

RESEARCH PAPER

First Record of the Genus and Species *Bhamoina varipes* (Jacoby, 1884) (Coleoptera: Chrysomelidae) in Bangladesh with Redescription of *Basilepta subcostata* (Jacoby, 1889)

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ABSTRACT

Specimens of Banana Leaf and Fruit Beetle from Southern part of Bangladesh were collected from Banana Orchard using aspirator and sweeping net. Collected specimens were intensively studied in the Systematic Entomology Lab of Patuakhali Science and Technology University during the period from June, 2021 to July, 2022. The genus *Bhamoina* Bechyné, 1958 and its allied species, *Bhamoina varipes* (Jacoby, 1884) **rec. nov.** were recorded for the first time in Bangladesh. Diagnostic characters and geographical distribution of the newly recorded genus and species were briefly described. *Basilepta subcostata* (Jacoby, 1889) was also recognized from that region morphologically. *Basilepta* (*Nodostoma*) *viridipennis* had been erroneously reported instead of *B. subcostata* in the literature as a pest of banana in Bangladesh previously. Key to species of *Basilepta* and *Bhamoina* from Bangladesh was provided for easy identification. Redescriptions of male and female *Basilepta subcostata* were presented with proper illustrations.

Key words: Banana leaf and fruit beetle, Bangladesh, *Basilepta*, *Bhamoina varipes*, new record

Introduction

Banana (Zingiberales: Musaceae) is one of the most popular, remunerative and important year round fruit crops to the growers considering total production of 817908 MT in an area of 121777 acres in Bangladesh (BBS, 2020). In the same year, banana production was 225319 MT in 11340 acres only in the southern part of Bangladesh. Therefore the southern part of Bangladesh contributes a lot in net banana production in a year. Day by day, the production and productivity of banana is being affected by several insect pests. About 19 insect pests have been found associated with banana from planting to harvesting that hampered to the production of banana (Simmonds (1996). Among them, Banana leaf and fruit scarring beetle (Coleoptera: Chrysomelidae) is considered as one of the most economically important pests in Bangladesh (Rahman et al., 2004).

As the beetle population causes serious damage by scars

on leaves and banana peel, has tremendously influenced on both quantity and quality of banana which reduces the market acceptability in the highly competitive export market. The market value may be reduced upto 50% due to attack of this pest (Alam et al. 2000).

Despite the economic importance of this notorious pest in Bangladesh, the nomenclature has not yet been clarified, and incorrect names had been used for this species in literature. At present, there is no systematic study on the species composition of leaf and fruit feeding chrysomelids in Bangladesh. In South and Southeast Asia, the following three of the 24 chrysomelid genera on Musaceae are known to feed on banana (Jolivet and Hawkeswood 1995): *Basilepta*, *Bhamoina*, and *Sphaeroderma*. In the literature, only one species, *Nodostoma viridipennis* Mots., was found in Bangladesh. The names *Nodostoma* spp., *Nodostoma viridipennis* and *Nodostoma viridipenne*

had been used for the common banana leaf and fruit scarring beetle in Bangladesh even though *Nodostoma* is a junior synonym of *Basilepta*. Prathapan *et al.* 2019 claimed that *Basilepta viridipennis* had been erroneously reported instead of *B. subcostata* in the literature as a pest of banana in Bangladesh. In addition, taxonomic redescription of *B. viridipennis* with illustrations of the genitalia is not available in the articles of Bangladesh. Then a big question exists here, either single species or species complex are feeding on leaves and fruits of bananas is not still clear. In this background present investigation is planned to identify the species of banana leaf and fruit beetle found in the southern part of Bangladesh with proper illustrations and description for easy identification.

Materials and Methods

This study was conducted for the taxonomic identification of species *Bhamoina* and *Basilepta* genus from Southern part of Bangladesh in Systematic Entomology Laboratory, Department of Entomology, Patuakhali Science and Technology University, Dumki, Patuakhali, Bangladesh during the period from June 2021 to July 2022.

Taxonomic Identification

Sample collection- Banana leaf and fruit beetles were collected with aspirator and sweeping net and stored in a plastic bag containing cotton balls soaked in ethyl acetate.

