



PLANTHOPPER FUNA ASSOCIATED WITH MAIZE AND SORGHUM CROP-ECOSYSTEMS FROM COSTAL ANDHRA PRADESH

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ABSTRACT

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Nine planthopper species viz., *Cemus* sp.; *Euidella* sp.; *Peregrinus maidis* (Ashmead); *Perkinsiella* sp.; *Perkinsiella sinensis* Kirkaldy; *Sardia rostrata* (Melichar); *Sogatella kolophon* (Kirkaldy) *Sogatella vibix* (Haupt) and *Tagosodes pusanus* (Distant) were reported from maize and sorghum crop-eco systems of costal Andhra Pradesh. The above species were identified and described. An illustrated key along with diagnostic taxonomic characters were provided for easy identification of the planthoppers associated with maize and sorghum crop eco-systems from coastal Andhra Pradesh.

KEYWORDS: Hemiptera, planthoppers, Delphacidae, maize and sorghum.

INTRODUCTION

Planthoppers belong to the super family Fulgoroidea in Fulgoromorpha of Auchenorrhynchos–Hemiptera comprising 20 families. Delphacidae is the largest family of planthoppers belonging to the super family Fulgoroidea of the Order Hemiptera and is represented by 2000 nominal species described under 280 genera (O'Brien and Wilson, 1985). The primary distinguishing character of the family Delphacidae is the presence of a mobile spur at the tip of tibia III. Delphacids are grass feeders and devastating pests on major agricultural crops viz., rice, sugarcane, maize, sorghum and other cereals (Wilson and O'Brien 1987). Planthoppers damage plants directly by feeding which cause a characteristic yellowing of tissue known as "hopper burn" and in addition planthoppers also act as vectors for plant viral disease viz., rice grassy stunt virus (*Nilaparvata lugens* (Stal), *N. bakeri* (Muir) and *N. muii* (China)) (Ou, 1985 and Hibino, 1989), rice ragged stunt virus (*N. lugens*) and *N. bakeri*), rice stripe and black-streaked dwarf virus (*Laodelphax striatellus* (Fallen) and *Terthron albobittatum* (Matsumura)), hoja blanca virus (*Tagosodes oryzicolus* (Muir) (Nault and Ammar, 1989), sugarcane yellow leaf syndrome (*Saccharosydne saccharivora* (Westwood)), Fiji disease virus (*Perkinsiella saccharicida* (Kirkaldy), *Perkinsiella sinensis* (Distant) and *P. vastatrix* (Kirkaldy)) (Wilson, 2005), maize rough dwarf virus (*Sogatella vibix* (Haupt)),

maize mosaic, maize sterile stunt, maize stripe virus (*Peregrinus maidis* (Ashmead)), finger millet mosaic virus (*P. maidis*), Brazilian wheat spike disease (*Sogatella kolophon* (Kirkaldy)) (Wilson, 2005) etc.

MATERIALS AND METHODS

Planthopper specimens were collected from different Agro-climatic zones of coastal Andhra Pradesh by sweep netting in maize and sorghum crop-ecosystems. About 10-15 to and fro net sweepings were taken each time and planthoppers collected were aspirated from the net into a glass tube and killed with a cotton swab wetted with a few drops of ethyl acetate. The killed specimens were transferred to homeopathic vials, labelled, brought to the laboratory and dried in a hot air oven at 45-50°C, for about 5 to 6 hours. For mounting and preparing slides of genitalia the procedure suggested by Knight (1965) was followed. For describing the different body parts the terminology suggested by O'Brien and Wilson (1985) was followed.

RESULTS AND DISCUSSION

During the present studies, from maize and sorghum crop ecosystems of coastal Andhra Pradesh, the following planthopper fauna were collected, identified and described to facilitate easy identification by economic entomologists.

