

## Taxonomic studies on leafhopper fauna associated with rice ecosystems in Tripura

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### ABSTRACT

A study was taken up during 2009 – 10 to collect and identify the leaf hoppers associated with rice ecosystem of Tripura region and thereby prepare key for identification. Collection revealed that nineteen leafhoppers are associated with rice crop ecosystem in different zones of Tripura state in India, which were identified subsequently. A key for distinguishing these leafhoppers along with illustrations has been provided.

**KEY WORDS:** Cicadellidae, key to species, leafhoppers, rice, Tripura

### INTRODUCTION

Leafhoppers belong to the family Cicadellidae of the order, Hemiptera. These are small wedge shaped insects of various forms, colour, and sizes and distinguished by having one or more rows of small spines extending the length of hind tibia. They are widely distributed and many of its members are serious pests and vectors of diseases of many economic crops.

The effective management of pest species damaging the crop cannot be undertaken without accurate identification. The literature dealing with the identification and taxonomy of insects is scattered in many journals and monographs published over many years and in many languages, many of these works are very difficult to obtain. The broad objective of this work is to give a comprehensive account of leafhoppers found in rice ecosystems of Tripura and preparation of taxonomic key for the

identification of common species found in rice ecosystem.

### MATERIALS AND METHODS

The leafhoppers were collected in rice crops of different agro climatic zones of Tripura by sweeping with the help of an insect net during 2009-10. About ten to fifteen net sweepings were taken each time and leafhoppers collected were aspirated from net, killed with ethyl acetate swab and transferred to homeopathic vials, labeled and brought to the laboratory and dried in an oven at 40-45<sup>0</sup>C for about 5-6 hours. The dried specimens were stored in homeopathic vials and labeled. The collected leafhoppers will be mounted singly on triangular card board points on right hand side of the thorax. These specimens were labeled. The label containing the information regarding locality, date of the collection, host plant and name of the collector will be transfixed to the respective specimens. The abdomen will be detached from the thorax with the help of

needle by pressing down at the junction of two. The detached abdomens kept in cavity blocks containing few milliliters of 10% KOH. The digested soft tissue was pressed out with the help of a blunt needle. These abdomens were washed with distilled water and transferred to a drop of glycerin. The male genitalia dissected out and illustrations were made under Trinocular Research Microscope with drawing attachment Knight (1965).