Curating and specimen preparation- Collected specimens were killed in various ways by placing them directly into 70% ethyl alcohol or putting them in killing jars containing a cotton ball soaked in ethyl acetate or freezing the specimens. Adult specimens were kept by usual pinning or with glue to a point of triangle paper on the right side of the specimen. Then data was labeled including locality (country, province, nearest town, specific location, latitude etc.), date, collector and host plant (if possible).

Accurate species identification of banana leaf and fruit beetles requires examination of the structure of the male genitalia or in some cases female genitalia. To examine these structure distal abdominal or genital segments was removed with a pair of minute insect pins. After removal of these segments the remainder of the body parts was dipped into 99% ethyl alcohol again for several seconds to hasten dehydration, then carefully laid on filter paper to dry in open air. Once dry it may be remounted onto a card point. Then, the distal abdominal or genital segment was macerated keeping in a test tube filled with 6-7 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 (80-90⁰) bath for 3-5 minutes for good observation. After thorough washing in distilled water the genital segment was transferred into a watch glass filled with a modifier Hood's solution (75% ethyl alcohol 70 parts: glycerin 25 parts: glacial acetic acid 5 parts) for further dissection. Then the segment was observed in glycerine jelly using a stereoscopic microscope (Optic Ivymen System). Photographs of the specimen were made using digital camera (SXY 150). After all examinations the

genital structure was preserved in transparent plastic tubes filled with glycerin and capped the tube well, then the prepared tube was pinned under specimen.

Image and plate composition- Images were produced by multi-focus system using the software Helicon Focus 5.1. Line drawings was scanned with HP Scanjet 4850 and imported into Adobe Photoshop CS3 for labeling, scaling, and plate composition (Rahman, 2012).

Results and Discussion

Taxonomic Identification

In South and Southeast Asia, the following three of the 24 chrysomelid genera on Musaceae are known to feed on banana (Jolivet and Hawkeswood 1995): *Basilepta*, *Bhamoina*, and *Sphaeroderma*. In the review of literature, only one species, *Nodostoma viridipennis* Mots., was found in Bangladesh. The various names *Nodostoma spp.*, *Nodostoma viridipennis* and *Nodostoma viridipenne* have been used for the common banana leaf and fruit scarring beetle in Bangladesh even though *Nodostoma* is a junior synonym of *Basilepta*. Prathapan *et al.* 2019 claimed that *Basilepta (Nodostoma) viridipennis* had been erroneously reported instead of *B. subcostata* in the literature as a pest of banana in Bangladesh. The same result had also been found in this investigation. In our country the most available species is *Besilepta subcostata* known as Banana Leaf and Fruit Beetle.

Species of Banana Leaf and Fruit Beetle from different districts of southern part of Bangladesh had been collected and intensively studied in the field and in the Systematic Entomology Lab of Patuakhali Science and Technology University during the period from June, 2021 to July, 2022. Following two species were recognized taxonomically with one new record from Bangladesh: *Basilepta subcostata* and *Bhamoina varipes* **rec. nov.** In this research, species were identified by observing their body color, male and female genitalia. As it was known that genitalia is a morphological marker for species identification based on biological species concept. However, a taxonomic key was prepared and shown below with description of recognized species from Southern part of Bangladesh.

Key to species of Banana Leaf and Fruit Beetle from Southern part of Bangladesh

1. Body color metallic, red and blue or entirely reddish, dark green or blue (Fig. 1 A-D)(Fig.2 A-C,E); oblong-oval form; aedeagus of male genitalia in lateral view sharply bent almost at right angle near base (Fig.1H-J)(Fig.2 G,H); Spermathecal capsule of female genitalia sickle shaped (Fig.1N) (Fig. 2K).... *Basilepta subcostata*

-Body color non-metallic, entirely reddish to dark reddish brown (Fig.3A) (Fig.4B); elongate-oval form; aedeagus of male genitalia in lateral view almost straight (Fig.3G); spermathecal receptacle oblong, widest in middle, narrow towards both end (Fig.4F)*Bhamoina varipes*

***Basilepta subcostata* (Jacoby, 1889); Figure: 1 (A-N); 2 (A-L)**

Nodostoma subcostatum Jacoby, 1889: Jacoby 1889: 164; Jacoby 1908: 334. *Nodostoma cyanipenne*: Lefèvre 1893: 120; Kimoto and Gressitt 1982: 51 (synonymy).

Basilepta subcostatum: Kimoto 1967: 69; Medvedev 1990: 8–9; Chûjô 1964: 268–269.

