Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Taxonomy and general biology of delphacid planthoppers in rice agroecosytems

Aimee Lynn B. Dupo and Alberto T. Barrion

Sixty-five species of planthoppers representing three subfamilies—Asiracinae (4 species), Stenocracinae (4 species), and Delphacinae (57 species)—all associated with rice agroecosystems in tropical Asia are taxonomically treated. Of the total, three genera of Delphacinae—*Nilaparvata* Distant, 1906; *Laodelphax* Fennah, 1963; and *Sogatella* Fennah, 1964—are economically important. The reconstituted planthopper food web comprising 244 species—218 species of invertebrates (89.34%), 17 vertebrates (6.97%), 6 pathogens (2.46%), and 3 nematodes (1.23%)—and a key to the parasitic Hymenoptera attacking planthopper eggs, and a pictorial guide to 63 species of predators are presented.

The diverse species in nature perform specific nutritional functions as either autotrophs (= producers) or heterotrophs (= consumers). The latter group of life forms is exemplified by phytophagous insects such as the delphacid planthoppers. Most of these planthoppers are economically important pests that feed directly or serve as vectors of pathogenic microorganisms and viruses to host plants, resulting in significant damage and yield losses for farmers. On the other hand, in the economy of nature, these planthoppers serve as sources of food for other heterotrophic consumers such as parasites and predators. Thus, the optimum existence of planthoppers in nature and agroecosystems vitally requires regulated management. Such strategic management of planthopper populations needs base-line fundamental scientific knowledge, which is the focal practical implication of this chapter.

What is a planthopper?

The term "planthopper" is a collective terminology applied to all phloem-feeding invertebrates constituting 14 families in the Superfamily Fulgoroidea, Suborder Homoptera, and Order Hemiptera. Like all homopterans, a planthopper has elongate mouthparts for piercing and sucking plant fluids in the phloem and xylem vessel elements. These vessels may have poor nitrogen content (Schaefer and Panizzi 2000) and less nutri-

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Table 1. Checklist of delphacid planthoppers and the virus diseases they transmit.

Virus disease	Delphacid planthopper vector	Distribution
Grassy stunt	*Nilaparvata lugens* (Stål)	Philippines and Sri Lanka
Stripe	*Laodelphax striatellus* (Fallen) *Unkanodes sapporonus* (Matsumura) *Terthron albifascia* (Matsumura)	Korea and Japan
Black streak dwarf	*Laodelphax striatellus* *Unkanodes sapporonus* *Terthron albifascia*	Japan

tion than pollen grains and other reproductive structures, yet today planthoppers as a group have been evolutionarily successful.

Family Delphacidae represents one member of the fulgoroid superfamily. Its members are appriopriately called "delphacid planthoppers" to technically distinguish them from the rest of the planthoppers. The primary distinguishing character of the delphacid family is the presence of a mobile spur at the tip of tibia III. It is the largest family in Fulgoroidea at the moment with approximately 2,000 nominal species described in 280 genera (Asche 1984, Yang 1989).

Economic importance

Osborn (1904) was first to presage the economic importance of planthoppers and even suggested that planthoppers would be more damaging to crops than previously forecast. The prediction was correct because planthoppers became the Green Revolution era's major insect pest to contend with. Planthoppers increasingly attracted attention from farmers, scientists, local government units, NGOs, and national institutes because the planthopper problem never dissipated but rather grew more threatening to crop production. Outbreaks of the brown planthopper became significant. Moreover, planthoppers vector a number of virus diseases that affect plant vigor and reduce yield. Table 1 shows the delphacid planthoppers and the virus diseases these insects transmit to the rice plant.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Morphology, classification, and key to genera/species

Figures 1 to 5 show the morphology of planthoppers.

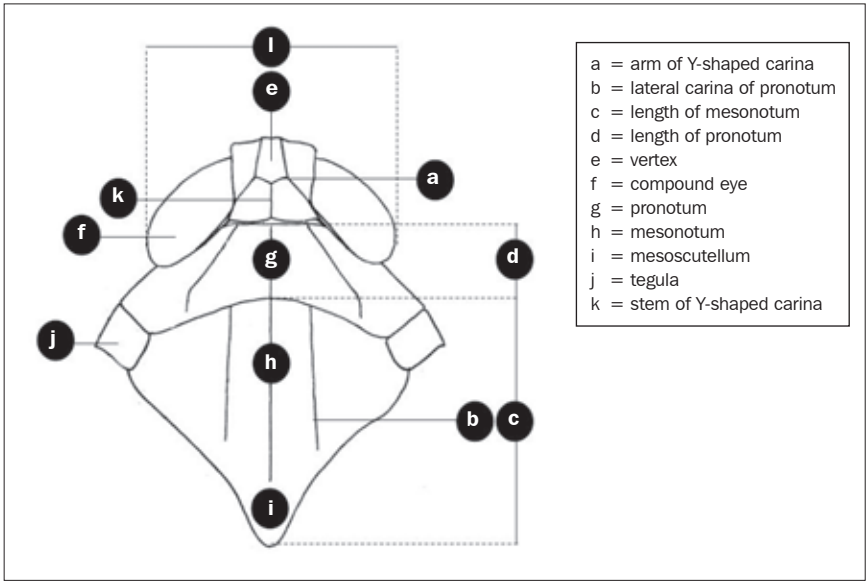

Fig. 1. Morphology of the head, pronotum, and mesonotum.

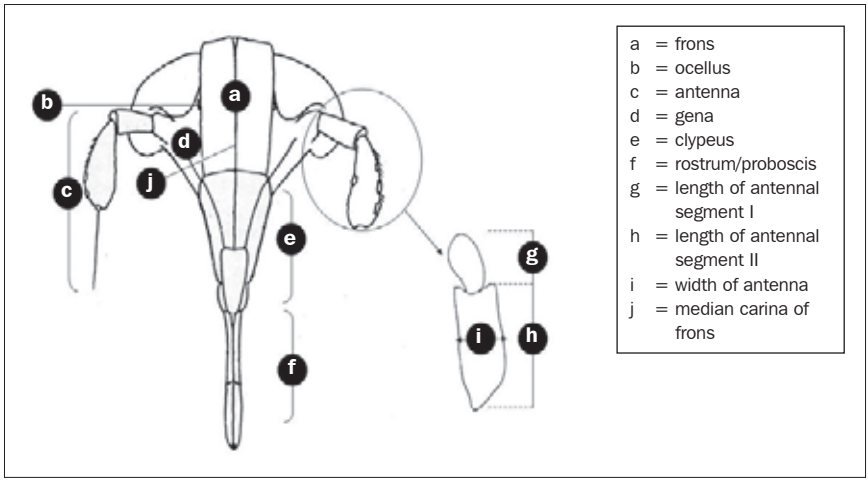

Fig. 2. Morphology of the frons, postclypeus (face), and antenna.

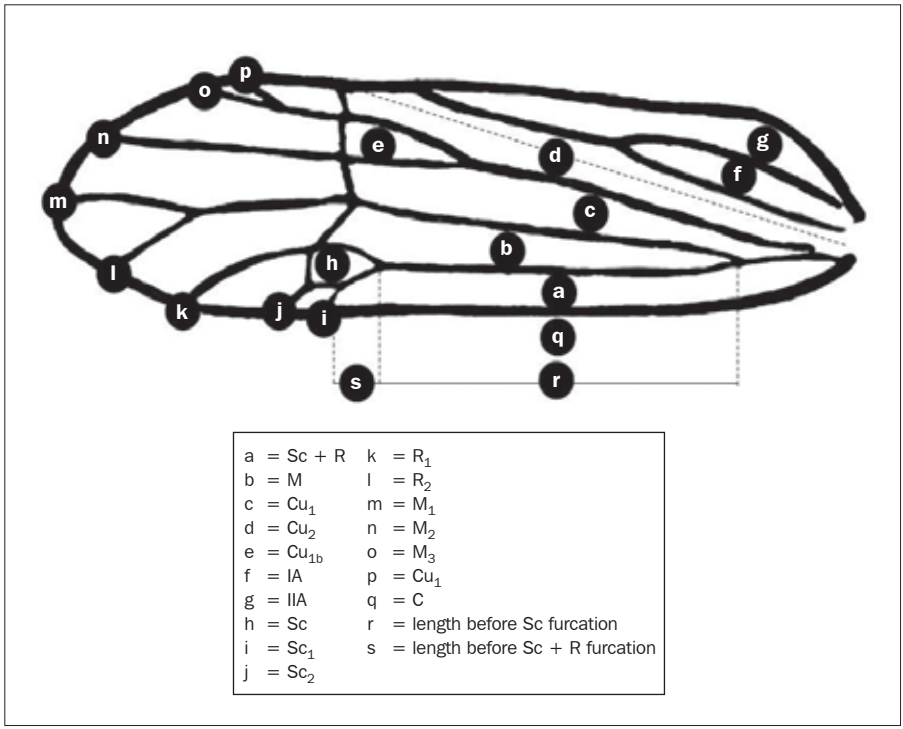

Fig. 3. Morphology of the forewing.

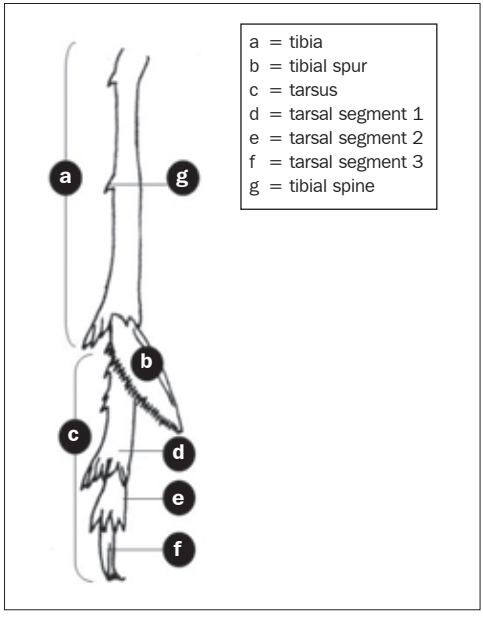

Fig. 4. Morphology of the tibia and tibial spine in leg 3.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

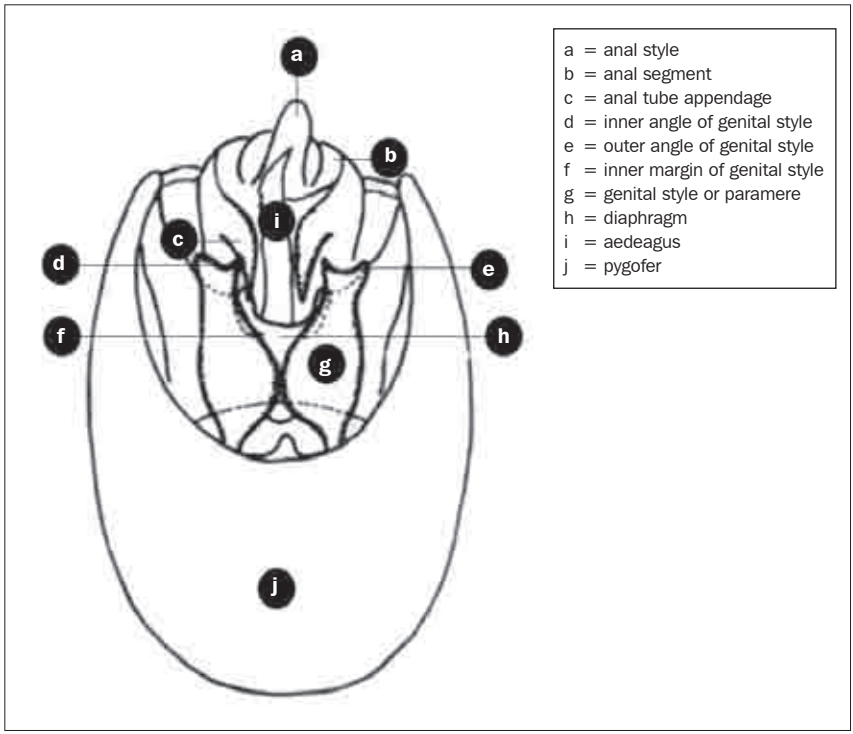

Fig. 5. Morphology of the male genital segment.

Checklist of delphacid planthoppers used in the key

1. *Melanesia pacifica* Kirkaldy
2. *Melanugyops* sp.
3. *Ugyops vittatus* (Matsumura)
4. *Ugyops tripunctatus* (Kato)
5. *Tropidocephala* sp.
6. *Tropidocephala flavovittata* Matsumura
7. *Tropidocephala nigra* (Matsumura)
8. *Tropidocephala dimidia* Yang & Yang
9. *Tropidocephala sinuosa* Yang & Yang
10. *Tropidocephala grata* Yang & Yang
11. *Tropidocephala formosa* Matsumura
12. *Tropidocephala brunnipennis* Signoret
13. *Tropidocephala saccharivoriella* Matsumura
14. *Tropidocephala festiva* (Distant)
15. *Arcofacies fullawayi* Muir
16. *Epeurysa abatana* Asche

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

17. *Epeurysa nawaii* Matsumura
18. *Tarophagus colocasiae* (Matsumura)
19. *Tarophagus persephone* (Kirkaldy)
20. *Sogatellana geranor* (Kirkaldy)
21. *Sogatellana quadrispinosa* (Muir)
22. *Sogatella furcifera* (Horvath)
23. *Sogatella vibix* (Haupt)
24. *Sogatella kolophon* (Kirkaldy)
25. *Latistria eupompe* (Kirkaldy)
26. *Tagosodes pusanus* (Distant)
27. *Terthron albovittatum* (Matsumura)
28. *Unkanodes albifascia* (Matsumura)
29. *Unkanodes sapporonus* Matsumura
30. *Stenocranus* sp. A
31. *Stenocranus pacificus* Kirkaldy
32. *Stenocranus* nr. *pseudopacificus* Kirkaldy
33. *Stenocranus* sp. B
34. *Perkinsiella* sp. A
35. *Perkinsiella vastatrix* Muir
36. *Perkinsiella pseudomaidis* Muir
37. *Perkinsiella* nr. *bakeri* Muir
38. *Perkinsiella saccharicida* Muir
39. *Perkinsiella graminicida* Muir
40. *Peregrinus maidis* (Ashmead)
41. *Euidella* sp.
42. *Dicranotropis* sp.
43. *Numata muiri* (Kirkaldy)
44. *Nycheuma cognatum* (Muir)
45. *Metropis nigrifrons* Kusnezov
46. *Sardia rostrata* (Kirkaldy)
47. *Paradelphacodes paludosa* (Flor)
48. *Harmalia anacharsis* Fennah
49. *Harmalia heitensis* (Matsumura)
50. *Harmalia samesimae* (Matsumura & Ishihara)
51. *Toya propinqua* (Fieber)
52. *Euidellana celadon* Fennah
53. *Cemus sauteri* (Muir)
54. *Cemus nigromaculosus* (Muir)
55. *Cemus changchias* Kuoh
56. *Cemus* sp. A
57. *Cemus* sp. B
58. *Opiconsiva dodona* (Fennah)
59. *Laodelphax striatellus* (Fallen)
60. *Coronacella sinhalana* (Kirkaldy)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

61. *Nilaparvata bakeri* (Muir)
62. *Nilaparvata muiri* China
63. *Nilaparvata albostriata* (Kirkaldy)
64. *Nilaparvata myersi* Muir
65. *Nilaparvata lugens* (Stål)

Key to the planthoppers of the rice agroecosystems in tropical Asia

1 Tibial spur of leg III subulate, circular, or angulate in cross section; antennae long 2
1' Tibial spur of leg III wedge-shaped with a single spine at apex or tectiform with teeth on hind margin; antennae relatively short 5

2 Antennae long and reaching midclypeus, second segment 3x longer than first; median carina of frons merged close to base; pygofer without midventral processes; parameres contiguous and swollen in basal one-third, curved outward forming a concavity at midlength, apices pointed almost touching one another ..... *Melanesia pacifica* Kirkaldy, 1907
2' Antennae very long, reaching beyond clypeus, second segment at least one-half longer than first; median carina of frons merged at about midlength; mid-ventral process of pygofer present; parameres not basally enlarged 3

3 Mesonotum with three carinae ..... *Melanugyops* sp.
3' Mesonotum with five carinae 4

4 Antennae as long as frons and clypeus combined; median carina of frons forked above midlength slightly in line to lower level of eyes; median ventral process of pygofer knob-like with rounded tip; parameres concave above mid-length with pointed apices subparallel to each other; body dirty light brown mottled with black spots on vertex and pronotum; body length 9–11 mm ..... *Ugyops vittatus* (Matsumura)
4' Antennae distinctly longer than combined length of frons and clypeus; median carina of frons bifurcates below midlength, way below lower level of eyes; median ventral process of pygofer apically broad and truncate; parameres slender and subparallel, tips meeting each other; body uniformly yellowish brown; pronotum lined with transverse row of three small and distinct reddish brown spots on each side; body length 8 mm ..... *Ugyops tripunctatus* (Kato)

5 Tibial spur of leg III solid, inner surface concave without teeth along posterior margin 6
5' Tibial spur of leg III tectiform with teeth on inner margin 18

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

6 Head noticeably extended in front of eyes, anterior end broadly rounded and snout-like; vertex without transverse to oblique connecting carina, subtriangular with lateral sides convex; frons long and reclined apically; clypeus as long as wide to longer than wide; pygofer with distinct medioventral process; parameres long, basal angles may bear long processes; forewings with small hair-bearing granules near veins; body length 3.1–4.25 mm 7

6' Head shortly developed in front of eyes, anterior end not snout-like; vertex with connecting carina; frons and clypeus different from above; pygofer without mediocaudal process; if present, anal segment with a pair of lateroapical processes; forewings without the hair-bearing granules 16

7 Head strongly projected forward far from eyes; face oblique almost at 45 degree angle viewed laterally 8

7' Head shortly porrect, close to the eyes; face in lateral view not at 45 degree angle 12

8 Vertex less than 2x longer than wide, 1.7–1.8x longer than the pronotum 9

8' Vertex 2-2.9x longer than wide, 2.5–3.3x longer than the pronotum 10

9 Vertex, frons except brown spot on frontoclypeal suture, upper gena, and pronotum green; vertex 1.7x longer than wide and 1.7x longer than the pronotum; postclypeus and base of gena dark brown; dorsal side of mesopleuron dark brown; forewing with knob-like protrusion on apical end of longitudinal vein M and subbasal area of longitudinal vein $R_2 + M_1$; body length 4 mm ..... *Tropidocephala* sp.

9' Vertex, frons, gena, and pronotum yellowish red; vertex 1.5x longer than wide and 1.8x longer than pronotum; postclypeus pale red; dorsal side of mesopleuron yellowish red; forewing without knob-like protrusions; parameres long, subparallel to each other except slightly enlarged base and diverging narrow apices; body length 3.6 mm ..... *Tropidocephala flavovittata* Matsumura

10 Vertex slightly 2x longer than wide, 2.5x longer than pronotum; pygofer with slender and pointed mediocaudal and laterocaudal processes; paramere with two concavities, subbasal inner cavity fused, apices rounded and slightly converging; body length 3.8 mm ..... *Tropidocephala nigra* (Matsumura)

10' Vertex 2.9x longer than wide, more than 3x longer than pronotum; pygofer and parameres differently shaped 11

11 Forewings with darker markings except hyaline vertical median band and black markings on apical ends of longitudinal veins Sc + R and $M + Cu_1$; knob-like protrusions more pronounced ..... *Tropidocephala dimidia* Yang and Yang

11' Forewings with light or pale markings, apical ends of Sc + R and $M + Cu_1$ without markings; knob-like protrusions indistinct ..... T*ropidocephala sinuosa* Yang and Yang

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

12 Vertex as long as to slightly longer than wide 13
12' Vertex distinctly longer than wide 15

13 Vertex as long as wide at midline, triangular in dorsal view; antennae not reaching the frontoclypeal suture; pygofer strongly concave viewed ventrally with a small medioventral process; parameres with an elongate basal process parallel to each other, more slender than the diverging outer processes with narrowed and outwardly curved apices; generally reddish brown except light brown face and gena; body length 3.2–3.4 mm ..... *Tropidocephala grata* Yang and Yang
13' Vertex slightly longer than wide; parameres diverging; body color not reddish brown; body length variable 14

14 Vertex greenish brown, as long as pronotum; pygofer with a short knob-like medioventral process, wing-like protrusions absent; parameres narrow and flattened basally with double concavities along the outer subbasolateral and subapicolateral areas, apices rounded; body length 3.7–3.9 mm ..... *Tropidocephala formosa* Matsumura
14' Vertex yellowish green, about 1.3x longer than pronotum; pygofer with a narrow and slender medioventral process and midlateral wing-like protrusions present; parameres flat, broad subapicolaterally forming a short, bluntly rounded tip, inner side with two short processes basally and basal one-third; body length 3.1–3.6 mm ..... *Tropidocephala brunnipennis* Signoret

15 Face with black markings only on apices of frons and base of clypeus; forewings more than 3x longer than wide, apical end narrow and acutely rounded; longitudinal veins M_2, M_3, and Cu_1 mat with brown bands; pygofer with a small, pointed, and granulate medioventral process; parameres subparallel to each other, inner bases each with a small spine, tip truncate laterocaudally; body length 3.5–3.7 mm ..... *Tropidocephala saccharivorella* Matsumura
15' Face black along apical and basal areas, clypeus, and gena; forewings barely 2.6x longer than wide, apical end broadly rounded, apices of longitudinal veins Sc + R and M with black markings; pygofer with strongly produced lateral margins, flattened medioventral processes with emarginated and granulate apices; parameres with a relatively long and slender subbasal process parallel to each other, main paramere body elongate and equally wide with apical one-sixth narrowed subapically and curved outward, tip oblique and sharply pointed at basal angle; body length 3.4–3.8 mm ..... *Tropidocephala festiva* (Distant)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

16 Vertex distinctly quadrate, in profile at right angle to frons; lateral carina concave; submedian carina of vertex transverse; frons nearly twice as long as broad; apical half of first antennal segment and both ends of segment II dark brown; lateral carina of pronotum converging, posterior ends reach hind margin; forewings taper midapically, sinuate below apex; anal segment without paired processes; pygofer without mediocaudal process; parameres long and slender, inner basal one-third rounded but separated from each other, apical two-thirds slightly converging, apices twisted outward; general color green to yellowish green; body length 3.15–3.6 mm.....*Arcofacies fullawayi* Muir

16' Vertex obtusely rounded into frons forming rounded apical margins, lateral carina slightly convex; submedian carina of vertex converging toward frons; frons 1.4x longer than wide; antennal segments without bands; pronotal carina diverging, not reaching hind margins; mediocaudal process present; anal segment with a pair of short processes; parameres with inner process, diverging apically; body brown to pale yellow or reddish brown; body length 3–3.93 mm 17

17 Median medioventral processes as high as lateral ones; vertex 2.3x wider than long; forewing transparent or hyaline without bands; parameres moderately long with shorter mid-inner process wider at midlength, narrowing apically, outer process longer and broader with truncate to oblique apices projected outward; body length 3–3.13 mm; body color pale yellow to reddish brown .....*Epeurysa abatana* Asche

17' Median medioventral process higher than lateral ones; vertex 3x wider than long; forewings dark brown at apical half; parameres slender with basal inner processes uniform in diameter and distinctly lower than the outer process, with moderately rounded apices; body length 3.5–3.9 mm; body color brown .....*Epeurysa nawaii* Matsumura