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S. No.	Crop eco-system	Name of the Planthopper	Family
1	Maize and Sorghum	<i>Cemus</i> sp.	Delphacidae
2		<i>Euidella</i> sp.	Delphacidae
3		<i>Peregrinus maidis</i> (Ashmead)	Delphacidae
4		<i>Perkinsiella</i> sp	Delphacidae
5		<i>Perkinsiella sinensis</i> Kirkaldy	Delphacidae
6		<i>Sardia rostrata</i> (Melichar)	Delphacidae
7		<i>Sogatella kolophon</i> (Kirkaldy)	Delphacidae
8		<i>Sogatella vibix</i> (Haupt)	Delphacidae
9		<i>Tagosodes pusanus</i> (Distant)	Delphacidae

For those species which were not studied here, literature or a Taxonomist working on the planthoppers may be consulted. The key for identification of the planthoppers associate with maize and sorghum crop ecosystems of coastal Andhra Pradesh is given here under.

1. Vertex and mesonotum without a distinct pale yellow or orange white stripe extending from the head. Aedeagus more or less straight, tubular or may be long and narrow definitely not twisted ...2
- Vertex and mesonotum with a distinct pale yellow or orange or white stripe extending from the head. Aedeagus twisted, tapering to apex with two rows of small teeth6
2. Aedeagus narrow and long whip like with or without lateral projections on long aedeagal shaft7
- Aedeagus shot and stout, tubular without any lateral projections.....3
3. Aedeagus tubular with a few small teeth like projections subapically. Aedeagus basally wider, gradually narrowed and tubular; two to three spines are there subapically, gonopore apical; genital styles relatively flattened, trapezoidal, distally and shallowly bifurcated (Fig. 22-23)
.....*Tagosodes pusanus*
- Aedeagus tubular but definitely without small teeth like lateral projections4

4. Vertex narrow, elongated between larger compound eyes; tegmina dark brown in colour with pterostigma; aedeagus more or less straight, tubular with subapical serrations; genital styles relatively short, broader medially with a deep sinuation along the inner margin; number of spines are scattered in the middle portion of the style (Fig. 16-17)

.....*Sardia rostrata*

- Frons with conspicuous raised pits on either side of the median carina; tegmina granulate along the veins and fuscus markings can be observed on head and vertex.....5
5. Frons with conspicuous raised pits on either side of the median carina; tegmina granulate along the veins and fuscus apically; aedeagus long, slightly decurved with long flagellum arising at apex, dorsal margin with one or two processes; genital styles broader basally, gradually narrowed apically with spines (Fig. 1-2).....*Cemus* sp.
- Frons with conspicuous raised pits on either side of the median carina Vertex and mesonotum dark brown without characteristic cream coloured band on pronotum. Aedeagus flattened, curved with a pair of long unequal subapical processes; genital style L- shaped (Fig. 3-6)*Euidella* sp.
6. Face with frons and clypeus pale yellowish brown in colour, but genae dark brown in colour; the genital styles have the outer process of apical bifurcation dilating from the base of middle then tapering to apex with dorsal margin forming a blunt angle;

diaphragm more or less 'U' shaped (Fig 20-21)

.....*Sogatella vibix*

- Face with frons, clypeus, genae entirely pale yellowish in colour; genital styles relatively short, broad, flattened, deeply bifurcated distally and anterior process of the apical bifurcation strongly produced tapering to apex, not distinctly dilated in the middle part, inner process very short; inner edge of the diaphragm rectangular (Fig. 18-19)

.....*Sogatella kolophon*

7. Brown coloured insects. Aedeagus elongated, curved laterally, C shaped with a pair of process apically. Pygofer with two spines on vertical margin. Genital styles broader basally narrowed apically more or less foot shaped. Apical portion of styles is with a small tooth like process (Fig. 10-12).....*Perkinsiella sp.*

- Light yellow-brown to yellow-orange coloured insects. Aedeagus definitely not curved and is linear in shape ending with a sharp point8

8. Light yellow-brown coloured insects. Pygofer slightly oblong to rounded; parameres small, bases sunken into deeply concave medioventral area, parallel basally, anal style short and relatively small. Aedeagus long narrow and whip like with processes sub apically (Fig. 7-9)*Perigrinus maidis*

- Brownish black coloured insects. Pygofer with a strong lateral projection. Aedeagus tubular, slightly curved with a pair of process in the middle and another process subapically. Aedeagus resembles an arrow. Genital style foot shaped, narrow in the beginning and very wide at the apex (Fig. 13-15)*Perkinsiella sinensis*

The most brief and important taxonomic and morphological characters of the above keyed species were provided here under for confirmation of identifications.