Basilepta subcostata: Kimoto and Gressitt 1982: 51; Sprecher-Uebersax 1997: 144; Medvedev and Sprecher-Uebersax 1999: 288; Kimoto 2001: 27; Medvedev 2001: 608; Kimoto 2005: 31–32; Moseyko and Sprecher-Uebersax 2010: 639.

Description: 2.4–3.0 mm in length, 1.4–1.9 mm in breadth, and 1.7 times longer than broad. Oval-shaped, glossy, oblong body (Fig. 1A-D). Coloration is extremely diverse, ranging from red brown to dark blue, dark green, blue black, black, or their combinations without any spots, stripes, or maculations (Fig. 1A-D); the vertex is the only part of the head that is red brown. Pronotum and elytra can be reddish-brown, dark blue, or shiny black in color. General leg color dark brown to reddish brown. Punctures on the vertex and frons of the head are clearly visible and are bolder and slightly smaller than those on the pronotum. Antennae filliform

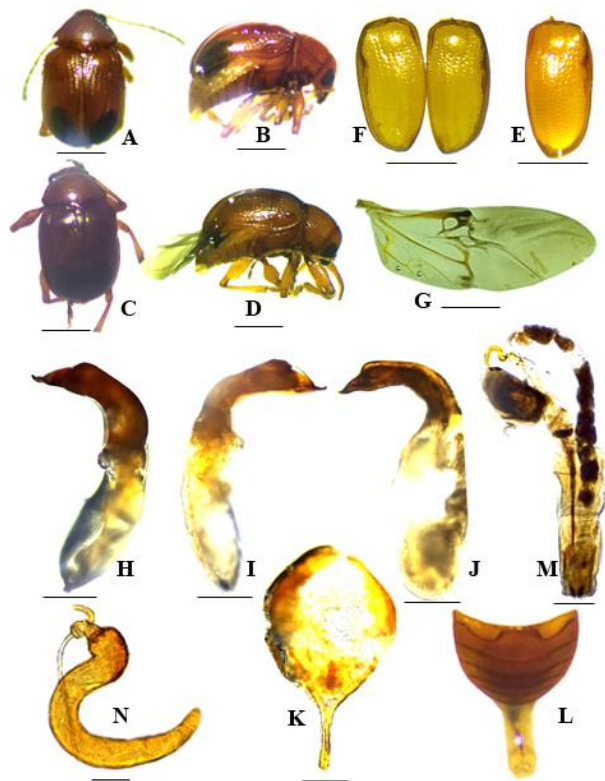


Fig.1: *Basilepta subcostata* (Entirely reddish brown), (A) Dorsal view of adult male,(B) Lateral view of adult male,(C) Dorsal view of adult female,(D) Lateral view of adult female,(E) Hind elytron of adult male,(F) Elytra of adult female,(G) Hind wing,(H, I, J) Male genitalia(aedeagus)-lateral view,(K) Male: tergite VIII ,sternite VIII, (L) Female genital block,(M) Female genitalia,(N) Female- spermathecal capsule. Scale bar: A-G =1.0mm; H-J, M =0.25mm; K = 0.1mm; L =0.5mm; N =0.05mm.