18 Median carina of vertex, pronotum, and mesonotum with a broad to narrow white or yellowish white band.....19

18' Median carina of head, pronotum, and mesonotum without the above.....45

19 Frons with median carina simple or forked near the base 20

19' Frons with median carina forked near middle to basal one-third 25

20 Abdominal tergites VII-IX with a dorsomedian whitish yellow band; ventrocaudal margin of pygofer trilobate.....21

20' Abdominal tergites concolorous, without dorsomedian whitish yellow band; ventrocaudal margin of pygofer not trilobate 22

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

21 Lateral pair of ventrocaudal processes broadly rounded lateroventrally, distal margin projected medially forming a pointed inner edge; medioventral processes subtruncate, longer than the lateral ones; aedeagus with diverging reflected processes; female genitalia with a thumb-like basal process in valvifer VIII and strongly formed movable double-scale in abdominal sternite VI present..... *Tarophagus colocasiae* (Matsumura)

21' Lateral pair of ventrocaudal processes tapers apically as long as lateral ones; medioventral processes rounded apically; aedeagus with broadly fused reflected flag-like process at base, apically bifurcates into subequal spines; valvifer VIII of female genitalia with bases medially widely rounded; sternite VI with medially asymmetrical notch movable double-scale ..... *Tarophagus persephone* (Kirkaldy)

22 Median portion of head, pronotum, and mesonotum with a broad white longitudinal band..... 23

22' Head, pronotum, and mesonotum with a narrow, pale whitish yellow median stripe..... 29

23 Anal segment with two pairs of processes on the ventral side 24

23' Anal segment with one pair of processes on the ventral side 25

24 Forewings subhyaline with yellow tinge, subcosta and commissure yellowish white, membrane lightly developed; first antennal segment as long as second; anal segment with inner pair of processes slender and longer than the short and more robust outer pair, apices of outer pair converging and inner pair diverging; parameres cleft apically, mid-outer part wide, rounded to subtruncate; anal style distinctly long..... *Sogatellana geranor* (Kirkaldy)

24' Forewings hyaline with yellowish veins, small granulations sparse, apex of clavus with a light reddish brown tinge; first antennal segment distinctly shorter than second segment; anal segment with a distinctly long inner process, outer one small and short; parameres with an apico-inner tip strongly projected inward, outer tip tapers slightly and mid-outer trunk laterally truncate; anal style relatively short ..... *Sogatellana quadrispinosa* (Muir)

25 Pterostigma distinct; apicobasal half of forewing and apex of clavus with dark brown band; frons, gena, and clypeus black except whitish carina in frons and clypeus; parameres with a bulbous subbasal inner margin, unequally cleft apex with a small inner spine and more apically rounded outer part ..... *Sogatella furcifera* (Horvath)

25' Pterostigma indistinct; forewing with or without band; frons, gena and clypeus, and parameres different 26

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

26 Genital segment of male with a U-shaped mediodorsal margin of diaphragm; parameres usually broad at inner midlength, apex cleft; forewings usually banded along apicobasal half.....27

26' Entirely not as above.....28

27 Forewings transparent, unmarked; face whitish with dark brown genae; parameres with slim and petiolated base, apex strongly cleft with apico-outer side obliquely truncate, apico-inner sides acute and converging ..... *Sogatella vibix* (Haupt)

27' Forewings distinctly banded, dark brown along apicobasal half; face with yellow to dirty yellow frons and genae; parameres with relatively robust base, subbasal expansion, concave apex with a longer obliquely projected outer tooth and a much smaller, acute apico-inner tooth converging slightly..... *Sogatella kolophon* (Kirkaldy)

28 Pterostigma indistinct; forewings hyaline without tinge; slender parameres strongly diverging, taper apically, almost reaching laterodorsal angle of genital segment, broad subbasally with a subtruncate inner part; diaphragm mediodorsally with broad W-shaped protrusion; clypeus yellow brown..... *Latistria eupompe* (Kirkaldy)

28' Pterostigma distinct; forewings prominently banded along apicobasal half and claval suture extended to pterostigma, bands form four transparent spots between veins on the apical margins; basal compartment of vertex subrectangular; parameres almost uniformly broad, widely concave apex slightly narrower than subbase, outer tip higher than inner spine; diaphragm mediodorsally T-shaped; clypeus brown, lighter than dark brown base of frons ..... *Tagosodes pusanus* (Distant)

29 Head not narrowed in front of eyes; mediolateral carina of vertex meeting together on vertex forming one mediolongitudinal carina; forewing opaque to hyaline; parameres relatively broad, basally without outgrowth, apex subtruncate or with a short process and long processes.....30

29' Head noticeably produced in front of eyes; median carina of vertex apically converged but not distinctly meeting on vertex, extended on to face except at extreme base; forewings mostly transparent; parameres slender, often with basal outgrowth, apices narrowed and acute.....32

30 Vertex to scutellum with a moderately broad median longitudinal pale yellow-white band; antennae, face, and genae blackish brown; forewings subhyaline with a gray tinge, hind margin whitish and veins mostly light brown to dark brown; short and subglobose pygofer with a concave medioventral area; paramere subcontiguous basally, diverging apically with subtruncate tips viewed caudally, rounded viewed laterally; body dark brown; body length ..... 2.6–3.4 mm ..... *Terthron albovittatum* (Matsumura)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

30' Vertex to scutellum with a narrow median pale white stripe; antennae, face, and genae light brown; forewing opaque to hyaline; genitalia different 31

31 Forewings opaque, black except whitish apical and basal areas; vertex to scutellum with a fairly wide longitudinal band; face, clypeus, and genae deep black; base of parameres inwardly enlarged, rounded, directed to each other, narrow at midlength and apical one-third broad with a small outwardly projected inner end, a globose outer process viewed laterally; aedeagus sigmoid and hook-shaped with rounded tips; body length 1.8–2.5 mm ..... *Unkanodes albifascia* (Matsumura)

31' Forewings hyaline with conspicuously white hind margin of clavus and broadly brownish hind margins, apical one-third of veins infuscated; vertex to scutellum with a narrow median longitudinal stripe; face, clypeus, and genae pale brown; base of parameres not enlarged, axe-like viewed laterally, inner margin uniformly concave and wide, forming a longer and rounded inner process directed upward, but one facing another in a subtruncate pattern, lower outer process subacute; aedeagus straight and arrow-like, barbed with subapical spines; body length 4.5–4.7 mm ..... *Unkanodes sapporonus* Matsumura

32 Forewings transparent except Cu_1 vein brownish below Cu_{1b} cell; frons, genae, and clypeus dark brown with white median and lateral carinae; frons 1.5x wider apically than base; parameres slender and curved outward anteriorly, narrowed inwardly at tip, then curved outwardly forming a hook; pygofer brown, midventrally V-shaped; tibial spur with 23 spines..... *Stenocranus* sp. A

32' Forewings uniformly hyaline; frons, genae, and clypeus yellow-brown; frons 1.6–1.8x wider apically than base; parameres and pygofer different; tibial spur with about 21–30 spines..... 33

33 Frons with a broad white median longitudinal band and narrow brown lateral carina; clypeus white; genae yellowish brown; parameres slender, uniformly straight and diverging, contiguous basally, tips narrowed forming outwardly projected hooks; anal segment with two short processes; tibial spur with 24–25 spines; body length 6.8–7.8 mm .....*Stenocranus pacificus* Kirkaldy

33' Without the combination of above characters..... 34

34 Face with two reddish brown longitudinal bands and three whitish yellow carinae, apex 1.6x wider than base; genae yellow-brown; clypeus swollen, yellow-orange; abdomen orange-yellow; tibial spur with 21 spines; base of parameres contiguous with a thin short spine, tips diverging, midpart long and slender outwardly hooked reaching beyond laterodorsal angle of pygofer; anal style relatively long; body length 6.12 mm .....*Stenocranus* nr. *pseudopacificus* Kirkaldy

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

34' Face, clypeus, and genae uniformly yellowish brown; frons 1.8x wider than base; abdomen light to dark brown; tibial spur with 30 spines; base of parameres contiguous with a long, erect, sharply pointed spine at right angle, paramere body strongly concave along inner lateral margin, slightly converging apically forming a small hook at tip, projected laterally outward; anal style short; body length 5 mm ..... *Stenocranus* sp. B

35 Antennal segments somewhat flattened; forewings distinctly banded, and granulated; pygofer with two medioventral spines 36
35' Antennal segments cylindrical; forewings usually without band, if banded, granulations very fine to indistinct; pygofer with none or three medioventral spines 41

36 Black species including legs and antennae; face black except light yellow-brown transverse band anterior of median Y-carina running to the genae, frons broadest at level of Y-median carina; pterostigma indistinct; forewings granulated, glossy light brownish yellow with two glassine spots on apical margins of cubital cell; medioventral part of black pygofer with two sharp processes curved caudally; bases of parameres robust and contiguous, inner margin concave forming 3–4 short spines at tip; anal segment with a pair of horn-like processes projected posteriorly; body length 7.7 mm ..... *Perkinsiella* sp. A
36' Light brown species without the combination of above characters 37

37 Face with a single color pattern, mottled with pale yellow-brown spots, subapical part bears two pairs and four pairs toward base, and 2–3 spots on lateral carina; forewings weakly granulated tinged brown on veins along apical one-third; pterostigma prominent; tibial spur with 32 spines ..... *Perkinsiella vastatrix* Muir
37' Face with two color patterns distinct 38

38 Small-bodied planthoppers, 5.4 mm long; frons with a transverse pair of interrupted white bands at level of simple eyes, four dots at subapex in line with two dots in each genae present, apex of frons white; median carina of clypeus white; antennae both blackish brown except yellow mediodorsal band on each segment; tibia I yellow with two brown bands subapically and subbasally; forewings strongly granulated, concave blackish brown band along median crossveins to vein M_1 present, apices of longitudinal veins also blackish brown; tibial spur with 27–28 spines…. *Perkinsiella pseudomaidis* Muir
38' Large-bodied planthoppers, 7 mm or more long 39

39 Forewings with light or pale brown markings on M_1 to Cu_1 or opposite the cubital cell, 3–4 glassine spots present along apical margins 40

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39' Forewings with dark brown longitudinal band running along lower half of wings, darker along apical third opposite cubital cell; body length 7 mm ..... *Perkinsiella* nr. *bakeri* Muir

40 Apical half of frons whitish yellow extended to genae and sides of thorax, apex close to frontoclypeal suture with two triangular brown spots similar to genae; basal half of frons brown mottled with minute spots in four transverse rows; clypeus dark brown concolorous to base of coxa I and mesopleuron; forewings with alternating whitish yellow and brown dots, pale brown band opposite cubital cell forming four circular glassine spots along apical margins, granulations relatively sparse; body length 7.6 mm ..... *Perkinsiella saccharicida* Muir

40' Apical half of frons brownish with white band below Y-median carina and along frontoclypeal margin; genae dull brown; clypeus brown; basal half of frons with indistinct white spots; forewings as above but granulations denser and closer to each other; body length 7 mm ..... *Perkinsiella graminicida* Muir

41 Forewings with distinct band and pterostigma 42

41' Forewings with or without band, pterostigma indistinct 43

42 Forewings not granulated, banded opposite cubital cell marking the veins in apical half dark brown and with four oblong glassine spots; pygofer with distinctly concave medioventral margin without processes; parameres contiguous basally, basal two-thirds parallel to each other, apical one-third curved outward then inwardly converging, tips slightly cleft; head width narrower than pronotum; body length 6.5–7.6 mm ..... *Peregrinus maidis* (Ashmead)

42' Forewings finely granulated, gray brown band covers Sc_1, R_1, M_1 to M_3, and Cu_1; medioventral margin rounded with three small teeth; parameres slender, broad basally projected caudally, diverging and twisted laterally, forming a narrow twisted apex directed laterally to the outside; head and pronotal width subequal; body length 5 mm ..... *Euidella* sp.

43 Lateral carina of pronotum visibly not reaching hind margin of pronotum; face broadest at apical one-third, lateral carina convex; clypeus and genae yellow-brown; second antennal segment less than twice as long as first; pygofer dark reddish brown with yellowish anal style; medioventral margin widely concave; parameres with a basal spur pointed posterad, midhalf rather flat and diverging, apical third thinly flat projected posteriorly; body length 4.2 mm ..... *Dicranotropis* sp.

43' Entirely not as above 44

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

44 Forewings with a longitudinal pale brown band across wings, granulations distinct; scutellum brownish yellow; frons darker than clypeus, mottled and dark brown like the genae; medioventral processes absent; long and slender parameres basally wide protruding caudally, projected upward with sharply pointed tip gently diverging; anal segment with two processes and aedeagal spine very long extended outward from base of parameres; tibial spur with 29 teeth; body length 5.5 mm .....*Numata muiri* (Kirkaldy)

44' Forewings hyaline with dark brown vein in apical half, granulations feeble; scutellum whitish yellow; frons yellow-brown with mottles and more spots lining the lateral carinae; clypeus and genae uniformly yellow-brown; medioventral process with a long median and two short lateral spines; parameres strongly diverging with pointed base directed caudally, flat and wide medially and acute apically; anal segment with two brown processes and aedeagal spine curved downward from base of parameres, then curved upward at level to midlength of parameres, tip bifurcate; tibial spur with 36 teeth; body length 5 mm .....*Numata* sp.

45 Forewings mostly dark brown; vertex narrow and projected anteriorly or rounded in front of vertex; median carina of mesonotum present or obsolete 46

45' Forewings mostly hyaline; vertex not strongly projected in front of head, never rounded 47

46 Head in profile rounded; lateral carinae of pronotum diverging concavely away from hind margin; median carina of mesonotum absent, area distinctly grooved; body generally blackish except shiny brown forewings, blackish brown antenna, transparent small spots at apex of Cu_{1b} cell and a larger spot at Sc cell; broad transverse white band along posterior margins of pronotum; median carina of rectangulate frons obsolete on both ends; tibial spur with 27 spines or teeth .....*Metropis nigrifrons* Kusnezov

46' Head clearly narrowed in front, well protruded anterior of the eyes; forewings with a large transparent spot opposite subcostal cell and three round spots along apical margins; lateral carina of pronotum converging, not reaching hind margin of pronotum; body black to reddish brown with yellow antennae, thin yellow carina on vertex, anterior margin of pronotum, and tip of scutellum; median carina of frons entire and Y-shaped carina distinct; tibial spur with 17–19 spines.....*Sardia rostrata* (Kirkaldy)

47 Forewings without pterostigma.....48

47' Forewings with pterostigma.....53

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

48 Scutellum light brown lined with light net-shaped markings; lateral carinae of frons slightly convex; parameres narrow V-shaped, broad apically, bolo-shaped and parallel-sided with subtruncated tips diverging or outer lateral tips acute; pygofer rounded to slightly oblong, medioventral margin moderately concave; anal segment with a pair of short processes; body length 2.8–3 mm ..... *Paradelphacodes paludosa* (Flor)

48' Scutellum without net-shaped markings; lateral carina of frons usually subparallel sided; parameres, pygofer, and anal segment different 49

49 Pronotum pale whitish yellow, anterolateral margins near eyes dull brown concolorous to the vertex and mesonotum; tip of scutellum light to pale brown 50

49' Pronotum, vertex, and mesonotum with similar colorations 52

50 Parameres each with an inner basal node bearing a long process and erect processes, subparallel-bodied, anterior end bilobed, higher inner lobe converging apically, longer and rounded apically, outer lobe broadly rounded and diverging laterally ..... *Harmalia anacharsis* Fennah

50' Inner tips of parameres acute, lower than to subequal in height to outer tip ... 51

51 Body elongate brown including vertex, face, genae, and forewings; carinae and hind margins of pronotum and scutellum pale brown; pygofer narrowed midlaterally; anal style moderately long; parameres basally contiguous forming a V-shaped profile then slightly diverging, apex unevenly bifurcate with a small inner tip acute and outer tip shortly rounded and diverging; body length 3 mm ..... *Harmalia heitensis* (Matsumura et Ishihara)

51' Body light or pale brown including face, clypeus, and antennae; forewings subhyaline; margins of frontal carinae dark brown; pygofer broadest at mid-length, narrowed along basal one-third; anal style short; parameres U-shaped in profile with broad apex, inner tip relatively slender with blunt apex converging, outer tip rounded to subacute directed laterally; body length 1.7 mm ..... *Harmalia samesimae* (Matsumura et Ishihara)

52 Pale yellow to yellowish brown body including clypeus, antennae, and face except dark brown carina on frons; forewings visibly hyaline with feeble granulations; pronotum and mesonotum in fresh specimens may show yellowish orange light tinge at midscutellum between whitish lateral carinae; antennae barely reach frontoclypeal suture; pygofer reddish brown, slightly oblong without a median ventral process; parameres united and moderately broad basally, inner apical half concave, apices subtruncate forming converging inner and diverging outer tips; tibial spur with 19 spines..... *Toya propinqua* (Fieber)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

52' Brown, similar to *Nilaparvata lugens* (Stål); face, clypeus, and gena dirty brown; forewings granulated; pronotum without yellow-orange tinge extended to mesonotum; antennae with 2nd segment 1.6x times longer than blackish brown segment I, reach midclypeus; pygofer distinctly oblongate, median ventral area concave, extended outward, bears a small blunt process; parameres united at basal one-half, indented or concave, apically forming rounded apex with a small and pointed inner process converging; tibial spur with 27 spines..... *Euidellana celadon* Fennah

53 Forewings distinctly marked with bands, strongly granulated; head slightly narrower than pronotum; pronotal carinae yellow and midmesonotum with a longitudinal pale yellow band; pygofer with a thin but broad medioventral plate..... 54

53' Forewings not marked as above; head visibly narrower than pronotum; pronotal carinae and mesonotum not yellowish; medioventral thin plate on pygofer absent 59

54 Males..... 55

54' Females 58

55 Pygofer with thick yellowish white lateromedian area almost oblong..... 56

55' Pygofer with thin yellow lateromedian area, subquadrate..... 57

56 Lateromedian area of pygofer yellow; parameres joined at base with a caudally projected small process, slender and tapers apically, narrow V-shaped in profile, outer lateral margin with a laterally projected blunt spine at midlength; propleuron white with five spots or dot marks; frons, clypeus, and genae blackish brown; frontoclypeal suture yellow; tibial spur with 36 spines..... *Cemus sauteri* (Muir)

56' Lateromedian area of pygofer white to whitish yellow; parameres without laterally projected blunt spine along mid-outer lateral margin; anal segment with a pair of long and slender processes curved inside the segment; propleuron whitish yellow without spots; frons blackish brown; clypeus with yellow basal half and dark brown apical half; frontoclypeal suture white; tibial spur with 30–33 teeth..... *Cemus nigromaculosus* (Muir)

57 Forewings almost entirely dark brown except transparent areas between veins Sc and R_1 and veins M_1 and M_2; frons concolorous with genae and clypeus, all reddish brown; frons flat, 1.9x longer than wide; antennal segment II 1.4x longer than segment I; pygofer with straight midlateral areas; parameres merged basally and enlarged, midhalf constricted, apical one-half flat, diverging and tip rounded; aedeagus Y-shaped connective with long arms; body length 5.95 mm ..... *Cemus changchias* Kuoh

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

57' Forewings with light brown and transparent areas, convex brown band runs from crossveins opposite Sc and Cu cells to apical margins, R_1 and R_2 veins brown; frons and clypeus paler than genae, frons with a shallow cavity subapically, nearly twice as long as wide; antennal length as above but segment 1 much darker than second; pygofer with concave midlaterals; parameres base moderately open, midhalf less constricted, apical half flat and blade-like, diverging with blunt tip; aedeagal Y-connective with short arm; body length 5.4 mm ..... *Cemus* sp. A

58 Vertex, pronotum, and mesonotum with a median longitudinal brown band, yellow brown in the scutellum; frons, clypeus, and genae reddish brown; frons with pale spots and genae none; antennal segment I black with yellow dorsal band..... *Cemus* sp. A

58' Vertex, pronotum, and mesonotum with a median longitudinal yellow-brown band; scutellum tip brown; frons, clypeus, and genae brown with distinct yellow spots; genae each with two spots; antennal segment I dark brown.... *Cemus* sp. B

59 Basal segment of tarsi III spineless laterally; pronotum white to pale yellow; mesonotum black to blackish brown, tips never brown..... 60

59' Basal segment of tarsi III with one or more spines laterally; pronotum, mesonotum, and tip of scutellum uniformly brown..... 62

60 Pronotum light to dark brown similar to vertex and mesonotum; vertex carina coarse with lateral margins straight; median carina of clypeus faded; forewings hyaline with fuscous tinge, veins fuscous and with a linear spot between claval vein and commissural margin dark reddish brown, lighter basad of the margins; antennal segment I yellow-brown; pygofer rounded with truncated mediocaudal area; parameres basally contiguous, inner lateral margins concave at most part, rather straight in outer part, apex emarginate with convergingly acute inner tooth, diverging subtriangular outer tooth; tibial spur with 19 teeth……..…..*Opiconsiva dodona* (Fennah)

60' Without the combination of above characters..... 61

61 Central carina of frons pale colored; vertex brown with yellowish brown carinae but black between median and lateral carinae; antennal segment I pale yellow-brown; forewings subhyaline with light brown tinge on clavus; pterostigma dark brown; pygofer oblongate and seemingly bilobed; parameres widely diverging from base, outer lateral subapex indented forming bluntly rounded tips; short anal segment processes parallel to one another..... *Laodelphax striatellus* (Fallen)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

61' Central carina of frons deep black; vertex black; antennal segment I darkly pigmented; forewings hyaline; pterostigma indistinct to very light brown; pygofer subglobose without bilobed appearance; parameres swollen at base, almost touching each other, broad and uniform in width, concave inner margin with acute and converging inner lateral apices, oblique at tip; anal segment with diverging processes..... *Coronacella sinhalana* (Kirkaldy)

62 Submedian frons concave forming an incomplete median carina; forewings with dark brown tinge toward apical margins opposite cubital cell, and veins R_1 to M_1; pygofer with a distinctly pointed process and laterally barbed medioventral processes; parameres cleft apically, small inner lateroapical tooth converging, large outer lateroapical tooth acute and diverging; aedeagus bulbous apically with a small hook and spines close to the apex; tibial spur with 28–30 teeth.....*Nilaparvata bakeri* (Muir)

62' Submedian of frons not excavated, median carina complete; pygofer with or without processes.....63

63 Medioventral margin of pygofer with three small processes; parameres cleft apically, apico-inner tip smaller than the apico-outer part with rounded tip; subapical part of parameres with a small spine projected caudally; aedeagus snoutlike at tip similar to a bird's head; female genitalia with inner margin of first valvifer basally spatulate; tibial spur with 18–20 teeth ...*Nilaparvata muiri* China

63' Pygofer without any processes on the medioventral margin 64

64 Pronotum opaque white; pygofer apically rotundate oval, thickened rim along anal third with a short spine; parameres broad, apically bifid with subapical inner lateral spine converging; tibial spur with 16 spines.....*Nilaparvata albostriata* (Kirkaldy)

64' Pronotum brown to stramineous; pygofer and parameres different; tibial spur with 19–36 teeth.....65

65 Carina of vertex prominently developed; pygofer moderately long, dorsolateral angles not produced caudally, inflected mesad; parameres moderately long, broadly indented lateromedially along inner side, outer midlaterals produced laterad, nipple-like forming a concave cavity subapically, apex broad with a small upcurvedly projected outer process and a broadly tapered inner process; aedeagus moderately long, straight, lined with 7 teeth along dorsal margin, ventrally with a long narrow process at midlength; tibial spur with 19 teeth.....*Nilaparvata myersi* Muir

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

65' Carina of vertex faintly developed; pygofer subovate, widest at about mid-length, dorsolateral angle slightly produced caudally; parameres relatively long, inner bases swollen almost touching each other, prominently concave at mid-inner area, slightly concave toward converging apices, outer apicolateral half moderately swollen; aedeagus long and slender, tapering apically, with teeth along caudal margins, broad medially, apex usually upturned left; tibial spur with 30–36 teeth. .. . . *Nilaparvata lugens* (Stål)

Systematic account of delphacid planthoppers

SUBFAMILY ASIRACINAE (Fieber 1872)

1. Genus *MELANESIA* Kirkaldy, 1907

Melanesia Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Exp. Stn. Entomol. Bull. 3:128
Haplotype: *Melanesia pacifica* Kirkaldy, 1907

Generic features: Head a little longer than wide viewed dorsally; vertex transverse, irregularly shaped, with two fairly deep but obscurely defined fovea; frons about two and a half times as long as wide apically and basally truncate, a single filiform carina forking close to the base, lateral margins widening a little toward the apex but narrowing slightly at the apical margin; genae not carinate, labium reaching beyond the coxae I; antennae long and reaching to about the middle of clypeus, somewhat flattened with a few circular sensory organs, but many short bristles; second segment 3x as long as the first, which is rather wider apically than basally; pronotum very transverse, lateral carina curving under the eyes; scutellum 4x as long as the pronotum with five carina; tegmina with forking radial vein much closer to base than the brachial, reforked basal of the subapical transverse line somewhat apical of the middle, the tegmina are bent in and there is a cross vein that cuts across the longitudinal ones, turning off obliquely toward the apex at the middle and turning off again, close to the apex of the clavus, into the commissure; tegmina closely and finely granulated both on and between the shortly piliferous veins; these are 1C apical veins, 4th and 5th reforking, 7, 8, and 9 having a common base; hind tibiae longer that the tarsi, with a basal spine and another basal of the middle; spur much as in genus *Ugyops*; basal segment of hind tarsi much longer than the other two together (reproduced from Kirkaldy 1907).