Cemus sp: Vertex, pronotum reddish black with cream coloured carinae. The forewings with blackish dots all along the veins and fuscous maculae apically. Genae reddish black in colour with cream coloured pits. Hemelytra with characteristic black dots along veins, fuscous streaks and with a distinct pterostigma. Pygofer short dorsally, long and strongly convex ventrally, posterior opening relatively small, longer than broad. Anal segment collar like with a pair of slender processes directed ventrally. Diaphragm long dorsoventrally, with

dorsal margin concave, deeply incised medially, medioventral process short, broader than long, quadrate. Aedeagus long, slightly decurved, with a long flagellum arising at apex, dorsal margin with one or two processes.

Euidella sp.: Eyes reddish brown. Vertex, pronotum and mesonotum tinged with orange to yellowish markings. Frons, genae, clypeus, antennae and legs yellowish brown. Pygofer ovoid, medioventral margin with three equally sized and long thin spines. Aedeagus flattened with long unequal flagellar appendages. Genital styles long and L-shaped.

Peregrinus maidis (Ashmead): Light yellow-brown to yellow-orange mesonotum with a pair of orange longitudinal bands between the white median and yellow-brown lateral carina. Frons, clypeus and genae yellowish brown. Head narrower than pronotum. Vertex truncate anteriorly, wider than long basally, clypeus tricarinate similar to frons. First segment of antennae shorter than second, apex with black ring. Transparent ungranulated wings which are brown on apical one-third portion with a pterostigma. Abdomen including pygofer dark brown to dark reddish brown. Pygofer slightly oblong to rounded. Style short and relatively small. Aedeagus long, narrow and whip like with sub apical process.

Sardia rostrata (Melichar): The colouration of vertex, thorax and tegmina is dark brown with black fuscous markings. The clypeus is black in colour and gradually narrows apically. Genae black in colour. Forewings are dark brown with pterostigma and fuscous apically. Pygofer broadly rounded, posterior opening longer dorsoventrally. Aedeagus more or less straight, tubular with subapical serration, gonopore apical. Genital styles relatively short, broader medially with a deep sinuation along the inner margin with number of spines scattered in the middle portion of the style

Perkinsiella sp.: Head broad with a broad medio-longitudinal, yellow to white band running from vertex to mesonotum. Wings are brownish. Scutellum yellow in colour. Vertex slightly projected in front of eyes. Mediolateral carinae raised along lateral carinae. Antennae large, reaching apex of clypeus, first segment rather triangular (broader at apex than at base). Wings are brownish, veins are granulate and pterostigma present. Spurs on hind legs are relatively small, thin with many minute teeth along the hind margin. Aedeagus elongated, curved with a pair of process subapically. Pygofer with

