

RESEARCH PAPER

First Record of the Bagworm Moth, *Mahasena corbetti* Tams (Lepidoptera: Psychidae) in Bangladesh

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ABSTRACT

Bagworm, *Mahasena corbetti* Tams (Lepidoptera: Psychidae) is a serious polyphagous pest in Southeast Asia and some island of the Pacific. In Malaysia, it was included in the list of dangerous pest in Plant Quarantine Act (PQA) due to their destructive feeding habit and rapid expansion of distributional range. On 12 May 2018, severe infestation of this exotic species, *M. corbetti* was known for the first time on Areca nut (*Areca catechu* L.) in Patuakhali, Bangladesh. Later, hitherto unknown, three new host plants, Hena, *Lawsonia inermis* (Myrtales: Lythraceae); Coconut, *Cocos nucifera* (Arecaceae); and Dracaena plant, *Dracaena fragrans* (Asparagales: Asparagaceae) were also reported for the first time in Bangladesh. Adult male moth and caterpillar were redescribed and illustrated with male genitalia for easy identification, and also to create the awareness among the areca nut and coconut growers about this destructive pest.

Key words: Bagworm, coconut case caterpillar, *Mahasena corbetti*, Quarantine pest

Introduction

Among 241 genera of bagworm moth and approximately 1350 species under family Psychidae, the genus *Mahasena* Moore was represented by 12 species within the Oriental region, with two occurring in Southeast Asia, namely, *Mahasena corbetti* Tams and *Mahasena andamana* Moore (Sobczyk, 2011; Robinson et al., 1994). The species *Mahasena corbetti* is one of the serious polyphagous pests of many plants in Southeast Asia and some islands of the Pacific, which complete larval development within a self-enclosing bag in which females are apterous. It was regarded as destructive agricultural pest, as their larvae voraciously feed on the leaves of many economically important plants (Firake et al., 2018). About 37 genera in 21 families of plants were known to attack by the larvae of *M. corbetti* and their most preferred families were 'Fabaceae' and 'Arecaceae' (Robinson et al. 2011; Leong and Lim 2012).

In Malaysia and Indonesia, Bagworm, *M. corbetti* was reported as leaf-eating pest of oil palm that resulted in crop losses more than 40%-50% in two subsequent years (Liau, 1987).

The very recently Firake et al. (2018) reported from India that the larvae of bagworm, *M. Corbetti* were found feeding on few arecanut plants and subsequently 1/3rd leaves of those plants were found to be defoliated within next 2–3 months. The affected plants had very few number and poor quality fruits compared to unaffected plants. Besides severe defoliation, necrotic patches were also formed on infested leaves which gave them 'burnt appearance' to the plants. Thus, it is essential to prevent the bagworm infestation reaching a moderate level as it can result in serious economic losses (Darus and Wahid 2000).

Bagworm, *M. corbetti* was more widely distributed (Fig. 1) and had been recorded from India, Thailand, Malaysia, Singapore, Sumatra, Java, Brunei, Solomon Islands, and Samoa (Firake et al., 2018; Leong and Lim 2012). In 2015–2016, severe incidence of *M. corbetti* was observed on arecanut (*Areca catechu* L.) plants in Sohbar and adjoining villages of East Khasi Hills district of Meghalaya State (India) that is bordering India and Bangladesh (Firake et al., 2018).



Fig. 1. Distribution map of *M. corbetti*. Red color shows its distribution in Southeast Asian and pacific region and single red dot (in Bangladesh map) shows the recent detection of *M. corbetti* in Southern part of Bangladesh (Source of blank map template: https://commons.wikimedia.org/wiki/File:Blank_map_political_world_territories.png)