1.1 *Melanesia pacifica* Kirkaldy, 1907
Plates 1a, 5a, 10a, 18a, 24a, 32a, 35a-b

Melanesia pacifica Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Exp. Stn. Entomol. Bull. 3:129.

Features: Body length 6.25–7 mm. Vertex, pronotum, and scutellum yellowish fuscous, carina a little darker; frons yellowish, lateral carina very narrowly blackish brown; antennae, labium, legs, and sterna brownish yellow, tibia I and II obscurely

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

biannulate with fuscous; apices of first and second segments of hind tarsi more or less dark, tegmina brownish yellow except small dark spot about the middle of clavus, apical margin dark and often the subcosta; in male, sternites more or less ferruginous; last segment deeply rotundately emarginated; pygofer elongate, very sinuate in profile; anal tube elongately produced horizontally; parameres contiguous inwardly for a third of their length, then curving outward and recurving, apices acute and nearly contiguous; in female, sternites yellowish brown, sutured with black, few last segments deeply acute, angularly emarginated or ovipositor dark, much longer than pygofer (Kirkaldy 1907).

Host plants: Rice (Pawar 1972)
Economic importance: Not economically important (NEI)
Distribution: Fiji (Navua and Rewa) and the Philippines (new record)

2. Genus *MELANUGYOPS* Fennah, 1956

Melanugyops Fennah, 1956. Insects of Micronesia, Homoptera: Fulgoroidea 6:107-108.
Type: *Melanugyops erebea* Fennah, 1956

Generic features: Vertex quadrate, little longer than broad, slightly narrower at apex than base, a pair of oblique carinae arising at basal angles, and united medially distally, apical margin of vertex transverse, strongly interrupted by projecting median carina, basal margin transverse, near or before level of middle of eyes; frons longer than broad (about 2.5:1) with lateral margins shallowly convex, median carina and lateral margins subfoliate, the latter projecting laterad; frons and clypeus in profile forming a smooth shallow curve; eyes only slightly excavate below; ocelli absent; antennae cylindrical, not much shorter than frons and clypeus combined, second segment about 1.5x as long as first; rostrum with apex of subapical joint attaining post-trochanters; legs not at all foliate or compressed; post-tibiae laterally three-spined, apically four-spined, spur long, subulate, terminating in a spine; pronotum tricarinate, depressed between carinae, two-thirds as long as an eye behind eyes, lateral margins obsoletely bicarinate; mesonotum tricarinate; tegmina (brachypterous) scarcely reaching to apex of abdomen, Sc + R forked near node, M simple, Cu_1 forked near level of union of claval veins, no claval suture developed but vein Cu_2 distinct toward apex; claval area long, with claval veins united slightly basad of its middle; a few submarginal cross veins weakly present, but not forming a definite nodal line; veins not granulate or setose, but intervenal areas distinctly so in distal half; wings in brachypterous form, absent; male genitalia as in *Ugyops* (reproduced from Fennah 1956).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

2.1 *Melanugyop*s sp.
Plates 1b, 10b, 18b, 24b, 40a

Features: Similar to *Ugyops* except for the tricarinate mesonotum; vertex in middle 1.65x wider than long, apex rounded, lateral margins straight with a small thickened spot before narrowing in front, carina yellow; frons, clypeus, and gena lined with two moderately broad longitudinal reddish brown bands running from vertex to clypeus and from vertex to pronotum and mesonotum; antennal segments subequal in length, first segment thinner than second with black and yellow alternating longitudinal stripes, second segment broader apically than yellow-brown base except for reddish brown band frontally; forewings subhyaline in most parts, light brown band on apical one-third, C-shaped from Sc_1 down to the cubital veins, subapex of M_3 to margins of M_2, R_2 with similar band.

Host: Rice
Economic importance: NEI
Distribution: Philippines (Luzon Island)

3. Genus *UGYOPS* Guerin-Meneville, 1834

Ugyops Guerin-Meneville, 1834. Voyage aux Indes Belanger 1:477
Type: *Ugyops percheronii* Guerin-Meneville, 1834

Ugyops Guerin-Meneville, 1834. Voyage aux Indes Belanger 1:477
_____. Burmeister, 1835. Handb. d. Entomol. 2:152
Hygyops. Amyot et Serville, 1843. Hist. Hem. 511
Ugyops. Matsumura, 1943. Cat. Araeopid. Imp. Jpn. 5
Ugyopus (!). Esaki et Ishihara, 1943. Ibid
Ugyops. Matsumura et Ishihara, 1945. Mushi 16
_____. Ishihara, 1945. Sci. Rep. Matsuyama Agric. Coll. 2:8
Bidis. Walker, 1857. J. Proc. Linn. Soc. 1:88
Jugodina. Schumacher, 1915. Suppl. Entomol. 4:141

Generic features: Head including eyes narrower than pronotum; vertex longer than wide, submedian carina arising nearly from base, uniting before apex; frons long, lateral carinae convex at apical three-fourths, median carina varies from simple to widely separated; postclypeus as wide as base as frons at apex; rostrum reaching to metatrochanters; ocelli obsolete; antennae long, cylindrical; pronotum with lateral carinae not reaching hind margin or laterals; mesonotum five-carinate; hind tibiae with 2–3 spines laterally, spinal formula of hindleg 4-5-4; anal segment large; pygofer with medioventral process; aedeagus with phyllobase indistinct, phyllus coil; supporting plate distinct, elongate; diaphragm very weakly sclerotized; opening of parameres incomplete; parameres simple.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

3.1 *Ugyops vittatus* (Matsumura, 1905)
Plates 1c, 5b, 10c, 15a, 18c, 21a, 24c, 32b, 35c

Bidis vittatus Matsumura, 1905. Trans. Sapporo Nat. Hist. Soc. 1:31
Jugodina dictyophoroides Schumacher, 1915. Suppl. Entomol. 4:141
Bidis vittatus Matsumura, 1920. Illustr. Thous. Ins. Jpn. 1:54
B. vittatus Kato, 1933. Three col. Illustr. Ins. Jpn. Ser. 4, pl. 14. f. 1
Ugyopus (!) *vittatus* Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 5
Ugyopus (!) *vittatus* Matsumura et Ishihara, 1945. Mushi 16:59
Ugyops vittatus Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:9
U. v. Fennah, 1956. Proc. Calif. Acad. Sci. 4(28):463; Insects of Micronesia 6(3):95
U. v. Kuoh, 1983. Econ. Ins. Fauna China 27:29
U. v. Yang and Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:8-9

Features: Body length 9–11 mm. Body dirty light brown, scattered with black spots on vertex and on pronotum; a row of black spots in each side of pronotum indistinct; vertex along middle line 2.1x as long as broad as base just anterior to middle of eyes, base slightly narrower than apex; frons longer than broad (3–3.1:1); submedian carinae widest apart at base; second antennal segment 1.7x as long as basal, antennae as long as frons and clypeus; genae not tumid; ocelli obsolete; tegmina not long, but exceeding abdomen, Sc + R fork, Cu_1 fork, and union of claval veins at same level (reproduced from Matsumura and Ishihara 1945, Ishihara 1949, Fennah 1956).

Host plants: "Pteridophyta," rice
Economic importance: NEI
Distribution: Japan, Taiwan, and the Philippines (Luzon Island and Panay Island)

3.2 *Ugyops tripunctatus* (Kato, 1931)
Plates 15b, 21b, 28a, 35d

Bidis tripunctatus Kato, 1931. Bull. Biogr. Soc. Jpn. 2:165
Ugyops (!) *tripunctatus* Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 6
_____. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:10
Ugyops tripunctatus Yang and Yang, 1986. Taiwan Mus. Special Publ. Ser 6:9-15

Features: Body length 7.95–8.11 mm; yellowish brown with head marked on vertex and lateral areas before eyes; pronotum with median carina and along posterior margin red mottled with dark markings on each side; antennae yellowish brown, second segment subapically brown; genae reddish around base of antennae; frons dark brown basally; clypeus basally red; forewings hyaline, slightly mottled dark apically; vertex longer medially than wide basally (2.2:1), widely rounding subacutely into frons, distinctly wider at apex than at base, lateral margins concave at midhalf, apical margin truncate with merged submedian carinae distinct, submedian carinae united far before apex forming a common eminence, basal compartment of vertex shorter basally than median length (about 1:1.9), hind margin prominently angulate

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

medially; frons longer at midhalf than wide at broadest part by about 3:1, widest at basal three-fourths, lateral margins shallowly convex, median carina simple in apical fifth, forked in basal four-fifths with two arms widely diverging; rostrum reaching hind coxae, apical segment distinctly shorter than subapical about 1:1.8 and seemingly 4-segmented; antennae pass apex of clypeus, basal segment longer than wide by about 5:1, shorter than second by about 1:1.8; ocelli present as a scar; post-tibiae with three lateral spines; spinal formula in hind leg 4-5-4; forewings with 4-branched Sc anteriorly, Sc complete, M not fused with Cu_1 basally and apically, R-M basad M-Cu, Cu_1 forked before end of M-Cu, cu_{1a} forked apically; anal segment large, lateroapical angles rounded basally; pygofer in profile wider dorsally than ventrally; posterior margin longer below medioventral process than above, posteriorly with opening wider than long, lateral margin ill defined, medioventral process single and relatively wide; phallus circular with a long petiole viewed dorsally; supporting plate elongate, slightly widening along dorsal margins; diaphragm very lightly sclerotized; parameres simple, knife-like, and apically converging.

Host plants: Pteridophyta
Economic importance: NEI
Distribution: Taiwan

SUBFAMILY DELPHACINAE Jensen-Haarupt, 1915

4. Genus *TROPIDOCEPHALA* Stål, 1853

Tropidocephala Stål, 1853 Ofv. Ak. Forh. 10:266.
Type species: *Tropidocephala flaviceps* Stål, 1853.

Tropidocephala Stål, 1853. Ofv. Ak. Forh. 10:266
Nephropsia Costa, 1862. Ann. Mus. Zool. Napoli 1:76
Conicoda Matsumura, 1900. Entomol. Nachr. M. 26:258
Orchesma Melichar, 1903. Hom. Fauna Ceylon :94
Ectopiopterygodelphax Kirkaldy, 1906. Hawaii Sugar Plant. Assoc. Exp. Stn. Entomol. Bull. :412
Smara Distant, 1906. Fauna Brit. Ind. Rhynch. 3:478
Tropidocephala Matsumura, 1907. Ann. Mus. Hung. 5:57
_____. Kuoh, 1983. Econ. Insects Fauna China 27:31
_____. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser 6:15

Generic features: Head at eye level narrower than pronotum; vertex longer medially than wide at base, apex protruded in front of eyes distinctly, tricarinate, median carina simple, frons base to apex, lateral carinae converging apically, submedian carinae projected from apex of lateral carinae, uniting at apex developing the anterior margin of vertex; frons longer at middle line than wide at broadest part about 1.9–3:1; in profile more or less reclined apically, lateral carinae convex medially not connecting with lateral carinae of vertex, median carina forked at extreme base forming a small

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

cell; clypeus wider basally than frons at apex or subequal, prominently tricarinate but sometimes not; rostrum reaching to mesocoxae, apical segment slightly longer than wide; antennae short, cylindrical, second segment longer than first, often not reaching frontoclypeal suture; ocelli small but present; pronotum tricarinate, lateral carinae well developed, converging posteriorly and reaching hind margin; spinal formula of hind leg 5-6-4 or 5-7-4; forewings with small hair-bearing granules near veins; anal segment relatively large; pygofer in posterior view with opening longer than wide, lateral margin with or without protrusion, ventral margin with medioventral process; aedeagus with distinct phallobase, phallus slender, curved ventrad, phallobase wide basally, concave submedially to house phallus with very long process apically or basoventrally; aedeagus fastened to the anal segment, supporting plate indistinct; diaphragm membranous; parameres long, sometimes basal angles with long process; females without seventh abdominal sternite.

4.1 *Tropidocephala* sp.
Plates 1d, 10d, 18d, 24d, 40b

Features: Body length 5.4 mm; body greenish yellow, greenish tinge in the pronotum and midmesonotum; vertex, basal half of frons, and genae green; pale yellowish in apical half of frons, clypeus, and genae; blackish brown spot on midapex of frons, midbasal one-half of clypeus and genae, dorsal side of mesonotum; head in lateral view snout-like at 45-degree angle; antennae whitish yellow, apex of segment I with a brown ring, segment II longer than I with an oblique blackish brown stripe dorsolaterally; legs whitish; forewings subhyaline, granulated, claval base tinged pale yellow, vein M with a small, elevated, mound-like brown spot before and after cross veins, Sc + R with a pale white-yellow spine; anal style almost 2x longer than diameter of anal segment.

Host plant: Rice (Pawar, 1972)
Economic importance: NEI
Distribution: Philippines (Luzon Island)

4.2 *Tropidocephala flavovittata* Matsumura, 1907
Plates 15c, 21c, 28b, 35e

Tropidocephala flavovittata Matsumura, 1907. Ann. Hist. Nat. Mus. Hung. 5:63
_____. Schumacher, 1915. Mitt. Zool. Mus. Berlin 8:133
_____. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 9; Syst. Stud. Jpn. Araeopid. 6
_____. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:14
_____. Kuoh, 1983. Econ. Insects Fauna China 27:37
_____. Yang & Yang, 1986. Taiwan Mus. Spec. Publ. Ser. 6:16-17

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Features: Body length 3.6 mm; yellowish red in the vertex, pronotum, and mesonotum; median carina of vertex and carinae of pronotum and mesonotum dirty white; frons yellowish red with genae slightly darker and clypeus paler, median carina of frons dirty pale yellow; antennae white, apical margin of basal segment, subapical margin, and median of upper surface all dark brown; ventral surface of thorax and legs yellowish red, hind legs lighter in color; abdomen reddish yellow; vertex at midline longer than wide at about 1.5:1, longer than pronotum by about 1.8:1; frons longer than wide at broadest part about 3.3:1, broadest between eyes, median carina forked at basal one-third; clypeus slightly wider than frons at base; head set at about 45-degree angle viewed laterally; antennae short, not reaching frontoclypeal suture, segment I as wide as long, segment II longer than first by about 1.8:1; forewings with reddish brown to light brown tinge along the apical margins of M_3 and Cu_1 pygofer in posterior view with opening suboblongate, lateral margin not produced, medioventral process rather small, widening apically; parameres simple, long, narrowed, and diverged slightly apically; anal style relatively long.

Host plant: Unknown
Economic importance: NEI
Distribution: China and Taiwan

4.3 *Tropidocephala nigra* (Matsumura, 1900)
Plates 1e, 10e, 18e, 24e, 32c, 35f

Conicoda nigra Matsumura, 1900. Ent. Nachr. 26:251
_____. Oshanin, 1903. Verz. Palaark. Hemip. 2:300
Tropidocephala nigra Oshanin, 1910. Ibid. 451
_____. Esaki, 1932. Iconogr. Ins. Jpn. 1782. f. 3521
_____. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jap. 8; Syst. Std. Jpn. Araeopid. 8
_____. Matsumura et Ishihara, 1945. Mushi 16:60

Features: Body length 4 mm; vertex more than 1.5x the length of pronotum vertex, pronotum, and scutellum brownish black to black except the whitish lateral carinae; median carina of vertex sometimes white too; female body light brown dorsally and ventrally, lateral carinae of pronotum bordered with black.

Host plant: Rice
Economic importance: NEI
Distribution: Japan and the Philippines (new record)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

4.4 *Tropidocephala dimidia* Yang & Yang, 1986
Plates 15d, 21d, 28c

Tropidocephala dimidia Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:25-26.

Features: Body length 3.53–4.25 mm; general color pale yellow with base of antennal segment I and II ringed dark brown; vertex devoid of longitudinal markings between carinae; forewings dark apices on longitudinal veins with transparent vertical tinges before the cross veins and apical margins between veins from Sc_1 to M_1; cross vein Sc_2-R very feeble; vertex longer at midline than wide at base by about 2.9:1, longer than pronotum by about 3.3:1, strongly protruding in front of eyes, set at 45-degree angle viewed laterally; frons longer in midhalf than wide at broadest part by about 2.6:1, broadest at level of anterior margin of eyes; clypeus with lateral carinae distinct, median carina very light; antennae not reaching frontoclypeal suture; spinal formula of hind leg 5-6-4.

Host plant: *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) Hubbard
Economic importance: NEI
Distribution: Taiwan

4.5 *Tropidocephala sinuosa* Yang & Yang, 1986
Plates 15e, 21e, 28d, 35g

Tropidocephala sinuosa Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:28-29

Features: Body length 3.89–4.59 mm; pale yellowish brown; forewings with pale markings, apical ends of longitudinal veins Sc + R, M, and Cu_1 unmarked; vertex very long, longer in midline than wide at base by 2.9:1, longer than pronotum by about 3.2:1, strongly protruding in front of eyes, rounded apically; frons elongated, longer at midlength than wide at broadest part by as much as 2.7:1, broadest above level of anterior eye margins; clypeus at base wider than frons at apex, carina very light; antennae not reaching the frontoclypeal suture; spinal formula of hind leg 5-6-4; pygofer in posterior view with opening wider than long, lateral margins acutely produced, ventrally the medioventral process small and acute apically, anterior margin strongly concave medially; aedeagus with slender phallus, phallobase with right side evenly formed viewed dorsally, in lateral (left) view right side produced into a lobe-like process apically, directed ventrally, another longer process emanates subbasally; anal style long, distinctly beyond anterior margin of the large anal segment; parameres slender, sinuate with small triangular process in the middle.

Host plant: *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) Hubbard
Economic importance: NEI
Distribution: Taiwan

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

4.6 *Tropidocephala grata* Yang & Yang, 1986
Plates 15f, 21f, 28e, 35h

Tropidocephala grata Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:26-27

Features: Body length 3.21–3.40 mm; reddish brown planthopper; apex of frons, clypeus, genae, lateral parts of pronotum and legs, except coxa III, light brown; antennae yellowish to light brown, apex of segment I with dark brown ring and oblique ring at base of segment II; abdomen and pygofer reddish brown; forewings with dark brown longitudinal veins of Sc + R, M and Cu_1, and basal two-thirds, transparent spots distributed on the costal and apical areas, rest of apical third after the cross veins brown; vertex triangular, as long in middle line as wide basally, longer than pronotum by about 1.3:1, conical at apex, slightly protruded in front of eyes; head frontally oblong, longer in midline than wide at widest part about 1.9:1, broadest at level of simple eyes, in lateral view, very slightly oblique to subparallel to hind part of genae; antennae short, not surpassing the frontoclypeal suture; spinal formula of hind leg 5-6-4; pygofer with opening longer than wide, lateral margins obtusely produced into triangular plates viewed posteriorly, medioventral process small seen ventrally, ventral margin strongly concave; parameres parallel, basal part a little wider than apicals, curved outward medially, apically slender, narrowed, blunt, and diverging; aedeagus with slender phallus, phallobase with process arising from subbasal area ventrad.

Host plant: *Miscanthus* spp.; *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) Hubbard
Economic importance: NEI
Distribution: Taiwan

4.7 *Tropidocephala formosana* Matsumura, 1910
Plates 15g, 21g, 28f, 35i

Tropidocephala formosana Matsumura, 1910. Schad. N. Nutz. Ins. Zucherrohr Formosas 16
T. f. Matsumura, 1911. Mem. Soc. Ent. Belg. 18:134
T. f. Schumacher, 1915. Mitt. Zool. Mus. Berlin 8:133
T. f. Kato, 1933. Three-col. Illustr. Ins. Jpn. 4. Pl. 15, f. 6
T. f. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 10; Syst. Stud. Jpn. Araeopid. 69
T. f. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:13
T. f. Kuoh, 1983. Econ. Insects Fauna China 27:38
T. f. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:21-22

Features: Body length 3.67–3.98 mm; generally dark brown to reddish brown; vertex greenish brown but genae, clypeus, and lateral sides of anterior margin of pronotum black; frons reddish brown, median carina white with dark brown border from apex of vertex to end of mesonotum straight; apex of antennal segment I and middle of segment II ringed with brown; forewings brown with hyaline areas distributed; vertex slightly longer at midhalf than wide at base, as long as pronotum, conical at apex,

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

protruding in front of eyes; frons at midhalf longer than wide at broadest part by about 2.1:1 at level of ocelli; clypeus with indistinct carina; antennae short, not surpassing the frontoclypeal suture; spinal formula of hind leg 5-6-4; pygofer in posterior view with opening longer than wide, ventrally with medioventral process simple, ventral margin slightly incised near both sides of the process; aedeagus with slender phallus, phallobase with right side obtusely produced devoid of another process; parameres divergent, narrow, and flattened outside, reflected inside, reflection much wider and thicker basally, inner angle formed as a bent process, basal angle with large production digitate, directed inward; style cover granulate.