### RESULTS AND DISCUSSION

In present study, the comprehensive study of leafhopper fauna associated with

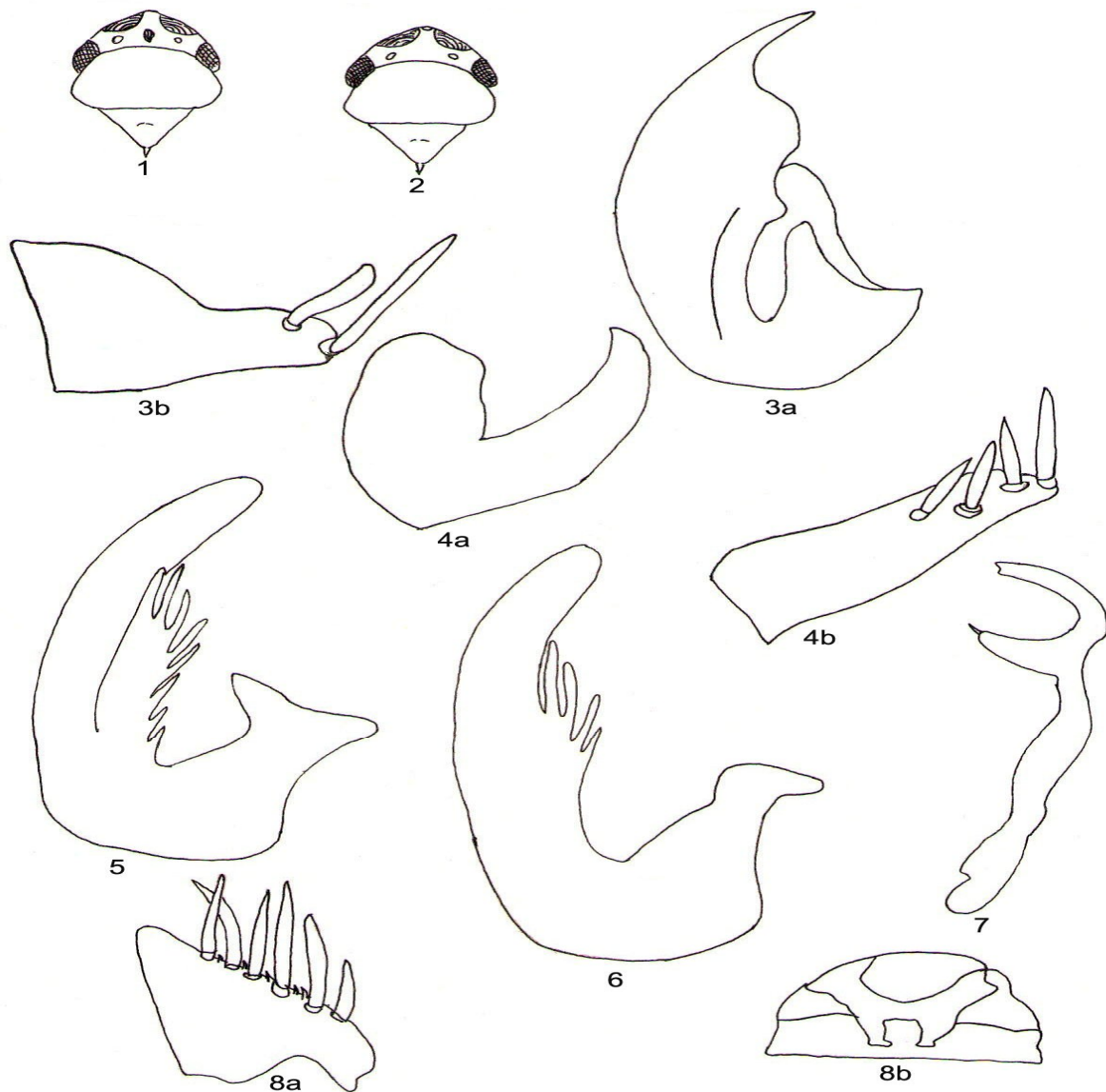
rice ecosystems in Tripura was undertaken. The leafhoppers were collected from rice fields in different places of Tripura were brought to the laboratory, processed and taxonomic characters were studied. 19 species of leafhoppers belonging to 7 genera under 5 tribes of the family Cicadellidae were identified and given here under. The key is based on male specimens only since male genitalia usually provide the reliable diagnostic in leafhoppers. The key developed for the identification of the leafhopper species collected in rice crop ecosystem of Tripura is furnished hereunder