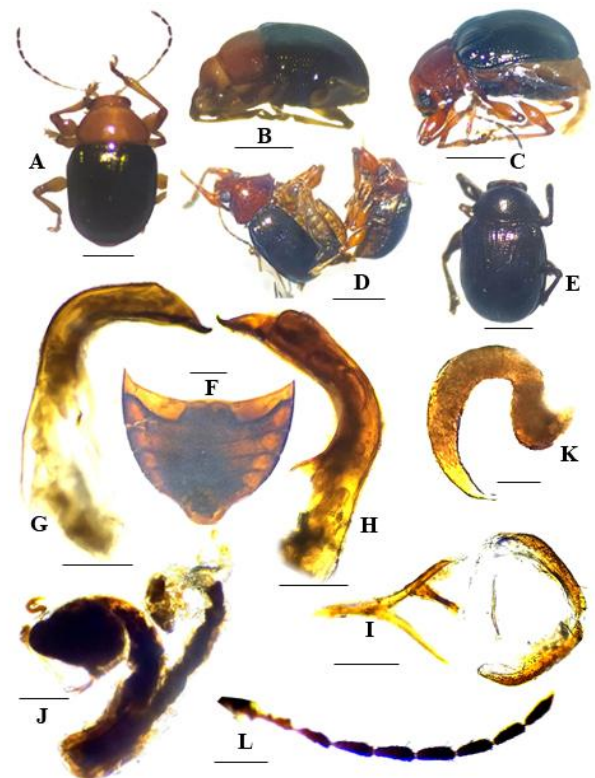


Fig.2: *Basilepta subcostata*,(A) Dorsal view of adult male,(B) Lateral view of adult male,(C) Lateral view of adult female,(D) Mating condition,(E) Dorsal view of adult female,(F) Male genital block,(G, H) Male genitalia(aedeagus)-lateral view,(I) Male- tergite VIII ,sternite VIII, (J)Female genitalia, (K) Female- spermathecal capsule, (L) Antennae. Scale bar: A-E =1.0mm; F, J, L =0.5mm; G-H =0.25mm; I =0.1mm; K =0.1mm.

(Fig.2 L). Antennae hardly reach the middle of the elytra; the first antennomere is thick and longer than the second; the second is thinner than the first, thicker than the third and fourth on their own; and the fifth and subsequent antennomeres are progressively thicker. The distal seven antennomeres are heavily coated in small, pointed setae, whereas the basal four are smooth, glossy, and sparsely setose. Elytra 1.2 times wider than they are long, striate punctate, and punctate weaker toward apex. The apex of elytra is convex narrowly (Fig.1E,F). Long legs with eight acute carinae on the tibia and dilated, minutely dentate ventrally beyond the middle femora.

Male genitalia: Near the base of the aedeagus proper the aedeagus is sharply bent almost at a right angle in lateral view (Fig.1H-J) (Fig.1 G,H), the apical part is dorsally recurved and acutely narrowed. Tergite VIII is semicircular, bearing small setae apically and spindle-shaped sclerotization on either side.

Female genitalia: The spermathecal capsule is sickle-shaped with the proximal portion being very short and constricted in the middle(Fig.1N) (Fig.2K).There is a dumbbell-shaped junction between the spermathecal gland and duct, and the distal portion having a sharp curve. The bursa copulatrix is sac-like, longer than wide,

and has long bursa sclerites (BS) on either side, between these sclerites, the spermathecal duct connects to the bursa copulatrix; the median oviduct is related to the bursa copulatrix's opposite side (Fig.2J). Elongate ovipositor which is sclerotized distally. Collateral gland present.

Material Examined: 15 males, Alinagor madrasa, Bhola, 12 July, 2021, Begum S; 11 Females, Alinagor madrasa, Bhola, 12 July, 2021; 7 males, Ujirpur, Barishal, 10 Aug. 2021; 17 Females, Ujirpur, Barishal, 10 Aug. 2021; 2 Males, Patharghata, Barguna, 25 Aug. 2021; 4 Females, Patharghata, Barguna, 27 Aug. 2021; 5 Males, Dumki, Patuakhali, 15 Sep. 2021; 7 Females, Dumki, Patuakhali, 20 Sep. 2021; 4 Males, Bagerhat, Khulna, 25 Oct. 2021; 5 Females, Bagerhat, Khulna, 25 Oct. 2021; 2 Males, Khulna sadar, Khulna, 27 Oct. 2021; 4 Females, Khulna sadar, Khulna, 27 Oct. 2021; 1 Male, Patuakhali sadar, Patuakhali, 10 April 2022; 5 Females, Patuakhali sadar, Patuakhali, 10 April 2022.

Distribution: Bangladesh, Cambodia, India, Laos, Myanmar, Nepal, Thailand.

Host plants: *Basilepta subcostata* was observed feeding on all the following cultivars of banana : Amrita sagar, Sabri, Kanthali kala and Kach kala.

Remarks: Ahmed (1963), Sen and Prasad (1953), Ahad *et al.* (1987) and Rahman *et al.* (2004) reported *Nodostoma viridipennis* as the species of Banana Leaf and Fruit Beetle in Bangladesh even though *Nodostoma* is a junior synonym of *Basilepta*. They didn't recognize taxonomically as compare with genitalia of other species. Prathapan *et al.* (2019) claimed that *Basilepta viridipennis* had been erroneously reported instead of *B. subcostata* in the literature as a pest of banana in Bangladesh.