Host plant: *Miscanthus* spp. and *Saccharum officinarum* L.
Economic importance: NEI
Distribution: China and Taiwan

4.8 *Tropidocephala brunnipennis* Signoret, 1860
Plates 1f, 5c, 10f, 15h, 18f, 21h, 24f, 32d-e, 35j

Tropidocephala brunnipennis Signoret, 1860. Ann. Soc. Entomol. France 8:185
T. b. Stål, 1866. Hem. Afr. 4:178
Conicoda graminea Matsumura, 1900. Ent. Nachr. 26:259
Ectopiopterygodelphax eximius Kirkaldy, 1905. Hawaii Sugar Plant. Assoc. Exp. Stn. Entomol. Bull. 1:412
Tropidocephala eximius Kirkaldy, 1905. Ibid. 3:142
T. brunnipennis Matsumura, 1907. Ann. Hist. Nat. Mus. Hung. 5:59
Conicoda graminea Oshanin, 1908. Verz. Palaark. Hem. 2:300
Tropidocephala brunnipennis Oshanin, 1910. Ibid. 2:451
T. b. Muir, 1913. Proc. Hawaii Entomol. Soc. 2:245
T. b. Susuki, 1915. List Spec. Hanazono Entomol. Inst. 10
T. b. Matsumura, 1917. Appl. Entomol. For. Ser. 382
T. b (!) Kato, 1933. Three-col. Illustr. Ins. Jpn. 4
T. b (!) Wu, 1935. Cat. Ins. Sin. 2:119
T. b. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 7; Syst. Stud. Jpn. Araeopid. 60
T. b. Matsumura et Ishihara, 1945. Mushi 16:60
T. b. Kuoh, 1983. Insects Fauna China 27:32
T. b. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:18-19

Features: Body length 3.11–3.61 mm; general body color greenish brown to dark brown, thorax greenish brown; vertex, pronotum, mesonotum, and deep base of forewings greenish yellow but blackish on the apical part, and both sides of median carina of frons, genae, coxae III, abdominal sternite, and pygofer; forewings with costal areas transparent, basal two-thirds dark brown; vertex longer at midline than wide at base by about 1.2:1, projected in front of eyes, conical at apex, longer than pronotum by 1.3:1; frons longer in middle line than wide at broadest part by about 1.6:1, widest at level above simple eyes; clypeus tricarinate; antennae not reaching frontoclypeal suture; spinal formula of hind leg 5-6-4; pygofer ovoid in posterior view with open-

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

ing longer than broad, lateral margins produced slenderly near base, in ventral view with medioventral process narrow and slender, ventral margin slightly concave at both sides with lateral extensions; anal style surpassing anterior margins of the long anal segment; aedeagus with slender phallus, phallobasal process arising from apical portion; diaphragm membranous; parameres flattened, apical third about twice as broad at base, inner margin almost straight, outer margin strongly produced laterad submedially, concave along basal third; each paramere with two short processes, one basal and another at basal third of inner margin directed mesodorsad.

Host plant: *Miscanthus* spp.; *Oryza sativa* L.; and *Saccharum officinarum* L.
Economic importance: NEI
Distribution: Australia, China, Japan, Malaysia, Philippines (new record), New Guinea, Madagascar, North Africa, S. Europe, and Taiwan

4.9 *Tropidocephala saccharivorella* Matsumura, 1907
Plates 15i, 21i, 28g, 35k

Tropidocephala saccharivorella Matsumura, 1907. Ann. Hist. Nat. Mus. Hung. 5:65
T. saccharivora (!) Matsumura, 1910. Schad. U. Nutz. Inst. Zuckerrohr. Formosas 28
T. saccharivorella Muir, 1913. Proc. Hawaii Entomol. Soc. 2:244
T. s. Schumacher, 1915. Mitt. Zool. Mus. Berlin 8:133
T. s. Dammerman, 1929. Agric. Zool. Malay. Archipelago 236
T. s. Wu, 1935. Cat. Ins. Sin. 2:120
T. s. Esaki et Ishihara, 1943. Syst. Stud. Jpn. Araeopid. 68
T. s. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:14
T. s. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:22-25

Features: Body length 3.52–3.73 mm; greenish yellow to reddish brown; apex of frons, around ocelli, base of clypeus and upper mesopleuron blackish; forewings hyaline, apical fourth excluding the costal area yellowish gray, apical part of longitudinal veins M_2, M_3, and Cu_1 covered with dark brown, apiculate brown in vein M indistinct, and small, round brown markings on middle of $Rs + M_1$; vertex long, longer in middle line than wide at base about 2:1, longer than pronotum by about 1.7:1, apically rounded and distinctly produced in front of eyes; frons longer in middle line than wide apart by about 2.4:1, widest at level of anterior eye margin; antennae short, reaching frontoclypeal suture; clypeus tricarinate; spinal formula of hind leg 5-6-4; forewings narrow, acutely rounded apically; pygofer opening wider than long viewed posteriorly, lateral margins without process, ventrally with medioventral process granulate and ventral margin straight, pointed at apex; aedeagus with slender phallus, phallobase with process arising at apex, in dorsal view forming a small digitate production at right side, in similar direction as phallus; parameres parallel, slightly wide at base, apical third narrowed and sinuate, basal angles each produced into a pointed process, in lateral view apex truncated, distinctly constricted subapically.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Host plant: *Miscanthus* spp. and *Saccharum officinarum* and *Saccharum* spp.
Economic importance: NEI
Distribution: China, Philippines, and Taiwan

4.10 *Tropidocephala festiva* (Distant, 1906)
Plates 1g, 5d, 10g, 18g, 24g, 35l

Smara festiva Distant, 1906. Fauna Brit. Ind. Rhynch. 3:478. f. 64
Tropidocephala festiva Matsumura, 1907. Ann. Hist. Nat. Mus. Hung. 5:62
T. f. Oshanin, 1912. Kat. Palaark. Hemip. 117
T. f. Muir, 1913. Proc. Hawaii Entomol. Soc. 2:224
T. f. Schumacher, 1915. Suppl. Entomol. 4:142
T. f. Wu, 1935. Cat. Ins. Sin. 2:119
T. f. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 9; Syst. Stud. Jpn. Araeopid. 64
T. f. Matsumura, & Ishihara, 1945. Mushi 16:60
T. f. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:19-21

Features: Body length 3.44–3.82 mm; vertex and thorax yellowish green, median carinae of both bordered with brown and outside of lateral carinae similarly brown, a pair of short brown longitudinal markings inside the posterior part of lateral carinae of pronotum just in front of lateral carinae of mesonotum, and on lateral area; anterior part of pronotum marked with dark brown; apex of segment I and base segment II of rounded antennae brown; frons with black markings on basal part, apical part, and on genae below eyes; clypeus, sternum of metathorax, femora of legs, part of tibia III and abdomen, including pygofer, black and rest colored brown; forewings dark brown, nearest base yellowish green, hyaline areas distributed, three on costal area, five on apical part, and one next to end of claval line, three black and globular markings apiculate to longitudinal veins Sc + R, M, and Cu_1; vertex longer in midline than wide at base by about 1.9:1, longer than pronotum by about 1.8:1, acutely rounded at apex, produced in front of eyes; frons longer medially than wide between eyes by about 2.4:1, clypeus tricarinate; antennae short, reaching the frontoclypeal suture; rostrum surpassing procoxae; spinal formulae of hind leg 5-6-4; pygofer opening longer than wide viewed posteriorly, lateral margins strongly produced, most part of opening weakly sclerotized except above opening of parameres, in ventral view with medioventral process flattened, widened apically, slightly emarginated at apex and granulate; anal style moderately long, surpassing anterior margin of the relatively long anal segment; aedeagus with slender phallus, basal portion of phallobase in dorsal view bearing triangular process apically, process of phallobase arising apically; parameres in caudal view, slightly parallel, main body subequally wide, elongate, apical sixth narrowed and curved, basal angle forming a long process, in profile with subapical portion granulate, truncated apically and pointed at basal angle.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Host plant: *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) C.E. Hubbard
Economic importance: NEI
Distribution: China, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Taiwan

5. Genus *ARCOFACIES* Muir, 1915

Arcofacies Muir, 1915. Can. Entomol. 47:319.
Type species: *Arcofacies fullawayi* Muir, 1915
Arcofacies Muir, 1915. Can. Entomol. 47:319
Arcofacies Kuoh, 1983. Econ. Insects Fauna China 27:45
Arcofacies Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:34

Generic features: Head including eyes narrower than pronotum; vertex with well-defined margins, wider basally than long submedially, apical margin distinctly emarginated at both sides of median point, lateral carinae concave, submedian carinae transverse; Y-shaped carina without stalk, arms very small, connecting submedian carinae formed a small cell, in profile vertex and frons at 90-degree angle; frons at midhalf longer than wide at broadest part more than 2:1, widest at level of simple eyes, lateral carinae convex basally, almost straight below level of ocelli, median carina poorly developed, forked at extreme base; clypeus slightly wider basally than frons at apex, at right angle to frons, tricarinate; rostrum not reaching over mesotrochanters; eyes in dorsal view with lateral margins emarginated medially; ocelli present; antennae cylindrical, basal segment distinctly longer than wide, shorter than segment II; pronotum with lateral carinae attaining hind margin, converging apically, median carina very fine; forewings at rest mode tectiform, M and Sc_1 with more than half-length common petiole, Cu_1 emanates from end of cross vein or basad; spinal formula of hind leg 5-6-4; pygofer viewed posteriorly with opening longer than wide, lateral margins strongly produced mediocaudally; medioventral process absent; aedeagus bears no phallobase, phallus tubular, simple and acute at apex; supporting plate sclerotized and pigmented, V-shaped; diaphragm wide and membranous; parameres long and simple, broad basally, slender and narrowed apically, subparallel and very slightly converging.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

5.1 *Arcofacies fullawayi* Muir, 1915
Plates 1h, 5e, 10h, 24h

Arcofacies fullawayi Muir, 1915. Can. Entomol. 47:320
A. f. Muir, 1919. Philipp. J. Sci. 15:526
A. f. Fennah, 1956. Proc. Calif. Acad. Sci. 28(4):465
A. f. Kuoh, 1983. Econ. Insects Fauna China 27:45
A. f. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:34-37

Features: Body length 3.15–3.58 mm; green to yellowish green planthoppers; white median line runs from apex of frons to end of mesonotum, bordered with black; antennae with apical half of segment I and base and apex of segment II ringed dark brown; lateral parts of pronotum each with an oblique white band with brown borders; pygofer blackish brown; forewings hyaline with brown veins, light brown over basal third, rest hyaline, mottled with dark brown markings, in dark portions veins marked with white spots; vertex quadrate, wider basally than long submedially by about 1.4:1; submedian carinae present subapically; frons longer at midhalf than wide at broadest area about 1.9:1; antennae surpassing the frontoclypeal suture, basal segment longer than wide about 2:1, shorter than segment II by half; forewings sinuate below apex; pygofer strongly produced caudomedially; phallus simple, strongly concave on dorsal margin, acute at apex, directed ventrad; parameres long, slender, rounded at base, suddenly narrowing apically, slightly twisted subapically.

Host plant: *Bambusa multiplex* (Lour.) Raeuschel; *B. oldhamii* Munro; *B. multiplex* Raeuschel cv. "fernleaf" Young
Economic Importance: NEI
Distribution: China, Indonesia, Philippines, and Taiwan

6. Genus *EPEURYSA* Fieber, 1866

Eurysa Fieber, 1866. Verh. Zool. Bot. Ges. Wien. XVI:520.
Type species: *Eurysa lineata* (Signoret, 1857)

Eurysa Fieber, 1866. Verh. Zool. Bot. Ges. Wien. XVI:520
Eurysa Fieber, 1875. Rev. Mag. Zool. 3:374
Eurysa Ferrari, 1878. Ann. Mus. Stor. Nat. Genova 18:80
Eurysa Melichar, 1896. Cicad. V. Mit.-Eur. 67
Epeurysa Matsumura, 1900. Entomol. Nachr. 26:261 (type: *Epeurysa nawaii* Matsumura, 1900)
Eurysa Oshanin, 1908. Verz. Palaark. Hemip. 2:309
Epeurysa Oshanin, 1908. Ibid. 311; 1912. Kat. Palaark. Hem. 118
Eurysa Muir, 1915. Can. Entomol. 47:263, 298
Epeurysa Muir, 1915. Ibid. 263
Eurysa Matsumura, 1917. Appl. Entomol. Form. Ser. 379
Eurysa Muir & Giffard, 1924. Hawaii Sugar Plant. Assoc. Entomol. Bull. 15:5, 8

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Eurysa Muir, 1926. Ann. Mag. Hist. Ser. 9(17):20
Eurysa Esaki & Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 41
Epeurysa Esaki et Ishihara, 1943. Ibid. 42
Eurysa Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:86
Epeurysa Asche, 1983. Marbuger. Entomol. Publ. 1(8):211-226
Epeurysa Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:44-45

Generic features: Body length 3–3.93 mm; generally brown, head across eye area as broad as pronotum; vertex distinctly short, and wider than long, rounded to obtuse toward frons, lateral margins concave, more or less diverging apically and basally, submedian carinae uniting at apex or not, Y-carina distinct; eyes fairly flat dorsally; frons longer medially than broadest part (1–1.4:1), broadest at level of simple eyes; lateral carinae convex medially, median carina simple to forked at extreme base; clypeus finely tricarinate; antennae simple, passing the frontoclypeal suture, second segment fairly swollen, about 2x as long as first; pronotum longer than vertex medially, wider than vertex including eyes; tricarinate, lateral carinae straight, posteriorly diverging and not reaching hind margin; pronotum and mesonotum moderately arched; scutellum large, longer than vertex and pronotum combined, apically triangular projected posterad; forewings ordinary, surpassing abdominal tip; legs simple, spurs thin, tectiform with minute teeth at apex; spinal formula of hind leg 5-6-4; anal segment ring-like, lateroapical angles moderately separated, each produced into a short and stout process; pygofer with three medioventral processes; aedeagus with phallobase, phallobasal process with subapical node, then forming a distal arm; phallus tubular, simple, apical part downwardly recurved; diaphragm membranous; parameres with strong process at basal angle.

6.1 *Epeurysa abatana* (Asche, 1983)
Plate 35m

Epeurysa abatana Asche, 1983. Marburger. Entomol. Publ. 1(8):211-226
E. a. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:49-50

Features: Body length 3.03–3.13 mm; pale yellow to reddish brown; forewings hyaline, devoid of any markings; vertex wider at base than long submedially about 2.3:1, obtusely rounding into frons, evenly convex along apical margins; frons at midline longer than wide at broadest part or subequal, base wider than apex, lateral margin slightly convex, median carina distinct; clypeus at base as wide as frons at apex, wider at base than long; rostrum reaching coxae II; antennae reaching level of basal third of clypeus, segment I cylindrical, slightly longer than wide, shorter than segment II by about 1:1.5; pygofer much longer ventrally than dorsally viewed ventrally, medioventral processes laterally triangular, median one lobe-like, apically rounded, widest of median process about one-fifth as wide as distance between highest points of lateral ones; anal segment relatively long, lateroapical angles each produced into convex lobe, line between them arched, in profile spinose-shaped and directed ventrad; aedeagus moderately long, phallus directed to left and curved ventrad in apical quarter, acute

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

apically, phallobasal process borne basally and protruding mediocaudad, forming a hemicircular apical node, after node, forming a long distal arm, in dorsal view turned right in 90-degree angle, 3x as long as wide of broadest part near node, very narrow, slightly dilated near apex and twisted, in posterior view, distal arm basally wide, gradually narrowing apically, dorsal margin evenly arched downward; parameres moderately long, bifurcated distinctly forming a short, blunt subparallel apico-inner arm and a large subtruncate apico-outer tip, diverging.

Host plant: *Bambusa dolichoclada* and *B. oldhamii*
Economic importance: NEI
Distribution: Philippines (Luzon Island) and Taiwan

6.2 *Epeurysa nawaii* (Matsumura, 1900)
Plates 15j, 22a, 35n

Epeurysa nawaii Matsumura, 1900. Entomol. Nachr. 26:261.
E. n. Oshanin, 1908. Verz. Palaark. Hem. 2:311
E. n. Oshanin, 1912. Cat. Palaark. Hemip. 113
Eurysa nawae (!) Susuki, 1915. List Spec. Hanazono Entomol. Inst. 10
E. n. (!) Matsumura, 1917. Appl. Entomol. Form. Ser. 381.
Eurysa (*Epeurysa*) *nawae* (!) Matsumura, 1920. Daippon Gaichu Zensho. Rev. & Addit. Ser. 260
Eurysa nawae(!) Matsumura,1931. Nippon Konchu Daizukan 1266
E. n. Cheo, 1935. Peking Nat. Hist. Bull. 10:106
E. n. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 41
Epeurysa nawaii Esaki et Ishihara, 1943. Ibid. 42
Eurysa nawaii Matsumura et Ishihara, 1945. Mushi 16:72
Eurysa nawae Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:86
Epeurysa nawaii Fennah, 1975. Entomol. Scand. Suppl. 4:83
E. n. Asche, 1983. Marburger. Entomol. Publ. 1(8):211-226
E. n. Yang & Yang, 1986. Taiwan Mus. Special Publ. Ser. 6:45-47

Features: Body length 3.53–3.93 mm; general coloration brown, dark form with wings darker at apical half, pygofer and genitalia darker than other parts; female yellow toward the head and thorax; dark brown abdomen; vertex relatively short, wider at base than median length submedially about 3:1, obtusely roundish toward frons, apical margin evenly convex; greatest length of basal compartment longer than median length of basal compartment about 1.2:1; frons at midline longer than wide of widest part about 1.3:1, widest at level of eyes, median carina forked almost near basal margin; clypeus basally wider than midlength about 1.4:1; antennae with segment I longer than wide, shorter than segment II about 1:1.3; pygofer much longer ventrally than dorsally, laterodorsal angles not produced ventrally, medioventral process with median one longer than lateral ones about 3x, apically ovoid, widest part one-third the distance between the highest points of lateral ones; anal segment with spinal processes, each developed as a convex triangular lobe, ventrad; phallus directed caudad

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

and decurved to ventrad in apical quarter, apically blunt; phallobasal process rather more slender than phallus, passing mediocaudad to left caudad, forming a node at tip, extending a more slender distal arm, in caudal view directed ventrad then left, in dorsal aspect, the widest part of the phallobasal process near node narrower than length of distal arm about 1:1.4; parameres moderately long, with basal angles very strongly produced to mediocaudad, in caudal view about half as high as inner angle; in laterocaudal view, with a small production on inner margin at about halfway of parameres; entire paramere dark brown.

Host plant: *Phyllostachys makinoi* Hayata and *Chimonabambusa quadrangularis* (Fenzi) Makino
Economic Importance: NEI
Distribution: China, Japan, Sri Lanka, and Taiwan

7. *Genus TAROPHAGUS* Zimmerman, 1948

Tarophagus Zimmerman, 1948. Insects of Hawaii 4:245-247.
Type species: *Megamelus proserpina* Kirkaldy, 1907

Tarophagus Zimmerman, 1948. Insects of Hawaii 4:245-247
Tarophagus Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:45
Tarophagus Fennah, 1956. Insects of Micronesia 6(3):110
Tarophagus Fennah, 1965. Bull. Brit. Mus. (Nat. Hist.) 17(1):37
Tarophagus Asche & Wilson, 1989. Bull. Entomol. Res. 79:286-287

***Generic features*:** Body length around 4 mm; small to medium-sized blackish brown planthopper with a creamy white or pale yellowish longitudinal band running from vertex to the dorsal discs of pronotum, mesonotum to the tip of scutellum; distinctly broad whitish yellow dorso-median band present on abdominal tergites VII-IX, laterotergites yellow; vertex medially about as long as broad at base, lateral margins straight, anteriorly converge moderately; basal compartments about 0.6x the length of vertex, median carina weak to indistinct, area shallowly concave; apical cell distinct; frons about twice as high as broad, maximum width at frontoclypeal suture; carinae of frons prominent, median carina forked in upper quarter; frontal area shallowly concave, basally almost flat; clypeus slightly shorter than frons, surface convex; median carina of clypeus distinct; rostrum reaching anterior margin of postcoxae; antennal segments cylindrical, segment II slightly longer than segment I; number and arrangement of sensory fields of pedicel: 16 in 7 groups or rows; ocelli and blemmata present; pronotum wider than head, in midline about as long as vertex; carina distinct, lateral pair straight, diverging caudally, reaching posterior margin of pronotum; mesonotum medially longer than pronotum by about 1.6:1, lateral carinae straight, diverging caudad, median carina weak, not visible at tip of scutellum; post-tibial spur foliate with 28–36 teeth.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

7.1. *Tarophagus colocasiae* (Matsumura, 1920)
Plates 16a, 22b, 28h, 36a

Liburnia (Delphax) *colocasiae* Matsumura, 1920, Dainippon Gaichi Zensho. 564; 1932
_____. Matsumura, 1932. Consp. Jpn. Injurious Ins. :225. (In Japanese.)
Delphalodex? *colocasiae* (Matsumura) Esaki et Ishihara, 1943. Dept. Agric. Kyushu Imp. Univ. Publ. 14:36
Megamelus proserpina Fullaway, 1937. Proc. Hawaii Entomol. Soc. 9:405
_____. Isaki, 1940. Botany Zool. Tokyo 3:278
_____. Esaki at Ishihara, 1943. Fukuoka Dept. Agric. Kyushu Imp. Univ. Publ. 14:19
_____. Matsumura & Ishihara, 1945. Mushi 16:71
_____. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:78-79
Tarophagus proserpina Zimmerman, 1948. Insects of Hawaii 4:247
_____. Fennah, 1956. Insects of Micronesia 6:110-111
_____. Fennah, 1970. Brit. Sol. Is. 6:60
_____. Fennah, 1971. Insects of Micronesia 6:571
_____. Fennah, 1978. Ann. Zool. (Wars.) 34:16
Tarophagus taiwanensis Wilson, Tsai, 1988. Pan-Pacif. Entomol. 64:54

Features: Body length of pygofer with medioventral processes longer than lateral ones; lateral ventrocaudal processes rounded laterodistally, distal margin slightly developed mediad forming an acute inner edge; reflected processes of aedeagus diverging with the longer right spine distally projected dorsocaudally; parameres short and small, basal two-thirds relative range apically narrowed, curved into thumb-like structure projected laterally; anal segment somewhat rounded and ring-like with w-shaped and short subparallel lateroapical angular (ventral side) processes; in females, the valvifer VIII has inner margins of bases developed into a long, finger-to-tongue-like process; sternite V bears a median membrane between the chitinized parts with two distinctly separated chitin-plates and the movable and double-scale of sternite VI bears a median straight incision.

Host plant: *Colocasia esculenta* L.
Economic importance: Relatively high
Distribution: Widespread in Southeast Asia: Indonesia, Myanmar, Philippines, Papua New Guinea, New Britain, Solomon Islands, Thailand, Guam, Micronesia, Marshal Islands, and Hawaii

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

7.2 *Tarophagus persephone* (Kirkaldy, 1907)
Plates 1i, 5f, 10i, 18i, 24i, 30a, 32f, 40c

Megamelus persephone Kirkaldy, 1907. Bull. Hawaii Sugar Plant. Assoc. Div. Entomol. 3:148
Megamelus proserpinoides Muir, 1917. Proc. Hawaii Entomol. Soc. 3:327
Tarophagus proserpina australis Fennah, 1965. Bull. Brit. Mus. Nat. Hist. Entomol. 17:37-39

***Features*:** Body length 2.8–3.2 mm; creamy white band runs from vertex to apex of scutellum; proboscis, margins of mesopleuron, coxae III, apex of tibiae, and second post-tarsal segment stramineous; forewings castaneous, with apical cells of R mostly transparent, margins of clavus white; rest of wings brownish gray including the veins; vertex at midlength as long as broad at base, subrectangular toward frons, distinctly narrower at apex than bases, lateral margins straight, apical margins shallowly convex with submedian carinae slightly prominent, Y-shape carina feeble, submedian carina not merging at apex of vertex, basal compartment of vertex wider posteriorly than broadest length 1.7:1 than median length 2:1; frons at midline longer than wide at broadest point 2.1:1, broadest apically, lateral margins shallowly sinuately diverging, median carina forked at basal fourth; clypeus basally narrower than frons at apex; clypeus as long as broad at base, very shallowly convex in profile, nearly straight, entire clypeus moderately convex; proboscis just reaches torchanter III; antennae reaching apical level of post-clypeus, basal segment longer than broad 2.1:1, segment II longer than segment I 1.4:1; ocelli small; pronotum shorter at midline than wide at anterior margin, lateral carinae straight, rarely reaching hind margin; mesonotum longer than scutellum by about 2.2:1; tibial spur with about 36 teeth; forewings much beyond abdomen, deeply rounded apically with Sc + R fork and Cu_1 fork at same level, slightly distad of middle, both much distad of fusion of claval veins; pygofer rather long, posterior opening about as long as broad, dorsolateral angles shortly produced, weakly inflected; diaphragm with dorsal margin excavate, lateral margins below midlength each produced strongly caudad in a stout process, tapering distad to an obliquely truncate apex; medioventral process knob-like on a stout stalk; aedeagus moderately long, compressed laterally, decurved in distal half, a short flagellum borne dorsoapically, reflected cephalad above aedeagus for about half its length, moderately expanding distad, bifurcate apically in two equal acuminate processes; parameres short, strongly divergent, basally wide, acute to narrow apically with outer angle more acutely produced laterally; anal segment short and collar-like, lateroapical angles contiguous, each projected ventrad into a stout pointed and spinose process.