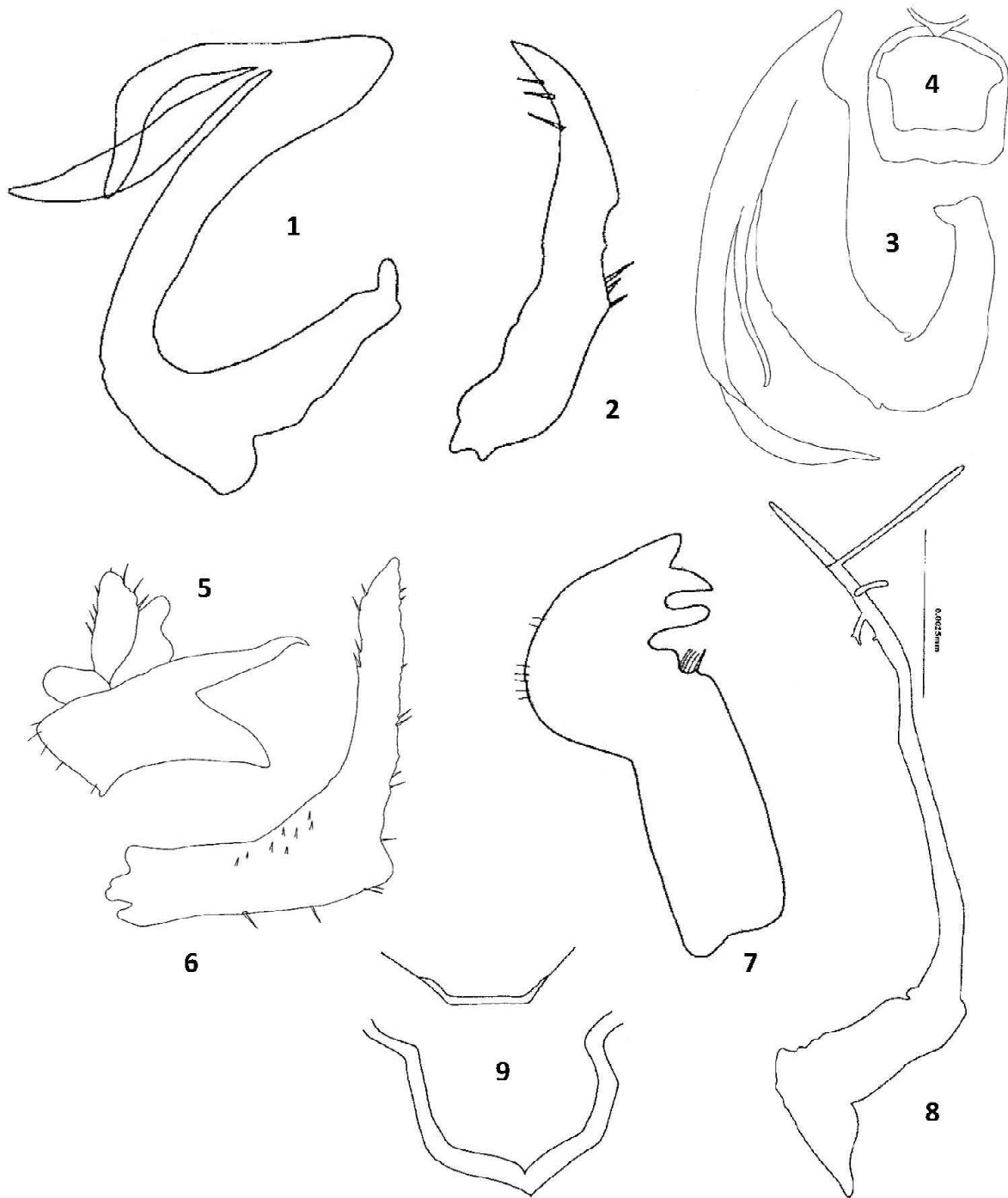


Fig. 1-2: *Cemus* sp. 1. Aedeagus, lateral view; 2. Style, lateral view; Fig. 3-6: *Euidella* sp., 3. Aedeagus, Lateral View; 4. Diaphragm; 5. Anal tube; 6. Style, lateral view; Fig. 7-9: *Perigrinus maidis*, 7. Style, lateral view; 8. Aedeagus, lateral view, 9. Anal tube.