***Bhamoina varipes* (Jacoby, 1884); Figure: 3 (A-K); 4 (A-J)**

Eucycla varipes Jacoby, 1884: Jacoby 1884: 210 (Sumatra; Mus. Leiden); Duvivier 1885: 42 (Is. Bodjo).

Sphaeroderma varipes: Jacoby 1889: 193 (N Burma: Teinzo, Bhamo; Tenasserim: Meetan); Maulik 1926: 318, 328 (Burma: Karen Mts., Assam: Khasi Hills).

Bhamoina varipes: Bechyné 1958: 91; Scherer 1969: 202–203; Döberl 2010: 505.

Bhamonia [sic] *varipes*: Kimoto 2005: 80. *Sphaeroderma varipennis* Jacoby 1892: 928 (Carin Cheba, Palon, Rangoon; Mus. Genova); Maulik 1926: 318, 325; Scherer 1969: 202 (synonymy).

Description: 2.75 – 3.45 mm in length, 2.0 – 2.85 mm in width, 1.4 times longer than broad. Elongate-oval form body. Completely reddish brown in color with the exception of distal portion of mandibles and eyes which are black in color (Fig.3A) (Fig.4A,B). In certain cases elytra are darker. Vertex is weakly convex in the lateral view and forms a concavity where it reaches the frons; the frons are highly arched and join the clypeus at an obtuse angle. Vertex appears somewhat flat and sparsely punctate in frontal view, with mixtures of small and tiny

punctures. Filiform antennae (Fig.3E). Antennal calli are transverse-oblique, trapezoidal, elevated above the vertex, and closely spaced dorsally. The first antennomere is longer than the second and third together, the second is a bit longer than the third and fourth separately, and from the sixth antennomere onward, they get gradually thicker. Scutellum is triangular, posteriorly acutely angulate, glossy, flat on top and minutely punctate. Elytra at base are as wide as pronotum, getting wider postbasally. Apex of the elytra convex. In the mesal half, elytral punctures confused, outermost punctures form a regular row and tend to form rows in the lateral half. Dark halo surrounding each elytral puncture present. Apical spine absent in the foretibia. Apical spine on mid – hind tibiae. Apical spine absent in the foretibia. Apical spine on mid- and hind tibiae. Males have first pro-, meso-, and metatarsomeres that are noticeably wider than females; males also have ventral capitate setae while females have ventral pointed setae.

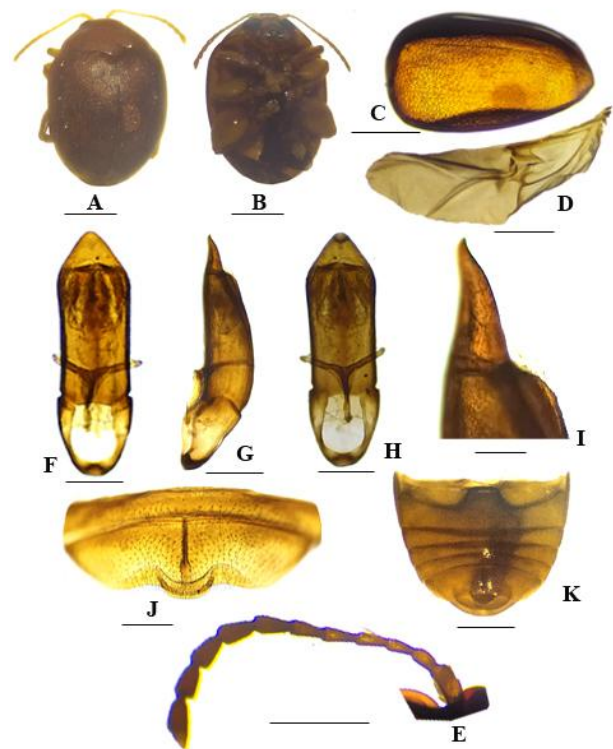


Fig.3: *Bhamoina varipes* (Adult male),(A) Dorsal view,(B) Ventral view,(C) Elytron,(D) Hind wing,(E) Antennae, (F) Aedeagus-dorsal view,(G) Aedeagus-lateral view,(H) Aedeagus-ventral view,(I) Apex of aedeagus,(J) Abdominal apex,(K) Genital block. Scale bar: A-D=1.0mm; E=1.0mm; F-H=0.2mm; I=0.05mm; J=0.35mm; K=1.0mm.