Host plant: *Colocasiae esculenta*
Economic importance: Relatively low
Distribution: Widespread in Southeast Asia and Australia, Papua New Guinea, Borneo, Philippines, Solomon Islands, New Britain, Malaysia, and Indonesia

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

8. Genus *SOGATELLANA* Kuoh, 1980

Sogatellana Kuoh, 1980 in Huang et al 1930. Acta Zootaxonomica Sin. 5(2):169
Type species: *Sogatellana marginata* Kuoh

Sogatellana Kuoh, 1980 in Huang et al 1930. Acta Zootaxonomica Sin. 5(2):169
_____. Asche and Wilson, 1990. Systematic Entomol. 15:37

Generic features: Head including eyes distinctly narrower than pronotum; vertex longer submedially than wide at base about 1.3:1; submedian carinae merged at apex, basal compartment wider basally than greatest length 1.3:1; frons longer at midline than wide at widest portion about 2.1–2.4:1, widest at apical third; lateral carinae convex below ocelli, median carina may or may not be forked at base; clypeus as wide as or wider than frons apically; proboscis reaching trochanter II; ocelli present; antennae cylindrical, passing the frontoclypeal suture, basal segment longer than wide, shorter than segment II about 1:2.3; pronotum with lateral carinae not reaching hind margin; spinal formula of leg III 5-7-4; tibial spur with 16–23 teeth; short anal segment ring-like with lateroapical angles moderately separated producing two processes; phallus tubular, narrowed apically only slightly, armed with several teeth; suspensorium also ringlike without dorsal arms; diaphragm wide with dorsal margin produced medially, median area near dorsal margin convex, margin with distinct pigmented ring, along it armed with many small spines, rough on surface; parameres wide, relatively long, and slightly diverging, inner angle well developed.

8.1 *Sogatellana geranor* (Kirkaldy, 1907)
Plate 36b-c

Delphax geranor Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Div. Entomol. Bull. 3(1):158
Delphax sponsa Kirklady, 1907. Ibid. 148
Sogatella geranor Asche and Wilson, 1990. Syst. Entomol. 15:35 & 37

***Features*:** Similar to *Sogatella kolophon* (Kirkaldy) but median longitudinal stripes from head to scutellum whiter, body size narrower and longer; carinae more pronounced, frons intercarinally reddish brown, head slightly produced in front of eyes; antennae reaching well beyond clypeus, segments 1 and 2 nearly subequal in length; forewings subhyaline tinged with yellow, subcosta and commissure ivory white slightly beyond abdominal tip, membrane scarcely formed; pygoter elongate viewed posteriorly (end-on) and thickened inwardly at the sides; anal segments distinctly quadrispinose with a lateral spine on each side directed downward, and with converging tips, and two downwardly directed spines with diverging tips; aedeagus swollen basally, narrowed at midlength viewed laterally, tube-like viewed dorsally with 18–19 subapical spines; diaphragm knob-to-mound-like; parameres slightly narrowed subapically, cleft at tip forming acute apico-inner obliquely converging tips and rounded apico-outer diverging tips.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Host plant: Rice
Economic importance: Low
Distribution: Australia, Philippines, S. Mariana Islands (Saipan), Palau Islands (Koror), Yap Islands (Yap)

9.2 *Sogatella quadrispinosa* (Muir, 1919)
Plate 36d-e

Sogata 4-*spinosa* Muir, 1919. Can. Entmol. 51:526
Sogatellara quadrinspinosa Asche & Wilson, 1990. Syst. Entomol. 15:36-37

Features: Typically resembles *Sogatella* planthoppers in size and general appearance; forewings hyaline with yellowish veins, granulations small and sparse, apex of clavus with reddish brown markings; antennal segments I shorter than II, 2nd segment 1.7x longer than first; anal segment with a pair of short outer processes and a pair of long inner processes, outer pair not reaching lateral margins of pygofer and inner pair with indistinctly diverging apices; diaphragm elongate knob-like; parameres broad at mid-length, constricted thereafter subapically, apex with a strongly rounded apico-outer end and slightly blunt apico-inner tip; aedeagus short, spirally spinose toward apex.

Host plant: Unknown
Economic importance: Low
Distribution: Singapore

9. Genus *SOGATELLA* Fennah, 1956a

Chloriona (*Sogatella*) Fennah, 1956a. California Acad. Sci. Proc. IV 28(13):471
Type species: *Delphax furcifera* Horvath, 1899

Sogatella Fennah, 1964. Bull. Entomol. Res. 54:48
_____. Fennah, 1965. Bull. Brit. Mus. (Nat. Hist.) 17(1):47
_____. Fennah, 1978. Ann. Zool. (Wars.) 34(9):221
_____. Ascher & Wilson, 1990. Syst. Entomol. 15:5
_____. Wilson and Claridge, 1991. CAB Intern. and Nat. Resources Inst. :55
_____. Ding and Zhang, 1994. China Agric. Sci. Technol. 74

***Generic features*:** Body length 2.5–4.0 mm; small and slender planthoppers; vertex to mesonotum lined with a median longitudinal whitish band; lateral portions of pronotum and mesonotum brownish black; head slightly narrower than pronotum; vertex length and frons distinctly slender; frons longer than broad with median carina forked at about level of middle of eyes, lateral margins straight and subparallel; antennae cylindrical, moderately short, 1st segment distinctly longer than broad, 2nd segment longer than first; combined length of pronotum and carinae nearly straight, strongly diverging basally, not reaching hind margin; not parallel with mesonotal carinate; mesonotum

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

tricarinate, longer than vertex and pronotum together; legs terete and slender; post-tibial spur with about 20 small teeth, basal segment of post-tarsus linked by a dorsally slightly concave tuberosity forming a broad U-shaped structure; aedeagus moderately long, somewhat sinuate, bent dorsally at basal third, tips curved ventral, slightly compressed and twisted and pointed apically, two rows of teeth present ascending from the ventrodorsal third on both sides to the dorsal third; phallotreme located subapical on the left side; parameres diverging, apically tapering and bifurcated distally.

9.1 *Sogatella furcifera* (Horvath, 1899)
Plates 1j, 5g, 11a, 16b, 18j, 22c, 24j, 30b, 32g, 36f

Delphax furcifera Horvath, 1899. Terms Fuzetek 22:372
_____ Mastumura, 1899. Nippon-gaichuhen. 406. f. 206
Liburnia furcifera Matsumura, 1900. Entomol. Nachr. 26:262
Delphax furcifera Onuki, 1901. Spec. Rep. Jpn. Agric. Stn. 10:58
Liburnia furcifera Meliches, 1903. Hom. Faun. Ceylon 104
Liburnia albinosa Fowler, 1905. Biol. Cent. Am. Han. 1:135
Sogatella distincta Distant, 1912. Annu. Mag. Nat. Hist. 8th ser. 9:191
Sogatella pallescens Distant, 1912. Ibid. 9:192
Delphax furcifera Oshanin, 1912. Kat. Palaark. Hem. 9:192
_____. Schumacher, 1915. Mitt. Zool. Mus. Berlin 8:134
Megamelus ? *furcifera* Muir, 1917. Proc. Hawaii Entomol. Soc. 3:328
_____ Muir, 1921. Ibid. 4:486
Sogata furcifera Muir et Gifford, 1924. Hawaii Sugar Plant. Assoc. Exp. Stn. Bull. 5:13
Liburnia furcifera Muir, 1924. Kwngyo-mohanjo Kenyu-hokoku 12:23
Sogata furcifera Muir, 1926. Annu. Mag. Nat. Hist. Ser. 9, 17:34
Sogata pallescens Gater & Corbett, 1926. Feder. Malay State Str. Settlm. Bull. 33:5
_____ Dammerman, 1929. Agric. Zool. Malay Archipel. 235
S. furcifera Muir, 1930. Trebia 12:31
Delphacodes furcifera Esaki et Ishihara, 1931. Rep. Leafth. Injur. Ricepl. Nat. Enem. 2:5
Liburnia furcifera Wu, 1935. Cat. Ins. Sin. 2:119
_____ Metcalf. 1938. Bull. Mus. Comp. Zool. 82:300
Sogatella furcifera Matsumura et Ishihara, 1945. Mushi 16:64
Sogata tandojamensis Qadori & Misra, 1960. Proc. 4th Pan Ind. Ocean Sci. Cong. B. Biol. Sci. 1960:115
Chloriona (Sogatella) furcifera Fennah 1964. Bull. Entomol. Res. 54:48
_____. Fennah, 1978. Ann. Zool. (Wars.) 34(9):221
_____. Asche & Wilson, 1990. Syst. Entomol. 15:9-11
_____. Wilson & Claridge. 1991. CAB Intern. & Nat. Resources Inst. 56-58

Features: Yellow to yellowish brown; pronotum white with black areas behind eyes; frons, clypeus, genae, lateral areas of mesonotum, coxae I and II, and pleura all black; abdomen and pygofer dark brown; forewings hyaline with brown spot at end of clavus; vertex submedially almost as long as wide at base, obtusely rounded toward frons, lateral carinae straight, submedian carinae merged apically, basal compartment wider basally than greatest length 1.6:1; frons at midline longer than wide at broadest part

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

about 2.4:1, lateral carinae shallowly convex, median carina simple; clypeus basally wider than frons at apex; antennae surpassing frontoclypeal suture, segment I longer than wide at apex, shorter than segment II about 1:1.8; tibial spur with about 25 teeth; forewings longer than widest part about 3.3:1; pygofer slightly narrower dorsally than ventrally in profile, opening almost as long as wide viewed posteriorly, laterodorsal angle obtusely rounded, weakly produced; phallus laterally compressed, with around 18 teeth at left and 14 at right side, two rows separated basally; suspensorium elongate with hole at middle; diaphragm with dorsal margin evenly concave bearing a pair of peglike processes; anal segment short, lateroapical angles of pronotum distinctly separated, each produced ventrad in a moderately robust spinose process; opening of parameres with dorsal margin evenly curved upward, ventral margin with a broad lobe medially; parameres divergent, each with outer angle widely formed, obtuse apically, inner angle formed as long as outer one, apically acute.

Host plant: Rice, *Leersia hexandra, Echinochloa* spp., *Digitaria, Paspalum, Leptochloa chinensis*
Economic importance: High
Distribution: Bangladesh**,** Taiwan, China, Japan, Korea, Saudi Arabia, Siberia, Micronesia, Philippines, Laos, Cambodia, Myanmar, Nepal, Vietnam, Thailand, India, Indonesia, Pakistan, Fiji, Seychelles

9.2 *Sogatella vibix* (Haupt, 1927)
Plates 2a, 5h, 11b, 18k, 24k, 30c, 32h

Liburnia vibix Haupt, 1927. Homop. Palestine 1:13
L. matsumurana Metcalf, 1943. Gen. Cat. Hemiptera Facsim. IV(3):364
Delphacodes longifurcifera Esaki & Ishihara, 1947. Mushi :41
D. panicicola Ishihara, 1949. Sci. Rept. Matsuyama Agric. Coll. 2:51
D. dogensis Ishihara, 1952. Ibid. 8:47
Sogatella longifurcifera Fennah, 1969a. Bull. Entomol. Res. 54(1):53
S. vibix Fennah, 1963a. Ibid. 51
S. catoptron Fennah, 1963a. Ibid. 54-55
S. paniculata Fennah. 1963a. Ibid. 78
S. auzensis Linnavouri, 1964. Ann. Zool. Fennici 1:341
S. longifurcifera Fennah, 1965. Bull. Entomol. Res. 17(1):47
S. parakolophon Linnavouri, 1973. Notulae Entomol. Helsinki 53:108
S. matsumurana Nast, 1975. Ann. Zool. (Wars.) 33:2
S. longifurcifera Okada, 1977. Ibid. 11
S. diachenkea Kuo, 1977. Acta Zool. (Wars.) 34(9):222
S. vibix Asche & Wilson, 1990. Syst. Entomol. 15:22-24
S. v. Wilson & Claridge. 1991. CAB Intern. & Nat. Resources Inst. 62
S. v. Ding & Zhang, 1994. China Agric. Sci. Tech Press: 76-78

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Features: Body length 3.33–4.16 mm; whitish yellow with black genae, large triangular area of mesopleura and round spot in metapleura, mesonotum with lateral fields pale brown to brown, apex of tarsi III black, abdomen and pygofer dark brown, forewings hyaline; vertex longer submedially than wide at base about 1.3:1, rounding into frons, wider at base than at apex, lateral carinae straight, arms of Y-shaped carinae distinct but the stem weak, submedian carinae not merged at apex, basal compartment of vertex wider at base than greatest length about 1.3:1; frons at midline longer than wide at broadest part about 2.4:1, median carina simple, forked at extreme base; clypeus basally wider than frons at apex, in middle line distinctly longer than wide at base; antennae passed frontoclypeal suture, segment I longer than wide at apex, shorter than segment II about 1:2.2; tibial spur with about 20 teeth; forewing longer than widest portion about 3.5:1; pygofer with dorsal margin almost as long as ventral in profile, laterodorsal angle rarely produced mesad, opening almost as wide as long viewed posteriorly; phallus similar in *S. furcifera* with around 18 teeth set in oblique pattern on left and 8 on right, two rows distinctly separated basally, not approximated; suspensorium with hole medially; diaphragm deeply concave along dorsal margin, median portion narrow, with a pair of peg-like processes, directed slightly caudad, apical portion strongly sclerotized; anal segment moderately short, lateroapical angles close but not contiguous, each produced ventrad in a moderately long spinose process; opening of parameres evenly concave ventrally with a small process medially; parameres with two apical processes, small inner one moderately converging, and large outer one strongly diverging.

Host plant: rice, maize, *Echinochloa crus-galli*, *Digitaria, Leersia*, *Phalacris,* and Setaria.
Economic importance: Low
Distribution: Oriental region: Bismark Islands, Cambodia, China, India, Indonesia, Laos, Pakistan, Philippines, Singapore, Thailand, Taiwan, Vietnam; Pacific region: Bonin Islands, Fiji Island, New Caledonia, Ryukyu Island, Solomon Islands, Tonga, Vanuatu: Australian region, Australia: Palaearctic region: Afghanistan, Cyprus, Egypt, Greece, Iran, Israel, Italy, Japan, Jordan, Korea, Lebanon, Mongolia, Morocco, Turkey, Saudi Arabia, former Soviet Union, Maritime Territory, and Yugoslavia; Ethiopian region: Kenya, Ethiopia, and Sudan

9.3 *Sogatella kolophon* (Kirkaldy, 1907)
Plates 2b, 6a, 11c, 18l, 24l, 30d, 32i, 36g-h

"Delphax" kolophon Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Entomol. Bull. 3(1):157
Opiconsiva insularis Distant, 1917. Trans. Linn. Soc. 2nd ser. Zool. 17:303
O. balteata Distant (in part), 1917. Ibid. 302
O. derelicta Distant, 1917. Ibid. 307
Delphacodes elegantissima Ishihara, 1952. Sci. Rep. Matsuyama Agric. Coll. 8:45
Sogata meridiana Beaver, 1952. J. Kansas Entomol. Soc. 25:111
Sogatella kolophon atlantica Fennah, 1963a. Bull. Entomol. Res. 54:58-59

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

S. k. insularis Fennah, 1963a. Ibid. 59
S. k. meridiana Fennah, 1963a. Ibid. 59
Sogatella balteata Fennah, 1963a. Ibid. 64
S. derelicta Fennah, 1963a. Ibid. 62
S. elegantissima Fennah, 1963a. Ibid. 76
S. nebris Fennah, 1963a. Ibid. 67
S. kolophon Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):47
S. k. Okada, 1977. Food & Fert. Tech. Centr. Asia Pac. Reg. 9
S. k. Fennah, 1978. Ann. Zool. (Wars.) 34(9):16
S.k. Asche & Wilson, 1990. Syst. Entomol. 15:16-20

Features: Body length 3.19–3.89 mm; yellowish brown with mesonotal lateral areas darker, coxae I and II, pleura and abdomen except laterally and pygofer brown to dark brown, forewings hyaline; vertex longer submedially than wide at base about 1.3:1, evenly rounded toward frons, slightly narrower apically than at base, basal compartment of vertex wider at base than greatest length about 1.4:1; frons in midline longer than widest part about 2.2:1, lateral carinae slightly concave, median carina forked at basal fifth; clypeus at base slightly wider than frons at apex; antennae extended to frontoclypeal, segment I longer than wide, shorter than segment II about 1:2; tibial spur with 15–22 teeth; pygofer wider dorsally than ventrally in profile, opening slightly longer than wide viewed posteriorly, laterodorsal angle typically inflected; phallus with 16 teeth arranged in oblique row on left, six on right margin, on caudal side left row obliquely reaching right side, two rows basally apart; suspensorium with a hole in the middle; diaphragm bears peglike process on each side, dorsal margin slightly arched, peglike processes and dorsal half of median part strongly sclerotized; anal segment short, lateroapical angles each produced ventrad into a short, stout spinose process; opening for parameres with dorsal margin arched upward, ventral margin with median projection obtuse; parameres with outer angle tapering to tip, basal angle forms distinct keel.

Host plant: Unknown
Economic importance: Low
Distribution: Oriental region: Cambodia, China, Hong Kong, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Seychelles Islands, Sri Lanka, Thailand, Taiwan, and Vietnam; Pacific region: Belau Islands, Bonin Islands, Fiji Islands, Galapagos Islands, Guam, Hawaii Islands, Manganeva Islands, Marquesas Islands, Eniwetok Atoll, Micronesia, New Caledonia, Northern Marianas Islands, Pitcairn Islands, Solomon Islands, Tonga Island, Western Samoa; Australian Region: Australia; Nearctic region: Bermuda Islands; Neotropical region: Ecuador, Guyana, Jamaica, Mexico, Montserrat, Sta. Lucia, Venezuela; Atlantic Ocean: St. Helena Islands; Ethiopian region: Cape Verde Islands, Côte d'Ivoire, Nigeria, South Africa; Malagasian region: Mauritius, Rodrigues Islands; Palaearctic region: Azores Islands, Canary Islands, Japan, and Korea

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

10. Genus *LATISTRIA* Huang et al, 1980

Latistria Huang et al, 1980. Acta Zootaxon. Sin. 5(2):166
Type species: *Latistria testacea* Huang et al

Latistria Huang et al, 1980. Acta Zootaxon. Sin. 5(2):166
Latistria Asche & Wilson, 1990. Syst. Entomol. 15:37

Generic features: With strong resemblance to the small species of whitebacked planthoppers belonging to the *Sogatella albofimbriata* group characterized by having an acute anterior vertex; the main generic character of *Latistria* is the shape of the diaphragm forming mediodorsally a wide plate protrusion with rounded lobelike lateral edges or sinuate bilobed crossplate; parameres long, slender with tapering to truncate apices, in repose, parameres almost reach the laterodorsal margins of the anal segment, subbasally with latero-inner expansion projected laterally, apices strongly diverging; aedeagus in right lateral profile subbasal one-third curved, and aedeagal body bears two longitudinal rows of spines running from top to bottom, sometimes crossing each other at midlength, longer row with 16–25 teeth, and shorter row with 10–17 teeth.

10.1 *Latistria eupompe* (Kirkaldy, 1907)
Plates 16c, 22d, 36i-j

Delphax eupompe Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Div. Entomol. 3(1):162
D. ochrias Kirkaldy, 1907. Ibid. 157
Sogatodes infestus Yang, 1989. NSC Special Publ. 6:172
Latistria eupompe Asche & Wilson, 1990. Syst. Entomol. 15:37

Features: Body length 3–3.5 mm; general color pattern varies from dark reddish brown to blackish brown, sometimes yellowish white on antennae, pronotum, scutellum, between the lateral carinae, legs, and commissure; forewings dark reddish brown, a little paler in Sc + R, Sc_1 to Sc_2, R_1, and cubital area posterior of claval line; veins closely but flatly granulate; with nine apical cells, four and seven pedicellate; antennae short, segment I shorter than segment II, not reaching the apex of frons; tibial spur with 13 spines; pygofer opening longer than wide, thickened internally at the midlaterals, slightly diamond-shaped; anal segment with two medially strong straight spines between which arises the upward and outwardly directed aedeagus; parameres diverging, elongate, slender, and apically acute.

Host plant: Rice
Economic importance: Low
Distribution: Australia, China, Fiji, Indonesia, and the Philippines

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

11. Genus *TAGOSODES* Asche & Wilson, 1990

Tagosodes Asche & Wilson, 1990. Syst. Entomol. 15:32
Type species: *Dicranotropis cubanus* Crawford, 1914

Tagosodes Asche & Wilson, 1990. Syst. Entomol. 15:32
Tagosodes Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 62

Generic features: Body length 3–4 mm; external features basically similar to the members of the genus *Sogatella* Fennah, 1956 species complex; vertex, pronotum, and mesonotum lined medially by a longitudinal white band, laterals of pronotum and mesonotum blackish to brown; vertex slender, nearly parallel-sided, longer at midline than at base about 1.4–1.7 times, posterior compartment of vertex lightly concave with weak to indistinct median carina, anterior cell long and slender, anteriorly terminated at tip of vertex, sometimes extended to frons; vertex and frons form a moderate acute angle, transition toward frons mostly rounded; frons high and slender, about 2x to slightly more as high as maximum width, broadest at or toward frontoclypeal suture; median carina prominent along the transition point from vertex to frons; clypeus with distinct carina; proboscis reaching coxae III; segment II of antennae 1.8–2x longer than segment I, arrangement of sensory field 16 and 7; number of spines on tibial spur of leg III, proportions of hind tarsal segments and wings as in *Sogatella*; pygofer ringlike, subglobose to ovoid viewed caudally, laterodorsal angles moderately produced; mid-portion of diaphragm elevated, mediodorsal margin caudodorsally developed variably as T-shaped, triangular, rectangular, U- or W-shaped protrusion, central portion ovoidly bulbous, ridged and lined with many teeth; paramere opening broadly trapezoidal; anal segment with two spinous processes borne from the laterodorsal angles on the ventral side, processes toward each other medially, slightly curved ventrad viewed laterally; shape of parameres varies basally broad, middle part slender and dilated apically, often diverging from base then at least inner apical angle converging medially; aedeagus tubular, slightly flat, with spines irregularly forming rows.