On 12 May 2018, caterpillars of bagworm moth, *M. corbetti* were firstly observed to be feeding voraciously on the leaves of areca nut (*Areca catechu* L.) plant in PSTU Farm (Fig. 2), and then it was reared in the Entomology Lab, PSTU, Patuakhali, Bangladesh till date. The incidence of this pest was also observed in Hena, *Lawsonia inermis* (Myrtales: Lythraceae); Coconut, *Cocos nucifera* (Arecales: Areaceae); and Dracaena plant, *Dracaena fragrans* (Asparagales: Asparagaceae) for the first time in Bangladesh (Fig. 3). Maximum abundance was observed from June to October. Larvae construct cases made of silk and the materials from the habitat i.e. large pieces of leaflet that give them their

characteristics ‘shaggy appearance’. Serious attack can kill the tree because of severe defoliation (Hisham2012). Bagworm, *M. corbetti* is considered as a pest of quarantine importance in several countries (Batugal et al. 2005; Anonymous 2016, Firake et al., 2018).



Fig. 2. Damage of Bagworm, *Mahasena corbetti* Tams to Areca nut plant (1); Infested leaves of areca nut caused by caterpillar (2); Infested areca nut fruit caused by bagworm (3); Defoliated leaves by a number of bagworm caterpillars (4).



Fig. 3. Larval case of *Mahasena corbetti* on coconut (1- red circled); on Hena (2); on dracaena leaf (4); larval case of areca nut (3).

This investigation aims to report the infestation of *M. corbetti* for the first time on the areca nut plants, coconut plants, Dracaena and Hena in Bangladesh and to provide details on the diagnosis and preparedness for its effective management and to create the awareness among the areca nut and coconut growers in Bangladesh.

Materials and Methods

Study location

The infestation of *M. corbetti* was firstly observed on May, 2018 in the PSTU Farm, Patuakhali, Bangladesh on Areca nut plants. Later, other two host plants of this bagworm, coconut and hena, were noticed. To study the

biology and find the adult, it was reared intensively on areca nut plant in the Lab of Pest Management, Department of Entomology, PSTU, Patuakhali, Bangladesh during the period from 12 May, 2018 to till date.

Sample collection

The affected area was surveyed and more than 150 larval cases of bagworm samples were collected from the infested areca nut, coconut and hena plants (Table 1).

Table 1. Number of samples collected from the host plants with place of collection

Infested plant	No. of larval cases collected	Place of collection
Areca nut	105	PSTU farm, Patuakhali
Hena	33	PSTU campus, Patuakhali
Coconut	21	PSTU campus, Patuakhali
Dracaena	06	PSTU campus, Patuakhali

Rearing of bagworm caterpillar in the Lab

Seedlings of areca nut were collected from the nursery and placed under net case in laboratory. Collected cases of bagworm caterpillars were released on the plants. Seedlings were provided for their feeding whenever necessary. Feeding, pupal and adult period were recorded. Male adult was collected from the net case for further study.

Taxonomic identification

Identification at species level in this group had to be determined based on male genitalia as females pass their whole life inside the pupa. Genital segment was separated by inserting a minute pin and kept in a test tube filled with 5-6 ml water, 1-2 pellets of 10% KOH, and 1-2 drops of filtered, saturated solution of Chlorazol black E powder in a hot water (80-90°C) bath for 3-5 minutes for clear observation. Then the segments were observed in glycerine jelly using a stereoscopic microscope (Zoom Stereo Microscope, BTB-3A).

Image processing

Photographs of the specimen were made by using digital camera, and multi-focusing system using software (Helicon Focus 5.1). Images were imported into Adobe Photoshop CS3 for labeling and plate composition.

Specimens examined in the present study were deposited in the collection of the Department of Entomology, Patuakhali Science and Technology University, Dumki, Patuakhali-8602, Bangladesh.