### KEY TO THE LEAFHOPPER SPECIES ASSOCIATED WITH RICE CROP ECOSYSTEMS OF TRIPURA

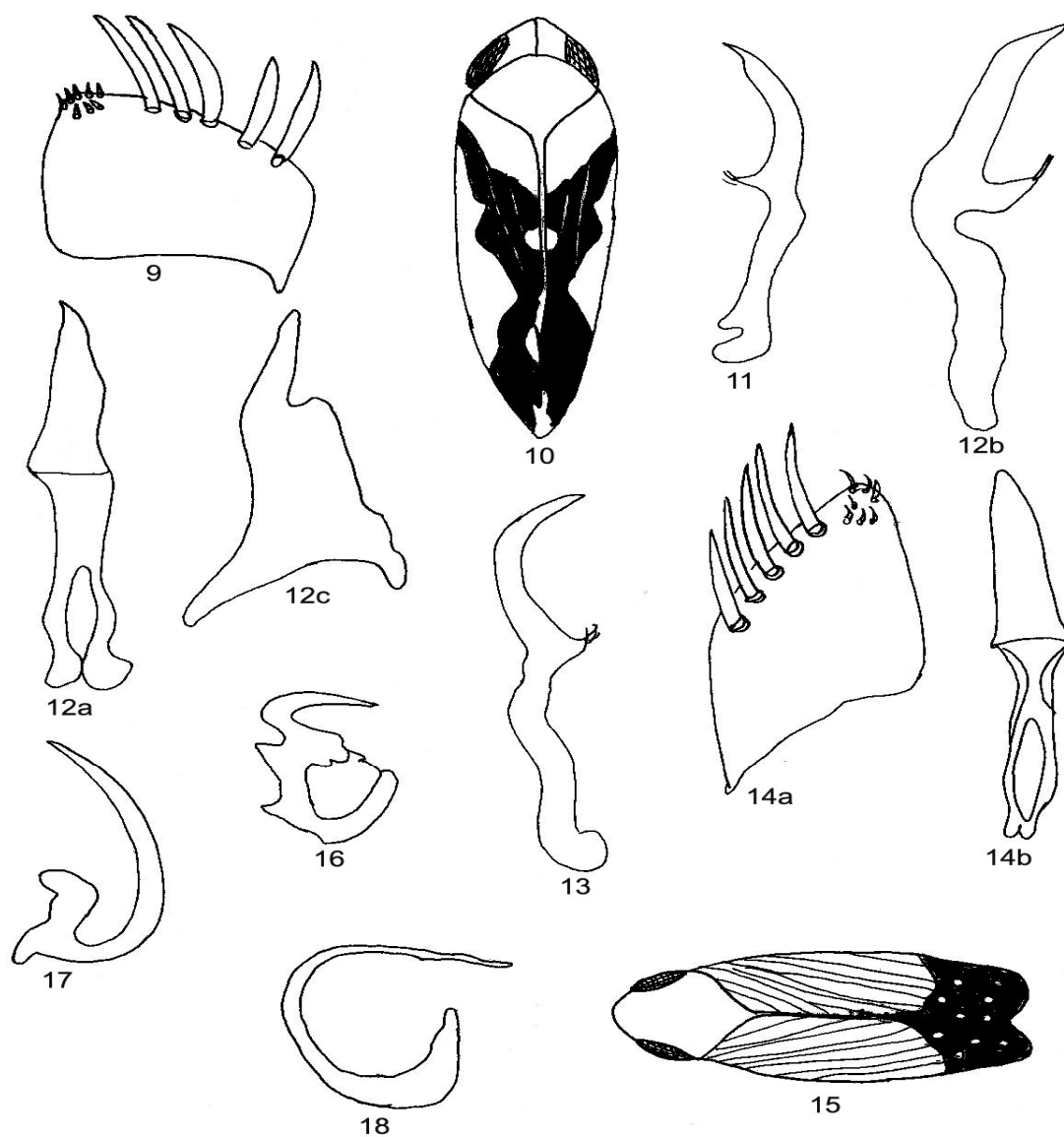
1. Mostly larger species, clypeus and clypellus swollen----- (2)
  - Mostly smaller species, clypeus and clypellus not swollen----- (3)
2. Central dark spot present at the margin of vertex and face, vertex with four black spots, two central, one at base and the second at apex and other two on the lateral margins near the basal angle of face, muscle impressions are distinct (Fig.1)-----  
----- *Cofana spectra* (Distant).
  - Central dark spot absent at the margin of vertex and face; usually pale green (Fig.2) -----  
----- *Cofana unimaculata* (Signoret).
3. Aedeagus fused with connective----- (4)
  - Aedeagus not fused with connective----- (11)
4. Aedeagal shaft strongly curved, apex of shaft notched in dorsal view without an apical extension and with distinct apical gonopore (Fig.7) -----  
----- *Deltocephalus vulgaris* Dash and Viraktamath.
  - Aedeagal shaft elongate gradually and weakly curved with or without apical extension; gonopore obscure----- (5)