11.1 *Tagosodes pusanus* (Distant, 1912)
Plates 2c, 6b, 11d, 18m, 25a, 30e, 32j, 36k, 40d

Sogata pusana Distant, 1912. Annu. Mag. Nat. Hist. 8(9):191
Kelisia fieberi Muir, 1917. Proc. Hawaii Entomol. Soc. 3(4): 331
Unkana formosella Matsumura, 1935. Insecta Matsumurana 9:72
Chloriona fieberi Fennah, 1956. Insects of Micronesia 6(3):120-121
Sogata striatus Qadri & Mizra, 1960. Proc. 4th Pan Indian Ocean Sci. Congr. B, Biol. Sci. 1960:117
Sogatella pusana Okada, 1977. Food & Fert. Tech. Centr. Asian Pac. Reg. 11
Himeunka chibana Tian & Kuoh, 1981. Acta Entomol. Sin. 24(2):193
Sogatodes assimilis Yang, 1989. NSC Special Publ. 6:178
Tagosodes pusanus Asche & Wilson, 1990. Syst. Entomol. 15:35
Tagosodes pusanus Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 63

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Features: Body length 3.2–3.5 mm; pale yellow vertex about 1.7x as long as its basal width, lateral sides subparallel, carina yellow, outer areas from mediolateral carinae dark brown; frons dark brown with pale yellow carinae concolorous with genae, proboscis, and ocelli; clypeus dark brown with pale yellow carinae; pronotum with light yellow carinae, similarly pale yellow medially with a pair of dark impressions, laterally dark brown but paler along posterior margin; mesonotum as long as combined length of vertex and pronotum, pale yellow medially, dark brown laterally with blackish lateral carinae; forewings well developed, distinctly tinged at apex of clavus, apical cells crescently reddish brown or with finger-like markings toward apical margins near veins; apical veins dark brown; abdominal segments dark brown, pale yellow posteriorly; pygofer nearly rounded, medioventral area shallowly concave; parameres subbasally broad, constricted at midhalf along inner and outer sides, moderately concave at apex; diaphragm T-shaped; aedeagus basally wide and subglobose, slender and cylindrical at apical half, with four spines at midlength and 5–9 spines apically.

Host plant: Rice
Economic importance: Low
Distribution: Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Micronesia, Pakistan, Philippines, Sri Lanka, Taiwan, and Vietnam

12. Genus *TERTHRON* Fennah, 1965

Terthron Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):55-56
Type species: *Delphax anemonias* Kirkaldy, 1907

Terthron Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):55-56
Terthron Fennah, 1978. Ann. Zool. (Wars.) 34(9):222
Terthron Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 69
Terthron Ding & Zhang, 1994. China Agric. Sci. Tech. Press 96

Generic features: Body length 2.7–3.3 mm; general color blackish brown; broad ivory white median longitudinal band present dorsally on the head, pronotum, and mesonotum; segment I of antennae blackish brown, II dark reddish brown; forewings hyaline with pale reddish brown veins; vertex at midlength as long as broad at base, subacutely rounded toward frons, as wide at apex as at base, lateral margins straight to weakly concave, apical margin transverse with submedian carinae barely prominent; Y-carina present but feeble, submedian carinae merged at apex of vertex, basal compartment of vertex broader at hind margin than its greatest length about 2:1; at midline frons longer than wide at broadest part about 2:1, lateral margins shallowly convex, median carina simple; clypeus at base moderately wider than at apex of frons, clypeus as long as broad at base, in profile, shallowly convex, almost straight, entire clypeus in profile, moderately convex.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

12.1 *Terthron albovittatum* (Matsumura, 1900)
Plates 2d, 16d, 22e, 37a-b

Dicranotropis albovittata Matsumura, 1900. Entomol. Nachr. 26:269
Delphax albovittata Susuki, 1915. List Spec. Hanazon. Entomol. Inst. 10
Liburnia albovittata Matsumura, 1917. Appl. Entomol. For. Ser. 379
Sogata albovittata Esaki, 1932. Iconogr. Ins. Jpn. 1734
Delphacodes albovittata Matsumura & Ishihara, 1945. Mushi 16:61
Terthron albovittatum Fennah, 1978. Ann. Zool. (Wars.) 34(9):222
T.a. Wilson & Claridge, 1991. CAB Inter. & Nat. Resources Inst. 69

Features: Body length 2.6–3.4 mm; dark to blackish brown planthoppers with a fairly broad pale yellow dorso-longitudinal median band running from vertex to apex of mesonotum; black face with white carina, genae, and clypeus; antennae mostly blackish brown, segment II slightly paler in color except base; vertex black between lateral and medio-lateral carinae; forewing subhyaline with a gray tinge, hind margin white, veins mostly light brown; vertex slightly longer than wide, forked toward frons; frons distinctly longer than wide, broadest at level of ocelli, slightly convex along lateral margins; median carinae forked nearly basad of frons; clypeus with distinct median carina; pronotum with distinct median and lateral carina, lateral carinae slightly concave, not reaching hind margin of pronotum, diverging; combined length of vertex and pronotum as long as to slightly shorter than length of mesonotum; pygofer oblongate, medioventral area concave housing base of basally merged parameres, the latter with subparallel sides, distinctly diverging, subtruncate at apex; aedeagus in lateral view, with a thumb-like apical process and a small acute one after concavity; anal segment with a pair of moderately long, acute, converging processes.

Host plant: Rice, *Panicum crus-galli* (barnyard millet)
Economic importance: High, vector of rice stripe virus and the black-streaked dwarf virus
Distribution: China, Japan, Korea, and Taiwan

13. Genus *UNKANODES* Fennah, 1956

Unkanodes Fennah, 1956. Proc. Calif. Sci. 28(13):474
Type species: *Unkana sapporona* Matsumura, 1935

Unkanodes Fennah, 1956. Proc. Calif. Sci. 28(13):474
Glymodelphax Wagner, 1963. Mitt. Hamburg. 2001. Mus. Inst. 60:167
Unkanodes Wilson and Claridge, 1991. CAB Intern. & Nat. Resources Inst. 69
Unkanodes Ding & Zhang, 1994. China Agric. Sci. & Tech. Press 109

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Generic features: Body length 4.5–4.7 mm long, pale brown to blackish brown with a fairly wide white band or stripe running from vertex to scutellum; vertex slightly oblong, nearly 2x as long as wide, narrowed at about midlength, medio-lateral carinae arise from lateral carinae apically, united to each other on apex and extended to frons as single carina; face somewhat oblong, broadest under eyes about 2.5x as long as broadest width; antennae relatively long, reaching beyond fronto-clypeal suture, segment I distinctly shorter than segment II by less than half the length of the second; pronotum and vertex almost subequal in length, tricarinate lateral carinae diverging posteriorly but not reaching hind margin; mesonotum tricarinate; pygofer moderately oblongate, mediocaudal process absent; parameres with concave inner midlaterals concave, apically forming lobe-like process, inner one higher than the other; laterodorsal angle distinctly higher than the tip of paramere; ventrolaterals of pygofer sometimes well developed laterally; anal segment with a pair of downwardly processes, aedeagus arrow-like with subapical barb of spines directed downward or hook-like.

13.1 *Unkanodes albifascia* (Matsumura, 1900)
Plates 22f, 37c

Liburnia albifascia Matsumura, 1900. Entomol. Nachr. 26:268
Delphax a. Oshanin, 1908. Verz. Palaark. Hem. 2:330
D. a. Oshanin, 1912. Kat. Palaark. Hem. 120
Delphacodes albifascia Esaki et Ishihara, 1943, Cat. Araeopid. Imp. Jpn. 35
Chilodelphax albifascia Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 69
Ribautodelphax albifascia Ibid. 69

Features: Body length 1.8–2.4 mm; body dorsally with a distinctly conspicuous fairly broad white median longitudinal stripe running from vertex to scutellum; vertex light brown with black band each between lateral and medio-lateral carinae; pronotum and scutellum brown; frons and clypeus black with white longitudinal stripe along its median carinae; genae similar to frons in coloration except for the brown lateral carinae; antennae light brown, short, and not reaching the fronto-clypeal suture, segment I shorter than segment II; forewings opaque, blackish with basal portion whitish and apical margins bearing whitish tinge; pterostigma conspicuously black; pygofer subglobose with laterally expanded ventrolateral margins, latero-dorsal angle well developed; parameres visibly concave at about midlength of the inner lateral margins, apically forming an outwardly projected hook, apicolateral tip of the outer margin rounded; anal segment with a pair of short processes; aedeagus hook-like viewed ventrally, barbed with spines toward the apex.

Host plant: Rice and a wide range of Gramineae
Economic importance: Relatively high; vector of northern cereal mosaic virus, stripe disease, and black streaked dwarf virus
Distribution: Japan, Korea, maritime territory of former Soviet Union

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

13.2 *Unkanodes sapporonus* (Matsumura, 1935)
Plates 2e, 16e, 22g, 37d

Unkana sapporona Matsumura, 1935. Insecta Matsumurana 10:74
Unkanella sapporona Esaki et Ishihara, 1945. Cat. Araeopid. Imp. Jpn. 22
Unkanella sapporona Matsumura et Ishihara, 1945. Mushi 16:69
Delphacodes sapporona Ishihara, 1949. Cont. Sci. Rep. Matsuyama Agric. Coll. 2:57
Unkanodes sapporona Fennah, 1956. Proc. Calif. Acad. Sci. 28:4
Elymodelphax excise Anufriev, ? 1980. Zool. Zh. 59
Unkanodes sapporonus Wilson and Claridge, 1991. CAB Intern. & Nat. Resources Inst. 68
Unkanodes sapporona Ding & Zhang, 1994. China Agric. Sci. & Tech. Press 110-112.

Features: Body length 4.5–4.7 mm, generally pale yellow-brown-bodied planthopper; vertex longer than wide, narrow, visibly extending forward between eyes; white stripe lined the median longitudinal area of vertex running to pronotum and scutellum; frons and clypeus concolorous, more dark colored than pale brown genae, frons broadest subanteriorly, lateral margins slightly concave, median and lateral carinae distinct, median carina forked close to base of frons; antennae short pale brown, segment I narrower and shorter than segment II, not reaching frontoclypeal suture; clypeus longer than wide with median carina present; length of vertex and pronotum combined longer than mesonotum; pronotum tricarinate; forewings hyaline, hind margin broadly brownish, veins along apical one-third infuscated; pygofer with a short narrow basal lobe adjacent to base of parameres, widens as parameres diverge; parameres parallel-sided most of their length viewed caudally, axe-like seen laterally; apex constricted on both sides, laterally inner apical tip shortly bulbous at tip; aedeagus arrow-like with barbed spines subapically.

Host plant: Rice
Economic importance: Minor pest; vector of black streaked dwarf and stripe viruses
Distribution: China, Japan, Korea, maritime territory of former Soviet Union, Taiwan

14. Genus *STENOCRANUS* Fieber, 1866

Stenocranus Fieber, 1866. Zool.-Bot. Ges. Wien, Verh. 16:519
Type species: *Fulgora minutes* Fabricius, 1787

Stenocranus Fieber, 1866. Zool.-Bot. Ges. Wien, Verh. 16:519
Stenocranus Sahlberg, 1871. Not. Sallsk. Faun. Fenn. Forh. 12:413
Stenocranus Fieber, 1875. Rev. Mag. Zool. 370
Stenocranus Farrari, 1878. Ann. Mus. Stor. Nat. Genova 18:57
Stenocranus Ashmead, 1889. Entomol. Am. 5:27
Stenocranus Melicher, 1896. Cicad. v. Mit. Eur. 56

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Stenocranus Van Duzee, 1897. Bull. Buffalo Soc. Nat. Sci. 5:230
Stenocranus Kirkaldy, 1907. Hawaii
Stenocranus Oshanin, 1912. Kat. Palaark. Hem. 118
Stenocranus Crawford, 1914. Proc. U.S. Mus. 46:587
Stenocranus Dozier, 1922. Ohio J. Sci. XXII (3):69
Stenocranus Muir et Griifard, 1924. Hawaii Sugar Plant. Assoc. Entomol. Bull. 15:11
Stenocranus Matsumura, 1935. Insecta Matsumurana 10:71
Stenocranus Esaki et Ishihara, 1943. Cat. Araeop. Imp. Jpn. 13
Stenocranus Matsumura & Ishihara, 1945. Mushi 16:68
Stenocranus Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:23-24
Stenocranus Fennah, 1956. Insects of Micronesia 6(3):113
Stenocranus Fennah, 1978. Ann. Zool. (Wars.) 34(9):219
Stenocranus Ding & Zhang, 1994. China Agric. Sci. Tech. Press 23

Generic features: Body length 2.6–7 mm; vertex projected in front of eyes, apex narrower than base, fairly oblong, usually 1.5–2x the width, with medio-lateral carina joining lateral carinae before reaching base and converging apically, but not meeting on vertex, continued on to frons, where they merge with each other inferiorly to base; head including eyes subequal to combined length of vertex and pronotum; eyes comparatively large; enlarged postero-laterally, Y-shaped median carina present; frons more than 2x as long as width at midlength, its widest point; eyes relatively large, swollen postero-laterally; clypeus wider basally than in frontal apex; antennae in most species short, not reaching fronto-clypeal suture, segment II longer than segment I by about 2:1; pronotum shorter than the length of vertex, wider than head, including eyes, lateral carinae convergingly curved posteriorly and distinctly reaching hind margin; mesonotum large, apex blunt to pointed, length about equal to combined length of vertex and pronotum; tricarinate but median carina indistinct toward apex; forewings well developed, distinctly protruded well beyond tip of abdomen; legs simple, basitarsus as long as or a little longer than the combined length of the other two tarsal segments; pygofer often oblongate with anal segment and long and large style projected outward, medioventral area deeply concave forming a distinctly sunken base of slender parameres; tips of parameres usually narrowed and pointed; aedeagus long, slender, and pointed apically.

14.1 *Stenocranus* sp. A
Plates 2f, 6c, 11e, 19a, 25b, 32k

Features: Body length 4.8 mm; body coloration pale yellow brown; head wider than long by about 1.34x at widest point; vertex, viewed dorsally, 1.8x longer than wide of broadest point along basad of vertex; submedian carina of vertex narrowed toward base of frons; basal compartment of vertex almost as wide as long, Y-carina faded to indistinct; eyes distinctly large; frons pale yellow brown except thin brown longitudinal stripe lining the side of lateral carina; 2.7x longer than wide at broadest subapical area, 4.5x at narrowed base of frons, anterior width 1.7x wider than base, median carina very thin yellow sigmoid-like toward fronto-clypeal suture, partly faded

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

before reaching the suture; lateral carinae of frons, clypeus, and genae thin black line; clypeus and genae pale yellow-brown; frontoclypeal suture sunken; clypeus strongly convex at middle, tricarinate; antenna yellowish, base of segment I narrower than its apex, segment II 2.3x longer than I, distinctly beyond frontoclypeal suture; length of vertex and pronotum together one-eighth shorter than mesonotum; pronotum tricarinate, lateral carinae straight and oblique, directed laterad, not reaching hind margin; mesonotum about 1.16x longer than vertex and pronotum, tricarinate, median carina fading toward scutellum, lateral sides light brown; forewings subhyaline with pale yellowish brown veins along apical margins, extended beyond tip of abdomen by about the length of abdomen; legs and abdomen yellowish; pygofer yellowish, darker in the anal segment; medioventral part widely and deeply concave, housing basally merged; apically diverging parameres; apical one-third of parameres moderately enlarged, tips pointed parallel to each other to slightly converging; laterodorsal angle of pygofer at level with the enlarging apical third of parameres; anal segment with a pair of short processes parallel to each other, tips hardly reaching laterodorsal angle; aedeagus brownish, thin, slender, and long; tibial spur with 23 spines.

Host plant: Rice
Economic importance: NEI
Distribution: Philippines (Luzon Island)

14. 2 *Stenocranus pacificus* Kirkaldy, 1907
Plates 2a, 6d, 11f, 19b, 25c, 32l-m, 37e-f

Stenocranus pacificus Kirkaldy, 1907. Hawaii Sugar Plant Assoc. Div. Entomol. 3(1):139
S. p. Fennah, 1956. Insects of Micronesia 6(3):114
Sogata hakonensis Pawar, 1972. Terminal Rep. Int. Rice Res. Inst.

Features: Body length 4–6.3 mm; light orange-yellow planthopper with a broad dorso-median longitudinal band running from head to scutellum; vertex frontally narrowed, produced in front of reddish eyes, 1.69x longer than wide at broadest basal area; basal compartment almost as wide as long basad; frons with a broad median white longitudinal band, including median carina, laterals, and lateral carina narrowly brown extended partly to vertex; widest subapically near the convex frontoclypeal suture, almost 3x longer than wide, anterior width 2x basal width; tricarinate; clypeus white medially as continued from frons, pale yellow-brown laterally; median carina present; genae brownish yellow; ocelli present, black; antennae yellow, segment II 1.75x longer than segment I, passing the frontoclypeal suture; forewing hyaline, tinged pale yellow, including veins, apical vein light reddish brown extended beyond abdominal tip by more than length of the dorsally orange abdomen; pygofer yellow, V-shaped toward medioventral margin, emarginate ventrally; anal segment prominent with a pair of processes subparallel to one another; parameres contiguous basally, diverging V-shaped toward apex, with a hooked tip directed lateroventrally; aedeagus elongate, subascending; legs yellow, tibial spur of leg III with 24–25 spines.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Host plant: Rice, *Saccharum officinarum*, and grass
Economic importance: Low
Distribution: Fiji Island, Western Caroline Island, Palau, and Philippines

14.3 *Stenocranus* near. *pseudopacificus* Kirkaldy
Plates 2h, 6e, 11g, 19c, 25d, 32n-o

Features: Body length 5.7–7.5 mm; pale yellow to light orange-yellow with a relatively narrow median longitudinal white band running from vertex to scutellum; eyes reddish brown to silvery brown with red tinge; mesonotum largely orange laterally; basal compartment pale yellow with margins brown; vertex whitish except for reddish brown band between median and lateral carinae running down to frons; frons reddish brown except for whitish median and yellow-brown carinae; clypeus orange; genae yellowish brown; antennae yellow; forewings hyaline, lightly granulated, veins pale brown toward apical margins; legs yellow; abdomen orange except for yellow pygofer; vertex slightly longer than wide, widest basad, frontally narrowed and projected in front of eyes; basal compartment at base 1.4x wider than long; median carina present forming bilobed area; combined length of vertex and pronotum about 0.6x length of mesonotum, the latter 1.65x longer than vertex and pronotum; lateral carina of pronotum very slightly concave to straight, not reaching hind margins; median carina of mesonotum faded before scutellum; frons at widest anterior, 2.66x longer than wide, almost parallel-sided except narrowed at base; ocelli black present; clypeus tricarinate, 1.44x longer than wide, apical half near the frontoclypeal suture bulbous, rounded, and swollen; antennae barely reached the frontoclypeal margin, segment II 2.1x longer than I; forewings extended beyond tip of abdomen by as much as 1.63x length of abdomen; pygofer subquadrate basally to moderately oblong, laterodorsal angle almost at midlength, U-shaped on apical end; parameres unique, large contiguous base forms thin spur with apically diverging tips, continued apically as slender process, curved outward laterally; anal segment with a pair of processes, horn-like curved toward the inside of pygofer; aedeagus long and slender, half-coiled subapically forming a transverse structure between horn-like process of anal segment; anal style relatively short. (Note: Quite similar to *S. pseudopacificum* Muir but genitalia pattern quite different.)

Host plant: Rice
Economic importance: Low
Distribution: Philippines (Luzon Island)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

14.4 *Stenocranus* sp. B

Plates 2i, 6f, 11h, 19d, 25e, 33a-b

***Features*:** Body length 5.6 mm; pale yellow with light orange-red abdomen; pronotum whitish yellow; mesonotum with yellowish brown band along lateral carinae and sublaterals pale yellow-brown; a dorso-median longitudinal white band from vertex to scutellum distinct; frons, clypeus, and genae yellow-brown, including carinae; ocelli black; eyes silvery brown; antennae yellow; hyaline wings very finely granulate; vertex narrowly projected forward in front of eyes, 1.23x longer than wide taken across broadest basal area; basal compartment as a whole subquadrate, each cell almost 2x longer than wide; vertex and pronotum together shorter than mesonotum, the latter 1.33x longer than vertex and pronotum; pronotum and mesonotum tricarinate; lateral carinae of pronotum slightly convex, not reaching hind margin; median carina of mesonotum indistinct toward scutellum; frons at apical portion 2.58x longer than wide, lateral margins more widely separated apically, sinuate basally toward vertex; clypeus mildly swollen near frontoclypeal suture; antennae with base of segment I narrower than apex, segment II 2x longer than segment I; forewings extended beyond tip of abdomen by twice the length of abdomen; pygofer yellow except for brownish aedeagus and tips of parameres; obligate to basally subquadrate; parameres horn-like, basally contiguous, with emanating thin and slender, apically pointed spines; inner midlaterals deeply concave, curved inward and then slightly outward forming an oblique small hook-like diverging process; pair of anal segment processes apically thin and slender, projected downward to aedeagus and converging.

Host plant: Rice
Economic importance: Low
Distribution: Philippines (Luzon Island)

15. Genus *PERKINSIELLA* Kirkaldy, 1903

Perkinsiella Kirkaldy, 1903. Entomologist 36:179
Type species: *Perkinsiella sacharicida* Kirkaldy, 1903

Perkinsiella Kirkaldy, 1903. Entomologist. 36:179; 1906. Hawaii Sugar Plant. Assoc. Entomol. Bull. 1:404
Phalacastor Kirkaldy, 1906. Hawaii Sugar Plant. Assoc. Entomol. Bull. 1:408
Perkinsiella Kirkaldy, 1907. Ibid. 3:136
Perkinsiella Muir, 1910. Ibid. 9:4. 1913. Proc. Hawaii. Entomol. Soc. 2:240
Perkinsiella Matsumura, 1917. Appl. Entomol. Form. Ser. 378.
Perkinsiella Muir, 1927. Ins. Samoa 2:11
Perkinsiella Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 44
Perkinsiella Matsumura et Ishihara, 1945. Mushi 16:73
Perkinsiella Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:18

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Perkinsiella Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:44
Perkinsiella, 1956. Insects of Micronesia 6(3):109
Perkinsiella Fennah, 1965. Bull. Brit. Mus. (Nat. Hist.) 17(1):16
Perkinsiella Fennah, 1978. Ann. Zool. (Wars.) 34(9):223
Perkinsiella Wilson and Claridge, 1991. CAB Intern. & Nat. Resources Inst. 70-72

Generic features: Moderately sized to large planthoppers, 5.0–7.7 mm long; easily recognized by head noticeably broad with a broad medio-longitudinal yellow to white band running from vertex to mesonotum; vertex slightly projected frontally in front of eyes, subparallel-sided, mediolateral carinae raised along lateral carinae, slightly posterior to middle, moderately converging anteriorly, continued to frons and branch near the lower margin of eyes; Y-shaped carina and usually faded to indistinct transverse carinae between mediolateral carina present; face about 2x as long as broad between eyes, the broadest area narrow and distinctly concave to excavated toward the apex; clypeus base about as wide as apex of frons; antennae large, nearly reaching apex of clypeus, sement I rather triangular (broader at apex than at base) and both segment I and II flattened, and segment II about 1.5x longer than first; pronotum slightly broader than vertex at eye region, a little shorter than vertex; lateral carinae diverging and curving posteriorly, fading before reaching lower margin; mesonotum relatively small obtusely projected posteriorly, length subequal to vertex and pronotum combined; legs simple, hind basitarsus more than 2x as long as the other two tarsal segments put together; spurs relatively small, thin, with many minute teeth along the hind margin; pygofer with two spines on vertical margin.

