

# Bionomics of the Casemaking Clothes Moth, *Tinea pellionella*(L.)(Lepidoptera:Tineidae)

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**Abstract**— The casemaking clothes moth (CCM), *Tinea pellionella*(L.)(Lepidoptera) belongs to the family Tineidae in the superfamily Tineoidea. Larval and pupal case of CCM are found on the walls both outside and inside buildings. The case is flat spindle-shaped, covered with sand, soil or other small particles outside. It is constructed by the first insect larva and enlarged by each successive instar. It has a cosmopolitan distribution and found associated with human.

A detailed account of morphological characters of four stages in the life cycle of CCM (egg, larva, pupa and adult) is described and illustrated in this paper.

The biological characteristics of each life stage are as follows. The mean for mating period was  $5.72 \pm 1.76$  hours. Eggs were laid in a clusters. The number of eggs laid by each female was  $102.50 \pm 7.07$  eggs (range between 95 and 120 eggs). The mean for incubation period was  $9.18 \pm 0.48$  days. The average larval developmental period was  $77.99 \pm 9.09$  days. Larval molting and pupation of this insect species took place within the same case. The pupal stage lasted from 13.41 to 14.41 days with an average of  $13.95 \pm 0.30$  days. The mean for the longevity of males and females was  $9.41 \pm 0.12$  and  $7.29 \pm 0.18$  days, respectively. The head capsule width varied from 0.08 to 0.11 mm with a mean of  $0.09 \pm 0.01$  mm for the first larval instar, and 0.60-0.88 mm for the last larval instar. The larva of this species were parasitized by *Apanteles* sp. (Hymenoptera : Braconidae)

**Keywords**—Case-making clothes moth, *Tinea pellionella*(L.), Morphological characters, Cosmopolitan distribution, *Apanteles* sp.

## I. INTRODUCTION

THE casemaking clothes moth (CCM), *Tinea pellionella*(L.)(Lepidoptera) belongs to the family Tineidae, the superfamily Tineoidea. Larvae are found inside building cases or bags. When feeding, it will thrust out its head and the first segment. Molting and pupation are in casing. This insect has a similar name and appearance with the casemaking clothes moth(bagworm) in family Psychidae. The males have wings and females are wingless. There are 2 types of casemaking clothes moths. They have different mating behavior.

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The casemaking clothes moth (CCM), *Tinea pellionella*(L.) are considered an insect of stored products [1]. The food sources for this larval are wide varieties for examples the fur, hair, feather, wool and small food particles including materials made from animal skins in the house. A larva attaches to ceiling and walls of the buildings. Thus, it causes a nuisance to dwellers. Excretion is very small and not being seen with the naked eyes. These insects are found both inside and outside walls of the house. It is noted that any home having this insect, showed a cylindrical case on walls, house ceiling, kitchen floors, living room and bedroom walls.

## II. MATERIAL AND METHODS

### A. Sample collection

The CCM larva were collected from the walls around the buildings in Bangkok metropolitan areas and placed into a plastic box sized  $13.5 \times 17.5 \times 6.5$  cm containing a rag or dust. The collected casemaking clothes adults were put onto a piece of clothes in a plastic box. The date and places of collection was recorded.

### B. Insect rearing in the laboratory

Both adults and larvae were cultured at room temperature( $27-35^\circ\text{C}$ ) in the entomological laboratory at King Mongkut's Institute of Technology. The larval food was fish feed(Sakura). The adult did not eat and was observed on mating behavior.

### C. Morphological Characterization

Developmental characteristics of eggs, larvae, pupa and adults of the CCM were recorded, measured and photographed.

## III. RESULTS AND DISCUSSION

### A. Morphology of the casemaking clothes moth, *T. pellionella*(L.)

Egg(Fig.1) : Eggs are cylindrical in shapes and yellowish color with measurement of 0.37-0.52 mm long and 0.25-0.36 mm wide.

Larva(Fig.2): The first instar was 0.57-0.59 mm long, having a brownish headcapsule. The dorsal parts of the pronotum, mesonotum and metanotum were sclerotized. Below the shield, there are 3 pairs of leg appendages. Number of larval moulting was unable to investigated. The last larval instar is 6.05-9.70 mm long.

Pupa(Fig.3):It is a small and elongate pupa (6.53-8.92 mm long). The body is brownish and the eyes are black.