Results and discussion

Observation of bagworm, *M. corbetti* infestation with its biology

On 12 May 2018, the larvae of bagworm, *M. Corbetti* were found feeding on few areca nut plants and subsequently one third leaves of those plants were found

to be defoliated within next two to three months (Fig. 2). The caterpillar had concealed themselves within larval case that consisted of overlapping thin strips of leaves excised from their host plant. They feed the leaves during day and night time but preferred to feed at night instead. In severe infestation, almost whole plant became defoliated and ultimately the plant died. Usually the caterpillar passed almost three month (90±5D) with feeding then they stopped feeding and sealed the entrances to their larval cases. Full grown larva (without case) of *M. corbetti* (Fig. 4:H,I) was about 15–20 mm long, head and thorax were brown in colour, while the abdomen was light yellowish brown in colour. Apical margin of prothorax creamy white; a white lining runs through dorsally on pro and mesothorax; a dorsal dark strip observed on the abdomen. In early stage, head and thorax of the larva (Fig. 4: G) brown but abdomen cream colour. Three pairs of true legs present on thoracic region, and five pairs of abdominal prolegs present on 3rd, 4th, 5th, 6th and 10th abdominal segments.

The male pupae of *M. corbetti* (Fig. 4: J) were 13–15 mm length, and usually found attached to the bottom of the case. The female pupae (Fig. 4: F) were larger than male in size (20–23 mm length) and dark brown in colour and found inside the cases. The adult female remains inside the pupa throughout the life. Adult females (Fig. 4: F) were wingless, cylindrical and creamy-white in colour. All the body appendages were highly reduced. On 27 August 2018 (15±5D), the first male moth had been released from its pupa.

The adult male moth (Fig. 4: A,B) survived 1-3 days (2±1). It was dark brown moth at a glance, body length with wing 12-13 mm; length of forewing 9-11 mm; hind wing 5-6.5 mm. Head with distinctly bipectinate antenna having 21 ciliated pectin. Their wings were a dark chocolate brown, costal margin almost straight, apex roundish, densely covered with medium broad scales; hind wing smaller than forewing (1:2); while the thorax was a lighter chestnut brown. Along the posterior segments of its abdomen, the flanks were adorned with prominent and symmetrical tufts of hair pointing outwards and backwards.

The adult male climbed onto the female's bag, hung upside down, and extended and inserted its abdomen into the bag, and then mated with the female. After oviposition, the female might die inside the bag or mummified.

Male genitalia

Male genitalia (Fig. 4: K, L) were long. The terminology of genitalia followed Firake et al. (2018). A hemispherical tegumen carried out a pair of clasper that was sclerotized with 2-3 hook shaped extension; valvae long, extending the distal end of tegumen; vinculum trapezoidal and saccus very long in shape. The aedeagus (phallus) (Fig. 4: M,N) very long, longer than entire genitalia, curved, distinctly thinner towards distal end, dark brown in colour.

Based on the external morphology and structure of male genitalia of bagworm moth, the identity of the bagworm species infesting areca nut plants in Patuakhali, BD