15.1 *Perkinsiella* sp. A
Plates 2j,11i,33c

Features: Body length 7.5 mm; black *Perkinsiella* form with brownish vertex, median plate of pronotum and scutellum, blackish brown legs, brownish median carina of mesonotum dorsum of femur I and wings particularly the veins and hyaline in the discal area and from Sc to M_{1+2}; vertex slightly produced in front of eyes, almost parallel sided, 1.23x wider than long at base, basal compartment wide, each slightly longer than wide to almost subequal median carina of compartment distinct; eyes large and distinct; frons black with very light yellow transverse band at level of simple eyes and a narrow line at frontoclypeal suture, 1.67x longer than wide, broadest at level of antennae, tricarinate, median carina forked at broadest point of frons, lateral carinae parallel-sided apically, widen medially and narrow basally; clypeus shiny black, median carina distinctly higher than lateral carinae; antennae typical of the genus except for color, segment I with yellowish brown longitudinal band laterally and ventrally, segment II yellow-brown along basal one-third; apex of segment I 1.8x wider than its base; segment II 1.5x longer than segment I; vertex and pronotum shorter than mesonotum, the latter 1.38x longer than combined length of pronotum and vertex; pronotum tricarinate, lateral carina sigmoid, posterior ends curve diverging, not reaching the hind margin; mesonotum tricarinate, median carina distinct up to scutellum, lateral carinae subparallel to one another, scutellum distinctly triangular, separated

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

by a transverse demarcation line from mesonotum; forewings 3.87x longer than broad, transparent in the discal area between veins R and M, subcostal cell, and Sc to M_{1+2} subcostal cell with two cells; pygofor black with yellow-brown style, subovate, narrowed in the medioventral margin with a pair of thin outerwardly curved spines; ventrolaterally strongly convex and rounded; parameres stout, contiguous basally, widen at midlength forming concave inner lateral margins, slightly converging to U-shaped apically, apex with small tooth-like protuberance projected upward; and segment with a pair of processes, slightly converging, then process projected caudad; and style leaf-like to pear-shaped, 2.5x longer than wide.

Host plant: Unknown
Economic importance: Low
Distribution: Philippines (Luzon Island)

15.2 *Perkinsiella vastatrix* (Breddin, 1896)
Plates 2k, 6g, 11j, 19e, 25f, 37g-h

Dicranotropis vastatrix Breddin, 1896. Deutsch. Entomol. Zeitschr 1896:109
D.v. Krueger, 1899. Zuckerrohr. U.S. Kultune 312
D.v. Brusse, 1904. Arb. Boil. About Land. Kais. Ges. Amt. 4:319
Perkinsiella vastatrix Kirkaldy, 1906. Hawaii Sugar Plant. Assoc. Exp. Stn. Entomol. Bull. 1:407; 1907. Ibid. 3:135,137
P. (*Dicranotropis*) v. Matsumura, 1910. chad. U. Nutz. Ins. Zuckerrohr. Formosa 15
P. v. Muir, 1910. Hawaii Sugar Plant. Assoc. Exp. Sta. Entomol. Bull. 9:5,9
P. v. Gater et Corbett, 1926. Fed. Malay. State Straits Settlm. Bull. 38:5
P. (*Dicranotropis*) v. Dammerman, 1929. Agric. Zool. Malay. Archipel. 235
P. v. Takano et Yanagihara, 1938. Spec. Rep. Tokyo Exp. Stn. 2:122
P. v. Esaki & Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 45
P. v. Ishihara, 1945. Sci. Rep. Matsuyama Agric. Coll. 2:21

Features: Body length 8 mm; brownish yellow with dark brown pterostigma, hyaline wings, brown markings on the apical one-third of forewings; dark brown antennal segment I except for yellow basolaterals; I and II legs yellow except tibia with subapical and subbasal blackish brown bands and tarsi I and II completely blackish brown; femur III with brown longitudinal lateral stripe vertex very slightly projected in front of eyes, 1.4x wider than long, 1.32x broader posteriorly than anteriorly; basal compartment visibly deep and concave, as wide as long, median carina present; frons, clypeus, and genae brownish, sometimes basal one-half of clypeus yellow; frons mottled with yellowish spots, 4–5 pairs at base, to level of Y-carina, 2–3 pairs at midlateral carina and 1–2 pairs subapically, 2.13x longer than wide at broadest point, just above level of distinctly black ocelli, tricarinate similar to clypeus, genae with a yellow spot subapically; antenna with apex of segment I almost 2x wider than its base, segment II 1.9x longer than I lightly passing the frontoclypeus suture; vertex and pronotum together about 0.7 length of mesonotum, the latter being 1.48x longer than vertex to pronotum; pronotum tricarinate, lateral margins sinuate, curved outward laterally, not

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

reaching hind margin, propleuron with four yellowish white spots just behind eyes; mesonotum tricarinate with whitish yellow tip of scutellum, without demarcation line between mesonotum and scutellum, median carina reaches scutellum; forewings beyond abdominal tip by about 0.8 length of abdomen; pygofer subovate, wider ventrally and somewhat elongate apically; medioventral process with a pair of thin and slenderly long bifurcating processes; parameres basally large and bearing two diverging processes; anal tube with a bifurcate spin; anal style short; venter of anal segment brown medially; tibial spur with about 30 teeth.

Host plant: *Andropogon sorghum*, rice, *Saccharum officinarum*, *Zea mays*
Economic importance: Relatively low
Distribution: Indonesia, Japan, Malaysia, New Guinea, Philippines, Taiwan, East Africa

15.3 *Perkinsiella pseudomaidis* (Kirkaldy, 1906)
Plates 2l, 6h, 12a, 19f, 25g, 40e

Phacalastor pseudomaidis Kirkaldy, 1906. Hawaii Sugar Plant. Assoc. Entomol. Bull. 1:408
Perkinsiella pseudomaidis Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Entomol. Bull. 3:136

Features: Body length 4 mm; typical pattern of *Perkinsiella*, broad whitish yellow dorsomedian band runs from vertex to pronotum and narrows to the mesonotum; lateral side of pronotum and mesonotum brownish; propleuron with three short white bands and a white spot; scutellum whitish yellow; eyes brownish silvery; antennae brown-yellow except for dark brown to black apex of segment I and base of II; frons blackish brown with two yellow transverse bands at eye level, genae blackish brown with two yellow spots; clypeus brown with yellow carinae; legs blackish brown with yellow apical median and basal bands in tibia I and II, sides of thorax and abdomen pale dark brown with whitish yellow patches; forewing transparent with distinct dark brown granulations; brown band anterior of cubital cell and just after cross veins present extending concavely but lightly to Cu_1 up to M_3; vertex slightly wider than long; frons 2.28x longer than broad, widest at level of simple eyes; vertex and pronotum together shorter than mesonotum, the latter 1.6x longer than vertex and pronotum; pronotum tricarinate, lateral carina posteriorly curved laterally, not reaching margins; mesonotum tricarinate but very low; pygofer with two relatively short ventral spines, in profile, ventral margin acutely developed; parameres twisted; ventral wall of anal tube bears four spines, dorsal ones longer than ventrals; valvifer VIII of female with inner margin of the base produced upright and vertical forming lobe-like tube extension.

Host plant: *Saccharum officinarum* L. and rice
Economic importance: Low
Distribution: Fiji and Philippines (Luzon Island)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

15.4 *Perkinsiella* near *bakeri* Muir, 1916
Plates 3a, 7a, 12b, 19g, 25h, 33d, 40f

Features: Body length 4.5–5.2 mm; generally blackish brown with a broad whitish yellow median longitudinal band running from basal compartment of vertex, pronotum, and tip of scutellum; pronotal band wider than in mesonotum; lateral margins of pronotum and mesonotum dark brown, propleuron with three transverse white bands and a spot; meso- and metapleuron with more whitish areas than other species; eyes blackish red to dark brown; frons with a broad tranverse yellowish white band on apical half extended laterally to genae, edge of pronotum, and pleuron; subapex of frons with transverse brown line extended to genae, dark brown in basal half; clypeus brownish yellow aligned to the blackish brown band on midcoxa I; antennae brownish black with yellow ventral line and black apex of segment I, segment II with a yellow spot subbasofrontally; femora I and II with alternating whitish yellow and dark brown longitudinal bands; tibia I and II with a basal and subapical blackish brown band; all tarsi black; leg III with brown markings on laterals and apex of femur, base, and apex of tibia near the spines; spur brown but whitish yellow before the spines; forewings granulated, transparent except for brown marking on apical one-third after the cross veins, apices of cells between Sc to half of R_2 + M_{1+2} transparent; vertex shortly protruded in front of large eyes, 1.26x wider than long at widest point, submedian carina fused down to frons, each cell of basal compartment slightly wider than long; vertex and pronotum together shorter than mesonotum, the latter 1.36x longer than combined length of vertex and pronotum; lateral carina of pronotum sinuate, curved laterally not reaching hind margins; mesonotum tricarinate as in pronotum, median carina forked toward scutellum; frons at widest point 1.85x longer than wide across level of ocelli; lateral carina parallel-sided anteriorly, convex medially, and narrowed apically; median carina forked almost at level of ocelli; pygofer obovate, medioventral area V-shaped with a pair of outwardly projected processes, ventrolateral margins strongly concave laterally; parameres relatively short and broad, apex with three small processes, inner one projected inward laterally, apical one slightly diverging, longest outer one curved caudad; anal segment with a pair of ventrally located processes, parallel to one another, projected caudally.

Host plant: Rice
Economic importance: Low
Distibution: Philippines (Luzon Island and Panay Island)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

15.5 *Perkinsiella saccharicida* Kirkaldy, 1903
Plates 3b, 7b, 12c, 16f, 19h, 23g, 25i, 28i, 33e, 37i-j, 40g

Perkinsiella saccharicida Kirkaldy, 1903. Entomologist 36:179
Perkinsiella saccharicida Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Entomol. Bull. :137
Perkinsiella saccharicida Muir, 1910. Hawaii Sugar Plant. Assoc. Entomol. Bull. 9:5
Perkinsiella saccharicida Kirkaldy, 1910. Faun. Hawaii 2:578
Perkinsiella saccharicida Melichar, 1913. Notes Leyd. Mus. 36:111
Perkinsiella saccharicida Matsumura, 1917. Appl. Ent. Form. Ser. 378
Perkinsiella saccharicida Singh-Pruthi. 1925. Trans. Entomol. Soc. London (1925):228
Perkinsiella saccharicida Gater et Corbett, 1926. Fed. Malay. State Straits Settlm. Bull. 8:5
Perkinsiella saccharicida Matsumura, 1932. Dainippon Gaichu Zusetsu 228
Perkinsiella saccharicida Esaki & Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 45
Perkinsiella saccharicida Matsumura et Ishi, 1945. Mushi 16:73
Perkinsiella saccharicida Fennah, 1965. Bull. Brit. Mus. (Nat. Hist.) 17(1):17

***Features*:** Body length 4.8–5.2 mm; dull yellowish brown except for blackish red eyes, transparent wings with brown granulation, basal margins of forewings, and pterostigma marked brown in midapical area of forewings in males; frons brown in basal half, whitish yellow in apical half with brown diamond-like spots close to the fronto-clypeal suture and genae; basal half of frons lined with three pairs of yellow spots arranged longitudinally to vertex and four transversely above ocelli level; clypeus chocolate brown parallel to the band on midcoxa I; antennae yellow except for brown ring on apex and ventral band of segment I; femora I-III with alternating yellow and brown longitudinal stripes; side of thorax with round brown spot in metapleuron; vertex only slightly protruded in front of eyes, 1.14x wider than long, basal compartment as long as broad; vertex and pronotum combined shorter than mesonotum, the latter 1.62x longer than two taken together; pronotum and mesonotum tricarinate; lateral carinae of pronotum curved laterad posteriorly, not reaching hind margin; forewings extended beyond abdominal tip by 1.27x length of abdomen; venter of abdomen of female white except for brown ovipositor sheath and lateral margins of sternites; pygofer ovate, medioventral area without a concavity, base of parameres with a pair of widely separated spines; parameres short and subtruncate apically; anal segment has a pair of upwardly projecting spines.

Host plant: Rice, *Saccharum officinarum* (L.), *Zea mays* (L.)
Economic importance: Low
Distribution: Australia, Fiji, Hawaii, Indonesia, Malaysia, New Guinea, Philippines, and South Africa

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

15.6 *Perkinsiella graminicida* Kirkaldy, 1906
Plates 3c, 7c, 12d, 19i, 25l, 33f, 37k-l

Perkinsiella graminicida Kirkaldy, 1906. Hawaii Sugar Plant. Assoc. Entomol. Bull. 1:406
Perkinsiella graminicida Kirkaldy, 1907. Ibid. 3(1):137
Perkinsiella graminicida Muir, 1910. Ibid. 9:5

Features: Similar to *P. saccharicida* except for brownish apical one-half of frons below the Y-median band and along the frontoclypeal margin; basal half of frons with indistinct white spots; genae dull brown; clypeus and antennae brown to yellowish brown, apex of antennal segment II with black ring; vertex at its greatest width 1.35x wider than long; vertex and pronotum combined shorter than mesonotum, the latter 1.4x longer than vertex and pronotum; pronotum and mesonotum tricarinate; lateral carinae of pronotum curved laterad posteriorly, not reaching hind margin; forewings extended beyond tip of abdomen by 1.35x length of abdomen; forewings with thicker granulations, apical third with a convex brown band from crossveins Cu_1 to M_3; pygofer brownish red, medioventral area with a pair of short subparallel spines; parameres with large contiguous black and rough base, U-shape in profile, with brown apical half forming two spines at right angles, outer one subapical and projected laterally, other one directed upward; anal segment with two long curved spines from the ventral side of the tube; aedeagus quite small.

Host plant: Rice
Economic importance: Low
Distribution: Fiji and Philippines (Luzon Island)

16. Genus *PEREGRINUS* Kirkaldy, 1904

Peregrinus Kirkaldy, 1904. Entomologist 37:175
Type species: *Delphax maidis* Ashmead, 1890

Dicranotropis Van Duzee, 1897. Bull. Buffalo Soc. Nat. Sci. 5:228
Peregrinus Kirkaldy, 1904. Entomologist 37:175
Peregrinus Crawford, 1914. Proc. U.S. Mus. 46:593
Peregrinus Muir, 1915. Canad. Entomol. 47:299
Peregrinus Muir & Giffard, 1924. Hawaii Sugar Plant. Assoc. Entomol. Bull. 15:11
Peregrinus Osborn, 1935. New York Acad. Sci. 14:234, 240.
Peregrinus Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 39
Peregrinus Matsumura et Ishihara, 1945. Mushi 16:71
Peregrinus Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:79
Peregrinus Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:44
Peregrinus Fennah, 1956. Insects of Micronesia 6(3):109
Peregrinus Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):18
Peregrinus Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 70

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Generic features: Body length 3.7–5 mm; light brown to yellow-brown; frons, genae, clypeus, antennal segment I, and laterals of pronotum and mesonotum darker in shape; forewings subhyaline, tinged brown; vertex almost as long as wide, slightly converging toward truncate apex, mediolateral carina convergent apically but distinctly not uniting on vertex, continued on to frons where carinae unite slightly at midlength, U-shaped median carina visible; frons relatively wide, its length 2x the width at midlength, its broadest point; clypeus base clearly wider than apex of frons; antennae comparatively long, protruding from base of face, segment I much longer than half of the second; pronotum almost as long as vertex, much broader than vertex, including eyes, tricarinate, lateral ones converging curved posteriorly and entirely reaching the hind margin; scutellum large, much longer than vertex and pronotum combined; legs simple, hind basitarsus longer than the other two margins; pygofer ovoid with truncate anterior end, small anal segment, parameres converging apically.

16.1 *Peregrinus maidis* (Ashmead, 1890)

Plates 3d, 7d, 12e, 16g, 19j, 23b, 25k, 28j, 33g-h, 38a-b, 40h

Delphax maidis Ashmead, 1890. Psyche 5:323
D. psylloides Lethierry, 1896. Ind. Mus. Notes 3:106
Dicranotropis maidis Van Duzee, 1897. Bull. Buffalo Soc. Nat. Sci. 5:240
Liburnia psylloides Melichar, 1903. Hom. Faun. V. Ceylon 104
Peregrinus maidis Kirkaldy, 1904. Entomologist 37:176
Pundaluoya simplicia Distant, 1906. Faun. Brit. Ind. Rhynch. 3:468
Liburnia psylloides Distant, 1906. Ibid. 484
Peregrinus maidis Distant, 1907. Ann. Soc. Entomol. Belg. 51:221
P. m. Van Duzee, 1909. Bull. Buffalo Soc. Nat. Sci. 9:197
P. m. Kirkaldy, 1910. Faun. Hawaii 2:577
Pandaluoya simplicia Melichar, 1913. Notes Leyd. Mus. 36:109
Liburnia psylloides Melichar, 1913. Ibid. 111
Peregrinus maidis Melichar, 1913. Ibid. 111
Dicranotropis maidis Crawford, 1914. Proc. U.S. Mus. 46:595
Peregrinus maidis Metcalf, 1915. J. Elisha Mitsch. Soc. 31:12
P. m. Van Duzee, 1917. Cat. Hem. Am. 769
P. m. Giffard, 1922. Proc. Hawaii Entomol. Soc. 5:109, 110, 116, 118
P. m. Muir, 1926. Ann. Mag. Nat. Hist. Ser. 9 :17, 80
P. m. Dammerman, 1929. Agric. Zool. Malay Archipel. 235
P. m. Esaki, 1940. Bot. Zool. 8:276
P. m. Swezey, 1940. Hawaii Plant. Rec. 44:158
P. m. Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 39
P. m. Matsumura et Ishihara, 1945. Mushi 16:71
P. m. Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:44.
P. m. Fennah, 1956. Insects of Micronesia 6(3):109
P. m. Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):18
P. m. Fennah, 1978. Ann. Zool. (Wars.) 34(9):223
P. m. Wilson & Claridge. 1991. CAB Intern. & Nat. Resources Inst. 70

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Features: Body length 3.7–5 mm; light yellow-brown to yellow-orange in some specimens, mesonotum with a pair of orange longitudinal bands between the white median and yellow-brown lateral carina, with transparent ungranulated wings banded brown on apical one-third radiating from apex of cubital cell to longitudinal vein Cu, M_3, M_2, M_1, and R_2 and Sc_1 but shaded areas form four white spots, one each between Cu_1 and M_3 and M_1 and M_2 and two between M_2 and M_3; pterostigma present; abdomen including pygofer dark brown to dark reddish brown; femora yellow-brown, tibiae yellowish; vertex truncate anteriorly, 1.25x wider than long basally, the broadest part; basal compartment with each cell as long as wide, both cells deeply concave; frons, clypeus, and genae yellow-brown with lateral carinae thinly black; ocelli black; frons at widest point at level of Y-median carina, 1.8x longer than wide; median carina forked nearly at midlength, boldly higher than lateral carinae, carinae with sharp edges; clypeus tricarinate similar to frons; vertex and pronotum combined length shorter than mesonotum, the latter 1.47x longer than the two together; lateral carinae of pronotum slightly convex posteriorly, not reaching hind margin; mesonotum's median carina fades in the base of scutellum; lateral carinae widen posteriorly and narrow anteriorly; segment I of antennae shorter than II, apex with black ring band; II about 1.85x longer than I, base black, narrower than apex, with apical one-third black; overall antennae reach a little beyond the frontoclypeal suture; forewings beyond abdominal tip by as long as total length of mesonotum to tip of abdomen; pygofer slightly oblong to rounded; parameres small, bases sunken into deeply concave medioventral area, parallel basally, the apical one-third curved out and bent inward, truncated to slightly cleft apices face each other; anal style short and relatively small.

Host plant: Maize, sorghum, sugar cane, *Bronus unicoides, Cynodon dactylon, Rottboellia cochinchinensis,* and occasionally on upland rice
Economic importance: High
Distribution: Cosmotropical species found in Africa, Bangladesh, Cambodia, India, Indonesia, Caroline Island, Hawaii, Laos, Malaysia, Micronesia, North and South America, Palau Island, Philippines, Sri Lanka, Taiwan, and Tahiti

17. Genus *EUIDELLA* Puton, 1886

Euidella Puton, 1886. Cat. Hem. Pal. 72
Type species: *Euidella basilinea* (Germar, 1819)

Euides Fieber, 1866. Verh. Zool-Bot. Ges. Wien. 16: 519 (nom. preocc.)
Euides Sahlberg, 1871. Not. Sallsk. Faun. Fenn. Forh. 12:402
Euides Fieber 1875-76. Rev. Mar. Zool. (1875):373
Euidella Puton, 1886. Cat. Hem. Pal. 72
Euides Melichar, 1896. Cicad. V. Mit.-Gur. 66
Euidella Oshanin, 1908. Verz. Palaark. Hem. 2:308
Euidella Muir, 1915. Can. Entomol. 47:263, 300
Euidella Muir et Giffard, 1924. Hawaii Sugar Plant. Assoc. Entomol. Bull. 25:6, 10

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Epunka Matsumura, 1935. Insecta Matsumurana 10:77
Toyoides Matsumura, 1935. Ibid. 78
Epunka Matsumura et Ishihara, 1945. Mushi 16:70
Eudes Ding & Zhang, 1994. China Agric. Sci. Tech. Ser. 50

***Generic features*:** Body length 6–7 mm; head relatively wide, about as wide as pronotum; vertex almost subquadrate or slightly longer than width; carinae fairly distinct except for the fading median carina; mediolateral carina merged with lateral carina before base; eyes moderate in size; face oblong, broadest almost medially, of length 2.5x the largest width, apex slightly narrower than base, mediolongitudinal carina furcate a little strongly to the midline; clypeus oblongate, base slightly wider than apex of frons; antennae very long, protruding apex of frons and almost reaching apex of clypeus, first segment distinctly longer than half of the length of segment II; pronotum shorter than vertex, with lateral carinae fading slightly posterior to the middle, before reaching hind margins; mesonotum relatively large, longer than combined length of vertex and pronotum, tricarinate, with apex moderately acute projecting posteriorly; forewings large, protruding well beyond abdominal tip; legs slender, simple spur thin, tectiform, hind margin with about 30 teeth; hind basitarsus much longer than combined length of second and third segment.

17.1 *Euidella* sp.
Plates 3e, 7e, 12f, 19k, 26a, 33i, 40i

Features: Body length 5 mm; eyes reddish brown similar to abdomen and pygofer; vertex, pronotum, and mesonotum tinged with orange to yellowish markings; frons, genae, clypeus, antennae, and legs yellowish brown; forewings hyaline with light brown band or apical half opposite cubital cell and vein R_1; segment and style yellow; vertex as long as wide, basal compartment deeply concave, 1.33x longer than pronotum; frons with median carina forked above midlength of frons, closer to base, mottled with yellowish white spots, four subapically in between the median carina, two each on the lateral carinae at level of Y-shaped carina and ocelli, a few fading ones at base of frons; genae each with two similar spots; antenna distinctly beyond frontoclypeal suture, almost up to midclypeus; pronotum tricarinate, one-third length of mesonotum, lateral carina curved posteriorlaterally but not reaching hind margin; mesonotum tricarinate, 1.29x longer than combined length of vertex and pronotum; pygofer ovoid, medioventral margin with three equally sized and long thin spines; base of paramere with a flattened part extended caudally, midhalf concave latero-caudally, twisted apically and diverging, forming tip with series of minute spike-like processes; anal segment with a pair of thin and long spines curved inward to the concave area of paramere; aedeagus long and slender with an apically long process curved inward parallel to the aedeagal body.