In males, the middle of the last ventrite forms a lobe with notches on either side, whereas the posterior border is entire in females. In males, the last ventrite has an internal longitudinal apodeme along the midline which is visible from the outside as a black line. In females, the apodeme is absent.

Male genitalia: In lateral view, the aedeagus is curved with an acutely pointed apex which is recurved dorsally

(Fig.3F). In ventral view, there is a longitudinal depression along the center of ventral side (Fig.3H). A triangular denticle is formed as aedeagus narrowed at the apex. Three laminae cover the dorsal opening partially.

Female genitalia: Spermathecal receptacle is oblong shaped which is widest in the middle and become narrowed towards both ends (Fig.4F). 2.2 times longer than broad. Medially fused vaginal palpi, both together 1.75 times broader than long. The tignum is channeled along middle and it is gently broadened anteriorly.

Nature of damage: When adults feed, they leave transverse, narrow linear scars on the abaxial surface of the leaf lamina. On the other hand, *Basilepta subcostata* produce much shorter and wider feeding troughs which are different than those of *Bhamoينا varipes*.

Material Examined : 4 female, Bhola sadar, Bhola, 16 May 2022, Begum, S ; 2 males, Bhola sadar, Bhola, 16 May 2022; 5 females, Dumki, Patuakhali, 30 May 2022; 3 males Dumki, Patuakhali, 30 May 2022; 2 females, Barguna sadar, Barguna, 27 Aug. 2021; all were collected by the same collector.

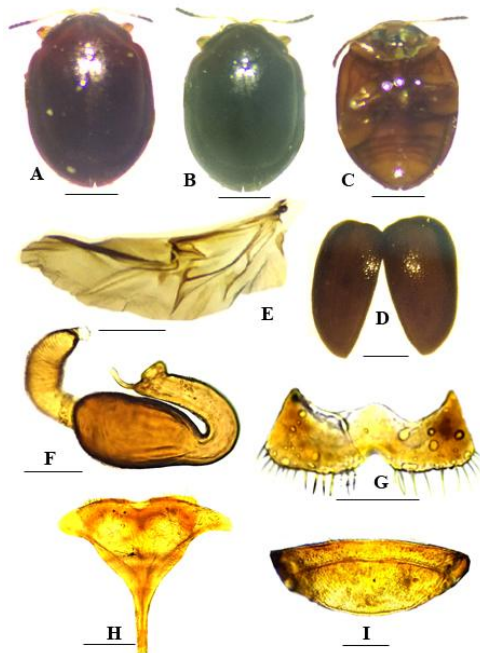


Fig.4: *Bhamoينا varipes* (Adult female), (A),(B) Dorsal view, (C) Ventral view, (D) Elytra, (E) Hind wing, (F) Spermathecal receptacle, (G) Vaginal palpi, (H) Tignum, (I) Abdominal apex. Scale bar: A-E=1.0mm; F=0.25mm; G=0.05mm; H=0.1mm; I=0.35mm.

Distribution: Bangladesh (**new record**); India (Assam; Meghalaya; Uttarakhand); Nepal; Myanmar; China; Sumatra; Laos; Vietnam.

Host Plants: *Bhamoينا varipes* was observed feeding on the following two cultivar of banana : Sabri kala and Kach kala . But between the two cultivars more beetles were found on Sabri kala compared to Kach kala.

Remarks: The genus *Bhamoينا* closely resembles *Sphaeroderma*. *Bhamoينا* can be easily separated from

Sphaeroderma by the anteriorly produced anterolateral corners of pronotum. *Sphaeroderma varipennis* Jacoby, treated as a synonym of *Bhamoينا varipes* by Scherer (1969).

Conclusion

In conclusion, two species of Banana Leaf and Fruit Beetle including a newly recorded one: *Basilepta subcostata* and *Bhamoينا varipes* **rec. nov.** were recognized in the southern part of Bangladesh based on morphological characters. Previously in Bangladesh the following erroneous names of Banana Leaf and Fruit Beetles were used to identify this notorious pest without taxonomic evidence: *Nodostoma* spp., *Nodostoma viridipennis* and *Nodostoma viridipenne*, whereas *Nodostoma* is a junior synonym of *Basilepta*. In our present observation, we didn't find *Basilepta viridipennis* in the banana orchard in the Southern part of Bangladesh. Therefore, further survey and taxonomic study of these pests on banana in the entire Bangladesh should be needed with morphological and molecular evidence.

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