TABLE I  
THE GROWTH AND DEVELOPMENT OF THE EGGS, LARVA, PUPA AND ADULTS OF CCM

Growth stage	Range(mm)		Average±sd(mm)		Duration time (days)
	width	length	width	length	
Egg	0.25-0.36	0.37-0.52	0.30±0.02	0.46±0.03	9.18±0.48
First larva	0.19-0.23	0.57-0.59	0.31±0.02	0.58±0.01	12.74±2.41
Last larva	0.31-0.35	6.05-9.70	0.33±0.10	7.93±1.06	45.61±1.68
Pupa	1.03-2.00	6.53-8.92	1.39±0.29	7.45±0.57	13.95±0.30
Male adult	0.33-0.42	2.36-4.05	0.38±0.36	3.00±0.52	9.41±0.12
Female adult	0.52-0.57	3.35-5.41	0.55±0.15	4.02±0.50	7.29±0.18

Adult(Fig.4 and 5):The adults are small moths and are shaded of light brown to tan with black eyes. The head is covered with brown fringe. The filiform antenna of males is longer than females: 6.05-6.20 mm for males and 4.56 - 4.78 mm for females. Tibial spur formula was 0-2-4 and tarsal formula was 5-5-5 with 3 pairs of relatively long legs. The brown front wings of male was 3.25-4.13 mm long and 0.70-0.83 mm wide and a hindwing of 2.38-3.31 mm long and 0.53-0.66 mm wide. The body length of a male was 2.36-4.05 mm and it had 1 frenulum. The front wing of female was 3.70-4.87 mm long and 0.78-1.13 mm wide and a hind wing was 2.97-4.02 mm long and 0.59-0.86 mm wide. The body length of a female was 3.35-5.41 mm and it had 2 frenulums.

#### B. Biology the casemaking clothes moth, *Tinea pellionella*(L.)

Both adults and larvae of the casemaking or case-bearing moth lives in the human dwellings. Larvae lived in silky cases and ate the crumbs or small materials as food. It brings material or sand to create a casing. Larvae live in the case all the time until they pupate in the same case. In constructing the case, the larva to build very small particles of sand, soil, iron rust, insect droppings, arthropod remains, hairs and other fibers are added on the outside. They are not bagworm in the family Psychidae. When the larva feeding, only its head and a pronotum was out of the case. The larvae of casemaking feed on animal hair, dust, made of wool and dead insects. Larvae were found by case sticking or hanging on the walls and caused blemish spots. They are considered as a nuisance insect. The male has wings but females are wingless. Mating was observed at daytime in end to end position took a long time for 3.66-9.66 h(Fig.6). One female may produce as many as 95-120 eggs. The pupal stage lasted for 13.41-14.41 days. The adult male and female developmental time were 9.20-9.62 and 7.08-7.62 days, respectively(Table 1).

There are 2 orders(Lepidoptera. and Trichoptera) of insect making cases during larval life. The cases can be varied among taxa, as to size, shape, and materials. They may be conical, oval, circular or spindle-shaped [2]. Construction materials may include soil, frass, twigs, food particles, leaves, or organic debris, and always including silk. In Tineidae family, *Phereoecaallutella* called a household case bearing moth, feeds within the case found living in the same habitat as *T.pellionella*, outside walls and inside the building. Of these two, only *T. pellionella*, a newly hatched larva out of an egg,

its head is dark and the rest of the larval body is white[3][4]. Of the two species, *Phereoeca allutella* is affiliated with mammals than man[4]. The case of *T. pellionella* is similar to that of *P. allutella* but the difference in case making material [5]

The casemaking clothes moths (*T. pellionella* and *P. allutella*) have 6-7 larval instars. Male has 6 larval instars and female has 7 larval instars[6]. The last instar larvae of this species were parasitized by *Apanteles* sp. (Hymenoptera: Braconidae)(Fig.7). The larva was killed just before pupation. The larval remains could be found inside the white silk cocoon of the wasp(Fig.8)[7].



Fig. 1 An egg cluster of *Tinea pellionella*(L.)



Fig. 2 Larva of *Tinea pellionella*(L.)



Fig. 3 Pupa of *Tinea pellionella*(L.)



Fig. 6 Mating was observed at daytime in end to end position



Fig. 4 An adult of *Tinea pellionella*(L.)(dorsal view)



Fig. 7 An Adult of *Apanteles* sp.



Fig. 5 An Adult of *Tinea pellionella*(L.)(ventral view)



Fig. 8 The larval remains found inside the white silk cocoon of the wasp

#### IV. CONCLUSION

The CCM is a nuisance insect, found world wide. Eggs are yellowish and cylindrical shape. The first instar is very small

larva. The larva lived and grew in the same case until pupation. The adult has filiform antenna. A male has 1 frenulum where as a female has 2 frenulums. They are small moths and mating during the daytime and females lay eggs in a cluster. Mating time took from 3.66 to 9.66 hours. The average of larval development was  $77.99 \pm 9.09$  days and pupal duration was 13.41-14.41 days. The lifespan of male and female adults were 9.41 and 7.28 days, respectively.

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