5. Forewings with zigzag reddish brown margins (Fig.10) -----  
----- *Maiestas dorsalis* (Motschulsky).
- Forewings without such marks as above ----- (6)
6. Aedeagal shaft smoothly curved; style apophysis slender----- (7)
- Aedeagal shaft not so curved, more or less straight; style apophysis straight and finger like (Fig.12a, 12b and 12c) -----  
----- *Maiestas truncata* (Dash and Viraktamath).
7. Ventral margin of aedeagal shaft extending beyond gonopore (Fig.11) -----  
----- *Maiestas dashi* Webb and Viraktamath.
- Ventral margin of aedeagal shaft not extending beyond gonopore----- (8)
8. Vertex with black stripes; subgenital plates as wide as wider than inner margin, apically strongly rounded (Fig.9) -----  
----- *Maiestas distincta* (Motschulsky).
- Vertex without black stripes, subgenital plates triangular (Fig.8a) ----- (9)
9. Abdominal sternal apodemes slender and elongated with blunt apex; subgenital plate more or less as wide as inner marginal length (Fig .8a and 8b) -----  
----- *Maiestas acuminata* (Dash and Viraktamath).
- Abdominal sternal apodemes not elongated and without blunt apex; subgenital plates width is narrower than inner marginal length (Fig.14a) ----- (10).
10. Aedeagal shaft constricted in the middle in dorsal aspect (Fig.14b) -----  
----- *Maiestas variabilis* (Dash and Viraktamath).
- Aedeagal shaft not constructed in the middle in dorsal aspect (Fig.13) -----  
----- *Maiestas subviridis* (Metcalf).
11. Tegmina with two anteapical cells----- (12)
- Tegmina with three anteapical cells ----- (15)
12. Light yellowish in colour with reddish longitudinal stripes on the vertex, pronotum and tegmina ----- *Balclutha pararubrostriata* Ramasubbarao and Ramakrishan.
- Without any reddish longitudinal stripes on the vertex, pronotum and tegmina -----  
----- (13)

13. Aedeagus with three pairs of basal processes and projections (Fig.16) -----  
 ----- *Balclutha incisa* (Matsumura)  
 - Aedeagus without such process----- (14)
14. Aedeagus elongated shaft strongly curved and extending beyond basal apodeme (Fig.18) -  
 ----- *Balclutha viridinervis* (Matsumura)  
 - Aedeagus not so elongated and not strongly curved (Fig.17) -----  
 ----- *Balclutha lucida* (Butler).
15. Vertex subangularly acute, foliaceous with marginal ridge; longitudinal pale orange  
 bands on head, pronotum and scutellum; tegmina brown in apical 1/3 rd with white spots  
 in case of males (Fig.15) ----- *Hecalus porrectus* (Walker).  
 - Vertex not subangularly acute, foliaceous without marginal ridge; longitudinal pale  
 orange bands on head, tegmina not present; male tegmina without such white spots-----  
 ----- (16).
16. Colour opaque green, aedeagus with variable number of spines directed towards apex  
 (Figs 5 and 6 ) ----- (17).  
 - Colour dull brown with various pattern of dark brown or black margins, aedeagus without  
 spines (Fig. 3a and 4a) ----- (18).
17. Vertex with submarginal black band; anterior margin of pronotum and inner margins of  
 claws usually marked in black colour; aedeagus with 8 or 9 pairs of spines (Fig 5) -----  
 ----- *Nephotettix nigropictus* (Stal).  
 - Vertex usually without any black band or markings aedeagus with 4-5 pairs of spines (Fig  
 6) ----- *Nephotettix virescens* (Distant).
18. Pygofer with two brown or black spines, spines-2 much thicker, shorter than spine-1 (Fig  
 3b) ----- *Exitianus indicus* (Distant).  
 - Pygofer with four to seven brown or black spines, all are more or less uniform in  
 thickness (Fig 4b) ----- *Exitianus nanus* (Distant).



**Fig.1. *Cofana spectra*: Head and Thorax. Fig.2. *Cofana unimaculata*: Head and Thorax. Fig.3- *Exitianus indicus*: a) Aedeagus, lateral view and b) Pygofer lobe . Fig.4. *Exitianus nanas*: a) Aedeagus, lateral view and b) Pygofer lobe . Fig.5. *Nephotettix nigropictus*: Aedeagus, lateral view. Fig.6. *Nephotettix virescens*: Aedeagus, lateral view. Fig.7. *Deltocephalus vulgaris*: Aedeagus, lateral view. Fig.8. *Maiestas acuminata*: a) Subgenital plate and b). Abdominal apodemes.**