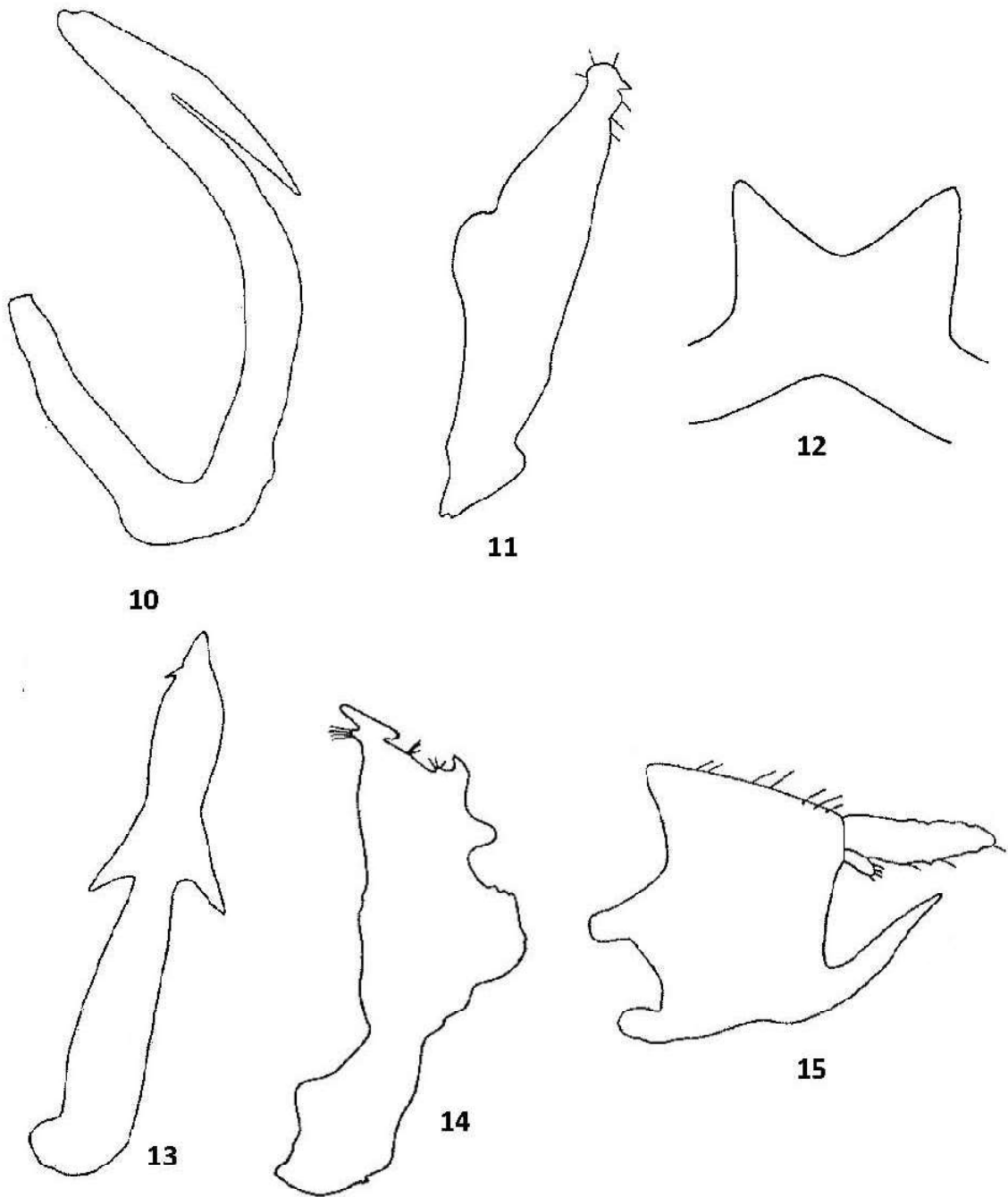


Fig. 10-12; *Perkinsiella* sp., 10. Aedeagus, lateral view; 11. Style, lateral view; 12. Anal tube process; Fig. 13-15; *Perkinsiella sinensis*, 13. Aedeagus, lateral view; 14. Style, lateral view; 15, Anal tube process.

