1)	4 (6.8)	34 (57.6)	0	18 (30.5)
Mae Hong Son	1 (1.5)	31 (47.7)	0	0	33 (50.8)
Overall	70 (32.7)	37 (17.3)	39 (18.2)	6 (2.8)	62 (29.0)

P = *Periplaneta*; *Py* = *Pycnoscelis*.

Percentage in each bracket based on total number of cockroaches caught in each province.

Table 4
Species composition of cockroaches found in three cities of Guangxi Province, China.

Cities	No. of cockroaches by species (%)					
	<i>P. americana</i>	<i>P. brunnea</i>	<i>P. australasiae</i>	<i>P. fuliginosa</i>	<i>N. rhombifolia</i>	<i>Py. surinamensis</i>
Nanning	39 (55.7)	7 (10)	11 (15.7)	0	0	13 (18.6)
Huangjiang	26 (49.0)	3 (5.7)	0	18 (34.0)	1 (1.9)	5 (9.4)
Hechi	40 (53.4)	14 (18.7)	13 (17.3)	1 (1.3)	0	7 (9.3)
Overall	105 (53.0)	24 (12.1)	24 (12.1)	19 (9.6)	1 (0.6)	25 (12.6)

P = *Periplaneta*; *N* = *Neostylopyga*; *Py* = *Pycnoscelis*.

Percentage in each bracket based on total number of cockroaches caught in each city.

sanitation and often applied insecticidal sprays. However, in China, the human dwellings were different from the Thai dwellings. Some of the human habitations were single rooms with poor sanitation. The foodstuffs were not properly maintained and fragments of food and organic matter were present. These factors caused fewer cockroaches to be captured in traps. In Thailand, five species of cockroaches belonging to two genera were present in three provinces; Chiang Mai, Chiang Rai, and Mae Hong Son. The most common cockroaches were *P. americana*, *P. australasiae* and *Py. surinamensis*, respectively. In the People's Republic of China, six species belonging to three genera were present in three cities; Nanning, Huangjiang, and Hechi. *P. americana* was the most common cockroach in all three cities.

At present, it is well known that cockroaches heavily infest urban dwellings, especially in lower socioeconomic communities (Roth and Willis, 1951; Green, 1962). Cockroaches as pests become more important when in close association with humans. Several research studies have discussed the effects of cockroaches on humans. They are capable of transmitting bacteria, viruses, protozoa and helminths

mechanically and biologically. A qualitative study of *P. americana* revealed the presence of 31 species of bacteria belonging to 16 genera. Most of these bacteria were pathogenic to humans and domestic animals (Paul *et al*, 1992). In addition, some studies have considered cockroach antigen as a probable causative agent of bronchial asthma (Kang, 1976). In Taiwan, the cockroach induced antigen-specific IgE-mediated bronchial asthma (Lan *et al*, 1988). In a study on allergen patterns of three common cockroach species; *Periplaneta americana*, *Blattella germanica* and *Blatta orientalis* were probed by allergic sera. These allergen patterns reacted to most sera from cockroach-allergen patients with asthma (Kang *et al*, 1991). In Japan, cockroaches may constitute one of the important inhaled allergens (Tomita *et al*, 2002). In Thailand, the study of aeroallergen sensitivity in allergic rhinitis patients showed that cockroaches were important aeroallergen sensitizers among the Thai population (Pumhiran *et al*, 1997). These studies have indicated that cockroaches are major contributors to disease in many countries.

This study provided baseline information on the major cockroach species and their prevalence in the

two countries. It is valuable information for developing control measures and managing allergy conditions.

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