**Fig.9.** *Maiestas distincta*: Subgenital plate. **Fig.10.** *Maiestas dorsalis*: Adult dorsal view. **Fig.11.** *Maiestas dashi*: Aedeagus lateral view. **Fig.12.** *Maiestas truncata*: a) Aedeagus, dorsal view, b) Aedeagus, lateral view and c) Style. **Fig.13.** *Maiestas subviridis*: Aedeagus, lateral view. **Fig.14.** *Maiestas variabilis*: a) Subgenital plate and b) Aedeagus, dorsal view. **Fig.15.** *Hecalus porrectus*: Adult dorsal view. **Fig.16.** *Balclutha incisa*: Aedeagus lateral view. **Fig.17.** *Balclutha lucida*: Aedeagus dorsal view. **Fig.18.** *Balclutha viridinervis*: Aedeagus lateral view.

Wilson and Claridge (1991) published a comprehensive account of leafhoppers and planthoppers found on rice from major rice-growing regions of the world. They described 52 species of leafhoppers all over the rice-growing regions of the world. Ishihara and Lowe (1969) reported 15 leafhoppers on rice from India. Sohi (1983) reported 20 species of Typhlocybinae leafhoppers belonging to Erythroneurini and Empoascini on rice from the oriental region. Misra and Israel (1968) and Misra (1980) studied the taxonomy, biology and habitat of 6 leafhoppers on rice from Orissa state.

Webb and Viraktamath (2009) reviewed the Deltocephalini and made with nomenclatural changes in the *Deltocephalus* group and other Deltocephalinae. They retained the well known genus *Recilia* for two species viz., *R. coronifer* (Marshall) and *R. raoi* (Dash and Viraktamath) and transferred all other species formally in *Recilia* or *Deltocephalus (Recilia)* to *Maiestas*. In the present investigation 19 leafhoppers belonging to 7 genera are identified on rice from Tripura state and are furnished here under.

1. *Exitianus indicus* (Distant)
2. *Exitianus nanus* (Distant)
3. *Nephotettix virescens* (Distant)
4. *Nephotettix nigropictus* (Stal)
5. *Cofana spectra* (Distant)
6. *Cofana unimaculata* (Signoret)
7. *Deltocephalus vulgaris* Dash and Viraktamath
8. *Maiestas acuminata* (Dash and Viraktamath)
9. *Maiestas distincta* (Motschulsky)
10. *Maiestas dorsalis* (Motschulsky)
11. *Maiestas dashi* Webb and Viraktamath
12. *Maiestas truncata* (Dash and Viraktamath)
13. *Maiestas subviridis* (Metcalf)
14. *Maiestas variabilis* (Dash and Viraktamath)
15. *Hecalus porrectus* (Walker)
16. *Balclutha incisa* (Matsumura)
17. *Balclutha lucida* (Butler)
18. *Balclutha pararubrostriata* Ramasubbarao and Ramakrishnan
19. *Balclutha viridinervis* (Matsumura)

The leafhoppers, *N. virescens* and *N. nigropictus* are found to be at pest status and also important vectors of tungro, rice transitory yellowing, rice dwarf (Wilson and Claridge, 1991). Though *Deltocephalus (Recilia) dorsalis* is relatively minor pest, but known to be a vector of tungro, rice

dwarf, rice gall dwarf virus disease and the sole vector of orange leaf MLO disease (Wilson and Claridge, 1991). In the present studies, *N. nigropictus* have been observed in large numbers, causing damage by sucking sap from rice plants, but *N. virescens* are found in less number

comparative to *N. nigropictus*. All other leafhopper species are found in less number and they were observed to be casual visitors feeding on weeds in the rice fields. These may attain pest status in due course of time as in case of brown planthopper, *Nilaparvata lugens* (Stal) which was recorded only as a very important pest on rice during sixties but now it attained pest status causing serious damage throughout the country on rice. Similarly the white backed planthoppers, *Sogatella furcifera* (Horvath) also now attained pest status on rice. Hence, the accurate identification of fauna associated with a particular agroecosystem is essential which may or may not be a pest at present. The key given in this paper will be useful for distinguishing some economically important leafhoppers on rice, particularly for the Entomologists who are working in this crop.

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