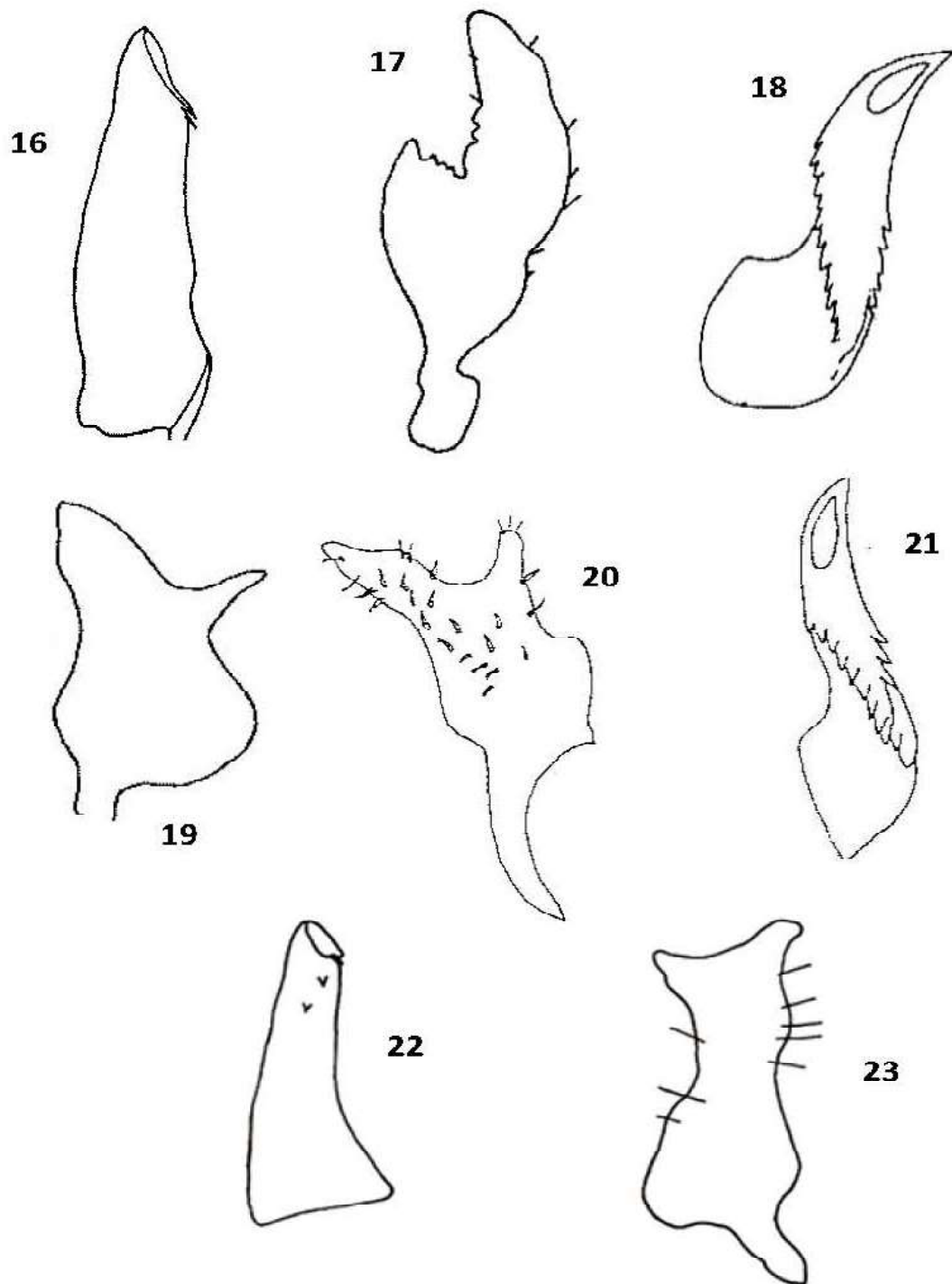


Fig. 16-17; *Sardia rostrata*, 16. Aedeagus, lateral view; 17. Style, lateral view; Fig. 18-19; *Sogatella kolophon*, 18. Aedeagus, lateral view; 19. Style, lateral view.; Fig. 20-21; *Sogatella vibix*, 20. Style, lateral view; 21. Aedeagus, lateral view; Fig. 22-23; *Tagosodes pusanus*, 22. Aedeagus, lateral view; 23. Style, lateral view.

two spines on vertical margin. Genital styles broader basally narrowed, apically more or less foot shaped. Diaphragm deeply sinuated in the middle.