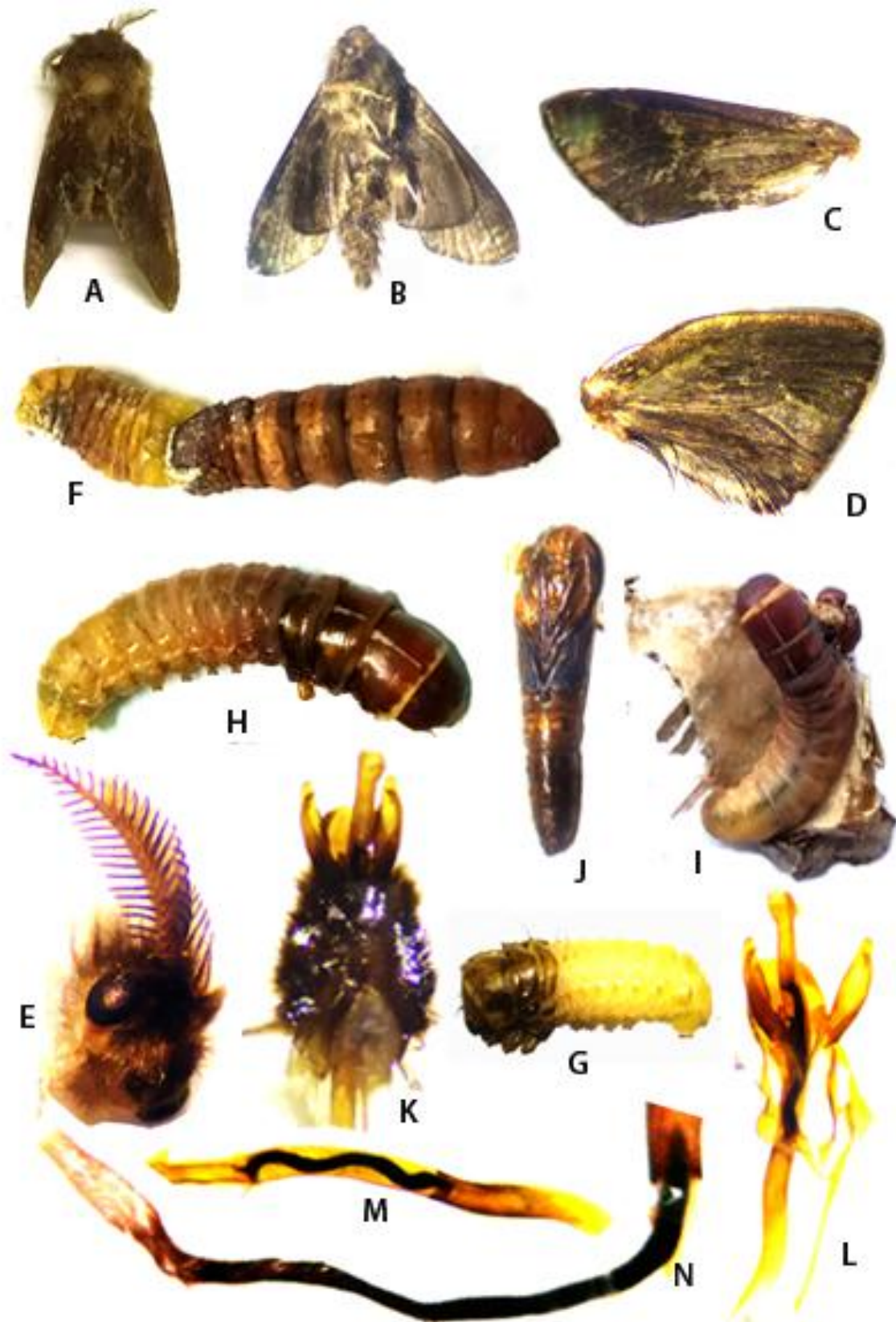


Fig. 4.A. Male of Bagworm, *Mahasena corbetti* Tams (Adult, dorsal view); B. Adult male (ventral); C. Forewing; D. Hind wing; E. Bipectinate antenna of male; F. Apterous female; G. Caterpillar (early instar); H. Caterpillar (late stage); I. Caterpillar with open case; J. Pupa (male); K. Male genital block; L. Male genitalia with tegumen, vinculum, valve and saccus; M-N. Aedeagus (Phallus) of *Mahasena corbetti*.

was confirmed to be *M. corbetti*. The morphology of adult male moth specimens and other stages of *M. corbetti* from our study were found matching with those previously illustrated (Firake et al. 2018; Leong and Lim, 2012; Kamarudin et al. 1994).

Conclusion

It is not clear if this species had invaded from neighboring countries to our country recently or it existed here without notice. However, this bagworm, *M. corbetti* is not only polyphagous but also very destructively defoliator to the economically important plants. Still right now, no significant damage reports were recorded from large area of Bangladesh but growers of areca nut and coconut should be more careful about this dangerous pest. This caterpillar feed the leaves remaining them inside the case, so management may be effective while feeding, not at pupal stage. Therefore, further research is needed to find out the appropriate control measures against this pest, and molecular identification of different species of bagworms should be necessary for accurate identification at species level.

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