***Perkinsiella sinensis* (Kirkaldy):** Brownish black in colour with vertex, pronotum and scutellum yellowish. Vertex is broader and more or less equal to its length. Wings are brownish in colour, veins are granulate and pterostigma present. Legs simple, hind basitarsus as long as the other two tarsal segments put together; spurs relatively small, thin with many minute teeth along the hind margin. Anal tube processes paired and shorter. Aedeagus tubular, slightly curved with a pair of process in the middle and another process subapically. Genital style foot shaped. Aedeagus resembles an arrow.

***Sogatella kolophon* (Kirkaldy):** Vertex, pronotum and mesonotum yellowish-white to pale stramineous. Lateral mesonotum orange brown. Face with frons, clypeus and genae entirely pale yellowish brown in colour. Clypeus and genae are light brown with yellow carinae. Post tibial spur with 19-21 teeth. Pygofer more or less round, posterior opening slightly longer dorsoventrally than broad. Anal segment, collar like with a pair of stout spine like processes directed ventrally up to the length of anal tube. Aedeagus twisted, tubular, usually sinuate with two rows of teeth and apical gonopore. Inner edge of diaphragm rectangular. Genital styles relatively short, broad, flattened, deeply bifurcated distally and anterior process of the apical bifurcation and tapering towards apex.

***Sogatella vibix* (Haupt):** Vertex yellowish white. Mid lateral carinae are black in colour. Forewings without pterostigma and are subtransparent. First segment of hind tarsus distinctly longer than the length of second and third segments put together, with thin and foliaceous tibial spur. Pygofer more or less round, posterior opening slightly longer dorsoventrally than broad. Anal segment moderately short, collar like with a pair of moderately long, slender stout spine like process directed ventrally. Aedeagus twisted, tubular and gonopore apical. The genital styles are apically bifurcated.

***Tagosodes pusanus* (Distant):** A white band present along the middle line from the anterior cell of vertex to the caudal tip of the mesonotum. The lateral sides of pro and mesonotum brown or black in colour. Frons and genae are black in colour. Clypeus light brown in colour. Hemelytra subtransparent, longer than wide with of dark

markings and pterostigma. Post tibial spur thin, foliaceous and with minute teeth marginally. Pygofer moderately long, posterior opening slightly longer dorsoventrally than broad. A pair of short spine like processes directed ventrally are present on the collar like anal segment. Aedeagus tubular, wider basally, gradually narrowed with 2-3 spines which are sub apical. Gonopore apical. Genital styles relatively flattened, trapezoidal distally and shallowly bifurcated.

Wilson and Claridge (1991) described 28 species of planthoppers belonging to the families viz., Delphacidae, Lophopidae, Meenoplidae and Cixiidae of Fulgoridae on rice and sugarcane. Mustaque and Akbar (1998) reported *Pyrilla aberrans* on sugarcane, rice, maize and sorghum. Rao and Chalam (2007) reported 23 delphacid planthoppers in India from rice and sugarcane ecosystems. Shashank (2009) reported 5 delphacid planthoppers viz., *Cemus* sp., *Nilaparvata lugens*, *Sogatella furcifera*, *Sardia rostrata*, and *Tagosodes pusanus* found associated with different rice and sugarcane crop eco-systems from Karnataka. In the present studies nine planthopper species belonging to family Delphacidae from maize and sorghum crop eco systems were collected, identified, described and illustrated for easy and quick identification. An identification key well supported with illustrations was also provided which will be useful aid to identify the planthoppers by research and extension workers. The accurate identification of planthopper fauna associated with a particular agro-ecosystem is very much needed along with their identification key to formulate integrated management strategies whenever they attain pest status.

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