Host plant: Rice
Economic importance: low
Distribution: Philippines (Luzon Island)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

18. Genus *DICRANOTROPIS* Fieber, 1866

Dicranotropis Fieber, 1866. Verh. Zool. Bot. Ges. Wien. 16:521
Type species: *Delphax hamata* Boheman (subsequent designation by Distant, 1906)

Dicranotropis Fieber, 1866. Verh. Zool. Bot. Ges. Wien. 16:521
Dicranotropis Sahlberg, 1871. Not. Sallsk. Faun. Fenn. Forh. 12:469
Dicranotropis Ferrari, 1878. Ann. Mus. Stor. Mat. Genova 18:88
Dicranotropis Edward, 1886. Trans. Entomol. Soc. London 1:92
Dicranotropis Ashmead, 1886. Entomol. Am. 5:27
Dicranotropis Melichar, 1896. Cicad. V. Mit.-Eur. 96
Dicranotropis Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Entomol. Bull. 3:132
Dicranotropis Matsumura, 1917. Appl. Entomol. Form. Ser. 379
Dicranotropis Muir & Giffard, 1924. Hawaii Sugar Plant. Assoc. Entomol. Bull. 15:6, 7.
Dicranotropis Muir, 1927. Insects of Samoa 2:13
Dicranotropis Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 48
Dicranotropis Matsumura et Ishihara, 1945. Mushi 16:67
Dicranotropis Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:70
Dicranotropis Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:43
Dicranotropis Ossiannilsson, 1978. Fauna Entomol. Scand. 7(1):152
Dicranotropis Kuoh, 1983. Econ. Insects Fauna China 27:83
Dicranotropis Yang, 1989. NSC Special Publ. 6:315

Generic features: Body length 2.5–5.3 mm; body mostly light brown, pale dirty brown to gray; vertex as long as wide to longer than wide; frons with or without scattered mottles of light-colored spots; mediolongitudinal carina of frons forked close to the midlength or near to the level of ocelli, but never forked at base of frons; forewing hyaline with or without markings toward the apex; parameres with apices mutant or conspicuously forked; ventral margin of pygofer usually without hooks, some may have hooks on ventral margin of anal tube.

18.1 *Dicranotropis* sp.
Plates 3f, 7f, 12g, 19l, 30f, 33j

Features: Body length 4.2 mm; pale yellowish brown with transparent wings without markings, pale yellow legs with antennae, brown eyes, reddish ocelli, reddish brown pygofer, and yellow anal segment and style; vertex moderately projected in front of the eyes, rounded in front viewed dorsally, 1.2x longer than wide basally, basal compartment concave, each cell about 1.57x longer than broad; vertex longer than pronotum by 1.2x, together with pronotum combined length slightly shorter than or as long as mesonotum; lateral carinae of pronotum curved posteriorlaterally not reaching hind margins; mesonotum tricarinate like pronotum; frons broadest along apical one-fourth; 1.95x longer than wide; pygofer with a widely concave medioventral area; paramere with a basal spur directed latero-outward, flat and slightly convex at midlength, apical one-third thin and projected caudally, in profile, parameres apically

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

diverging moderately; anal segment with a pair of long and slender ventral processes converging toward tip of aedeagus, then joining parallel to one another reaching base of parameres.

Host plant: Rice
Economic importance: Low
Distribution: Philippines (Luzon Island)

19. Genus *NUMATA* Matsumura, 1935

Numata Matsumura, 1935. Insecta Matsumurana 9:139
Type species: *Stenocranus sacchari* (Matsumura)

*Numat*a Matsumura, 1935. Insecta Matsumurana 9:139
Unkana Matsumura, 1935. Ibid. 10:73
Numata Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 18
Numata Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:35
Numata Fennah, 1978. Ann. Zool. (Wars.) 34(9):222
Numata Kuoh, 1983. Econ. Insects Fauna China 27:77

Generic features: Body length 3.5–5.17 mm, grayish to light reddish brown planthoppers; head across eyes slightly narrower than pronotum; vertex about as long submedially as wide at base, anterior margins transverse, submedian carinae not merging apically; basal compartment wider at base than maximum length about 1.7:1; frons longer than broad at widest midline point about 2.3:1, median carina forked above level of ocelli; postclypeus wider basally than frons apically; rostrum reaching mesotrochanter; ocelli present; antennae cylindrical, bypassing the frontoclypeus suture, basal segment longer than wide, shorter than second about 1:2; pronotum with lateral carinae not reaching hind margin; spinal formula of leg III 5-7-4; tibial spur with 17–35 teeth; anal segment ring-like, lateroapical angle each forming a stout process; pygofer longer ventrally than dorsally, ventrally deeper concave, without medioventral process; phallus large, flat laterally, acute apically, incised subapically in ventral margin; diaphragm short; parameres long and diverging, basally projected caudad then abruptly dorsad.

19.1 *Numata muiri* (Kirkaldy, 1907)
Plates 3g, 7g, 12h, 19m, 26b, 30g, 33k-l, 38c-d

Dicranotropis muiri Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Entomol. Bull. 3:134
Stenocranus sacchari Matsumura, 1910. Schad. U. Nutz. Ins. Zuckerrohr Formosas 16
Dicranotropis muiri Muir, 1916. Hawaii Sugar Plant. Assoc. Div. Entomol. Bull. 13:153
D. m. Muir, 1917. Proc. Hawaii Entomol. Soc. 3:317
Numata sacchari Matsumura, 1935. Insecta Matsumurana 9:139
Unkana sacchari Matsumura, 1935. Ibid. 10:73

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Numata sacchari Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 18
N. s. Matsumura et Ishihara, 1945. Mushi 16:70
N. s. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:36
Numata muiri Fennah, 1978. Ann. Zool. (Wars.) 34(9):222
N. m. Yang, 1989. NSC Special Publ. 6:59-61

Features: Body length 4.10–5.17 mm; light yellowish brown with a spherical black spot on each metapleuron; forewing subhyaline with basal end of claval suture, apices of apical veins dark brown and pale to light brown membrane between M_{3+4} and Cu_{1a}; abdomen dark brown; vertex as long submedially as wide as base, narrowed apically than base, submedian carina not merging at apex; Y-shaped carina with weak stem, basal compartment of vertex broader basally than greatest length about 2:1; frons at midline longer than wide by about 2.3:1, subparallel-sided except for narrow base, median carina forked at basal third; clypeus very long, longer than wide at base; antennae extended beyond frontoclypeal suture, basal segment longer than wide, segment II about 2x as long as first; tibial spur with about 30 teeth; forewings longer than widest part about 4:1; pygofer prominently longer ventrally than dorsally, opening wider than long; viewed posteriorly, lateral margins not clearly defined; phallus very large, strongly compressed laterally, reflected cephalad distally bearing two processes, upper one surpassing base and lower one not reaching it; diaphragm very narrow, angulated along dorsal margin, forming a V-shaped area weakly sclerotized; parameres long and narrow, dorsally directed, basally contiguous and apically diverging; anal segment short, ring-like, lateroapical angles separated, each produced ventrad forming a stout spinose process.

Host plant: *Saccharum officinarum* L. and rice
Economic importance: Low
Distribution: China, Japan, Philippines, Taiwan, and Vietnam

20. Genus *NYCHEUMA* Fennah, 1964

Nycheuma Fennah, 1964. Trans. R. Entomol. Soc. Lond. 116(7):145
Type species: *Dicranotropis capensis* Muir

Nycheuma Fennah, 1964. Trans. R. Entomol. Soc. Lond. 116(7):145
Nycheuma Kouh, 1983. Econ. Insects Fauna China 27:31
Nycheuma Yang, 1989. NSC Special Publ. 6:95

Generic features: Body length 2.56–3.40 mm; head slightly wider than or as wide as pronotum; vertex shorter submedially than wide at base about 1:1.2, moderately rounded toward frons, about as broad apically as at base, apical margin transverse with submedian carinae distinct, Y-shaped carina weak, submedian carina not merging apically; frons at midline longer than wide at broadest portion about 2:1, widest at level of simple eyes; lateral margins straight and converging distad beyond this point, median carina forked at base; antennae cylindrical, passing shortly beyond fronto-

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

clypeal suture, segment I longer than wide, about 2:1, shorter than segment II about 1:2; pronotum tricarinate, lateral margin not reaching hind margin; spinal formula of hindleg 5-7-4; tibial spur with about 20 teeth; anal segment short, lateroapical angles widely separated, each produced ventrad in a spinose process; pygofer dorsally short, long and strongly convex ventrally, posterior opening as long as wide, laterodorsal angle not produced, lateral margins weak, medioventral process present, small to long, sometimes complex; long phallus compressed laterally, reflected cephalad at apex in a flagellum; diaphragm deeply impressed with membranous dorsal margin; parameres simple, narrow, distally tapering, rectangulately or subacutely bent dorsad.

20.1 *Nycheuma cognatum* (Muir, 1917)
Plates 3h, 7h, 12i, 20a, 26c, 33m

Dicranotropis cognata Muir, 1917. Proc. Hawaii Entomol. Soc. 3:317
D. c. Muir, 1921. Ibid. 4:575
D. c. Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:43
D. c. Fennah, 1956. Insects of Micronesia. 6(3):111
Nycheuma cognatum Fennah, 1964. Trans. R. Entomol. Soc. Lond. 117(4):145
N. c. Fennah, 1969. Pacif. Ins. Mongr. 21:37
N. c. Fennah, 1971. Insects of Micronesia 6(9):571
N. c. Fennah, 1973-1975. Entomol. Scand. Suppl. 4:89
N. c. Kuoh, 1993. Econ. Insects Fauna China 27:81
N. c. Yang, 1989. NSC Special Publ. 6:96

Features: Body length 2.56–3.26 mm; uniformly brown with subhyaline forewings; vertex slightly shorter submedially than wide at base about 1:1.1, Y-shaped carina relatively distinct, basal compartment of vertex wider basally than widest length about 1.8:1; frons at midline longer than wide at widest point about 1.7:1, widest at level of ocelli; postclypeus wider at base than frons at apex, slightly wider than base, than length in midline; rostrum reaching trochanter III, apical segment shorter than subapical segment; antennae extend beyond midpostclypeus, basal segment longer than wide about 1.7:1, segment II shorter about 1.8:1; tibial spur with about 27 teeth; pygofer with posterior margin strongly produced caudad medially, opening small viewed posteriorly, distinctly wider than long; lateral margin weakly defined, ventral margin shallowly concave, with three distinct medioventral processes, middle the longest; phallus tubular and long, arched slightly upward medially, reflected cephalad at apex in a flagellum on right side, top of flagellum slightly turned mesad then laterad, apically pointed, with a large stout process at middle left, smaller one near apex right; opening of parameres oblongate; parameres slender, blade-like, widely divergent, pointed apically, inner margin straight, outer margin moderately produced lateromedially; anal segment long, collar-like, lateroapical angles very widely apart, each projected caudad and partly mesad in stout spinose processes.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Host plant: Rice
Economic importance: Low
Distribution: Australia, Bonin Island, China, Fiji, New Caledonia, Philippines, Sri Lanka, Taiwan, West Caroline Island

21. Genus *Metropis* Fieber, 1866

Metropis Fieber, 1866, Oshanin. Kat. Palaark. Hemip. 120
Type species: *Metropis mayri* Fieber, 1866

Generic features: Body length 3.3–5 mm; blackish brown to dark reddish brown planthopper with eyes, frons, and genae reddish brown, yellow clypeus and legs; forewings almost uniformly yellowish brown except for transparent subcostal cell and small cubital cell; head visibly rounded in front of eyes, moderately produced in front; vertex distinctly rounded in front viewed dorsally, wider than long by about 1.45 times, anterior and posterior width subequal, basal compartment with each cell as long as wide; submedian carina visible; frons almost subquadrangle, longer than wide at midlength by about 1.12x, Y-median carina not visible toward base and median carina partly erased anteriorly, absent in some species; clypeus lower than frons, median carina absent; ocelli absent; antennae cylindrical, segment 1<11, slightly exceeded the frontoclypeal suture; vertex almost as long as to slightly shorter than pronotum; combined length of vertex and pronotum shorter than mesonotum, the latter only 1.06x longer than vertex and pronotum; forewings beyond abdominal tip by about one-third its length, long, about 4x longer than wide; pygofer ovoid, medioventral margin V-shaped, laterodorsal angle weak; paramere relatively slender, distinctly diverging apex slightly narrowed forming a small outwardly directed hook; aedeagus slender, almost parallel-sided with apical subtriangular spine.

21.1 *Metropis nigrifrons* Kusneaov, 1929
Plates 3i, 8a, 13a, 16h, 20b, 23c, 26d, 38e, 40j

Metropis nigrifrons Kusneaov, 1929. Vien. Entomol. Zeitg. 46(3):167
Stiroma nigrifrons Dlabola, 1966. Acta Entomol. Bohemoslov 63:443
M. nigrifrons Ding & Zang, 1994. China Agric. Sci. Ser. 36

Features: As described above in the generic features, however, the specimens examined have frons rough with transverse striae and median carina distinct, Y-shaped median carina absent; posterior margin of pronotum with a narrow yellow transverse band.

Host plant: Rice
Economic importance: Low
Distribution: China and the Philippines (new record)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

22. Genus *SARDIA* Melichar, 1903

Sardia Melichar, 1903. Hom. Fauna v. Ceylon 96
Type species: *Sardia rostrata* Melichar, 1903

Sardia Melichar, 1903. Hom. Fauna v. Ceylon 96
Sardia Distant, 1906. Faun. Brit. Ind. Rhynch. 3:475
Hadeodelphax Kirkaldy, 1906. Hawaii Sugar Plant. Assoc. Entomol. Bull. 1:410
Hadeodelphax Kirkaldy, 1907. Ibid. 3:140
Sardia Muir, 1913. Proc. Hawaii Entomol. Soc. 2:246
Sardia Muir, 1915. Can. Entomol. 47:267, 301
Sardia Distant, 1916. Faun. Brit. Ind. Rhynch. 6:141
Sardia Muir, 1927. Insects of Samoa 2:11
Sardia Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 38
Sardia Matsumura & Ishihara, 1945. Mushi. 16:75
Sardia Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:82
Sardia Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:41
Sardia Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):44
Sardia Yang, 1989. NSC Special Publ. 6:280
Sardia Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 72

Generic features: Body length 3.8–4.5 mm; head prominently narrower than pronotum, strongly produced in front of eyes; vertex medially longer than wide at narrowest point between eyes by as much as 2:1, lateral sides subparallel, apical margin acutely developed medially, submedian carinae uniting on vertex; Y-shaped carina weak; basal compartment narrower basally than greatest length; frons at midline longer than widest part about 3:1; rostrum reaching trochanter III; short antennae cylindrical; ocelli distinct; pronotum with lateral carinae reaching hind margin; spinal formula of leg III 5-7-4; tibial spur with around 20 teeth; pygofer in profile ventrally wider than dorsal, ovoid; parameres simple, inner sides concave to straight; anal segment ring-like, borne medially; aedeagus short and robust.

22.1 *Sardia rostrata* Melichar, 1903
Plates 3j, 8b, 13b, 20c, 23d, 26e, 29a

Sardia rostrata Melichar, 1903. Hom. Fauna v. Ceylon 96
S. r. Schumacher, 1915. Suppl. Entomol. 4:142
S. r. Esaki & Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 38
S. r. Matsumura et Ishihara, 1945. Mushi 16:75
S. r. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:83
S. r. Kuoh, 1983. Econ. Insects Fauna China 27:123
S. r. Yang, 1989. NSC Special Publ. 6:282
S. r. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 72

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Features: Body length 4.3–4.5 mm; black planthopper except for yellowish white antennae, rostrum, femora I and II, tibiae, and tarsi; whitish along leg III, apex of scutellum, and basal two-thirds of hind claval margins; forewings opaque, pale black, whitish to transparent between Sc and another three areas along anterior margins between Sc_2 and R_1, R_1 and Rs, and Rs and M_1, and darker toward tip of clavus; head distinctly narrowed frontally forming a subacute and ridge-like tip; vertex at base and anterior of eyes 2.35x longer than wide; basal compartment with indistinct arm of Y-carina but stem visible; pronotum a little shorter than half length of vertex; combined length of vertex and pronotum longer than mesonotum by about 1.33x; lateral carina of pronotum concave to slightly converging before reaching the hind margin; basal segment of antennae distinctly shorter than segment II; pygofer visibly wider ventrally than dorsally, laterodorsal angle not produced, lateral margins weakly defined; aedeagus short but robust with few subapical teeth; anal segment with lateroapical angles each developed medially into long spinose processes, wide apart, directed ventrad; parameres subparallel, rounded upper area, inner margin slightly concave, basal angle obtuse laterocaudally.

Host plant: Rice
Economic importance: Low
Distribution: China, India, Indonesia, Iran, Philippines, Taiwan, Sri Lanka

23. Genus *PARADELPHACODES* Wagner, 1963

Paradelphacodes Wagner, 1963. Mitt. Hamburg Zool. Mus. 60:169
Type species: *Delphax paludosa* Flor, 1861

Generic features: Body length 2.8–3 mm; pale brown planthopper as reflected in the frons, clypeus, genae, and antennae; forewings hyaline; head moderately projected in front of eyes; vertex as long as wide to slightly longer than wide; basal compartment with each cell a little longer than wide, median carina present; submedian carina united in the frons; frons distinctly longer than wide; widest at midlength, median carina forked closer to base than midlength, lateral carina slightly convex; antennae cylindrical, base of segment I slightly narrower than apex; segment II about 2x longer than segment I and exceeded the frontoclypeal suture; vertex longer than pronotum; combined length of vertex and pronotum shorter than mesonotum, the latter about 1.2x longer than vertex and pronotum; lateral carina of pronotum curved posteriorlaterally, not reaching hind margins; mesonotum tricarinate with subparallel lateral carinae; pygofer ovoid, laterodorsal angle distinct to weakly produced; medioventral margin moderately concave; paramere diverging, with apicolateral tip pointed blunt, inner margins curved; anal segment with a pair of ventral processes, short and acute at tips; aedeagus simple with a ring-like suspensorium.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

23.1 *Paradelphacodes paludosa* (Flor, 1861)
Plates 23e, 38f

Delphax paludosa Flor, 1861. Rhynch. Livlands. 2:82
Liburnia paludosa Scott, 1870. Ent. Monthly Mag. 7:75
*Delphacodes kuwahara*i Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:58
Paradelphacodes paludosa Wagner, 1963. Mitt. Hamburg Zool. Mus. 60:169
P. p. Okada, 1977. Food & Fert. Tech. Cen. Asia & Pac. Reg. 15
Kakuna kuwaharai Kuoh & Ding, 1980. Acta Entomol. Sin. 23(4):301
P. paludosa Ding & Zhang, 1994. China Agric. Sci. Tech. Press 59

Features: Body length 2.8–3 mm; body light brown with subhyaline wings, slightly darkened along apical half, veins with coarse granulated areas; vertex longer than wide with fairly wide apex, carinae indistinct except for mediolateral ones relatively visible; frons subparallel-sided, slightly narrowed above eyes, of length about 2.5x the width; antennae relatively long, almost reaching apex of clypeus, segment II slightly less than twice the length of segment I; pronotum slightly shorter than vertex; mesonotum smaller, the length less than vertex and pronotum combined; forewings short, slightly protruding abdominal apex; tibia III with a small spine near base and the other about the middle; basitarsus clearly longer than the other two tarsal segments combined; tibial spur rather thin with only 17 teeth along hind margin; pygofer ovoid except for subtruncate ventral end, widest at midlength; paramere bolo-like, subbasally concave in the inner side, broadens with straight sides apically almost parallel with other lateral sides, apico-inner tip concave to flat and apico-outer one forming a blunt spine; aedeagus bent at midlength with spines lining at apical half in sigmoid pattern; suspensorium ring-like; anal segment with a pair of short acute ventral processes.

Host plant: Unknown
Economic importance: Low
Distribution: China and Japan

24. Genus *HARMALIA* Fennah, 1969

Harmalia Fennah, 1969. Pacif. Ins. Monogr. 21:37
Type species: *Sogata thoracica* Distant, 1916

Harmalia Fennah, 1969. Pacif. Ins. Monogr. 21:37
Harmalia Fennah, 1978. Ann. Zool. (Wars.) 34(9):221
Paracorbulo Tian & Ding, 1980. Entomotaxonomia 2(4):315
Harmalia Kuoh, 1983. Econ. Ins. Fauna China 27:113
Harmalia Yang, 1989. NSC Special Publ. 6:198
Harmalia Wilson and Claridge, 1991. CAB Intern. & Nat. Resources Inst. 66
Harmalia Ding & Zhang, 1994. China Agric. Sci. Tech. Press 80

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

24.1 *Harmalia anacharsis* Fennah, 1969
Plate 17a, 38g-h

Harmalia anacharsis Fennah, 1964. Pac. Ins. Monogr. 21:38
Harmalia anacharsis Fennah, 1978. Ann. Zool. (Wars.) 34(9):221
Harmalia anacharsis Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 66

Features: Body length 3–3.6 mm; dark to light brown planthopper; pronotum pale dirty white, mesonotum dark reddish brown with white scutellum; forewing uniformly pale brown; head including eyes narrower than pronotum, moderately projected in front of eyes; vertex at widest point longer than wide; slightly longer than pronotum; combined length of vertex and pronotum slightly less than length of mesonotum; pronotum and mesonotum tricarinate; lateral carina of pronotum projected posteriorlaterally but not reaching the hind margins; pygofer longer than wide, oblongate with a long ventral portion, medioventral area somewhat truncate, lateral margins not expanded, somewhat parallel-sided; laterodorsal angle developed; paramere with latero-inner base expandedly truncate in posterior view, apices each bear a setaceous process, extended upward subparallel to one another, apical end forming a long thumb-like inner process and the lower outer one broadly rounded; oval segment rather tube-like with a pair of ventral spines that converge basally and diverge apically; aedeagus in lateral view, long and cylindrical.

Host plant: Rice
Economic importance: Low
Distibution: New Caledonia, Indonesia, Philippines, Sri Lanka, and Vietnam

24.2 Harmalia heitensis (Matsumura & Ishihara, 1945)
Plates 3k, 8c, 13c, 17b, 20d, 23f, 26f, 30h, 38i, 40k

Sogata heitensis Matsumura & Ishihara, 1945. Mushi 16:66
S. h. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:66
Harmalia h. Fennah, 1973-75. Entomol. Scand. Suppl. 4:105
H. h. Fennah, 1978. Ann. Zool. (Wars.) 34(9):15
H. h. Yang, 1989. NSC Special Publ. 6:200-201

Features: Body length 2.13–3.33 mm; body blackish brown; pronotum with posterior half white, carinae of frons and clypeus, proboscis, antennae, and legs brown except for dark brown and light tibiae; forewings brown, granulose, concolorous with veins; vertex as long submedially as wide at base, lateral carinae straight, submedian carina merged on vertex far before apical margin, basal compartment wider at base than greatest length about 1.7:1; frons longer at midline than wide at widest part about 2.5:1, broadest at apical third, lateral carinae distinctly convex below simple eyes; antennae overpass frontoclypeal suture, basal segment longer than wide about 1.6:1, shorter than segment II by about 1:1.9, tibial spur with about 19–21 teeth; forewings about

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

2.9x longer than wide; pygofer in profile wider dorsally than ventrally, laterodorsal angle strongly produced and reflected, opening wider than viewed posteriorly, lateral margins convex; aedeagus long, tubular without tooth; diaphragm narrow, dorsal margin rounded and small; parameres wide, slightly divergent, outer margin developed medially, inner margin convex, outer angle forms a broad triangulate lobe, inner angle short and acute; anal segment collar-like, lateroapical angles approximate, each produced into a strong spinose process, ventrally directed.

Host rice: Rice
Economic importance: Low
Distribution: Philippiines, Taiwan, and Vietnam

24.3 *Harmalia samesimae* (Matsumura & Ishihara, 1945)
Plate 38j

Unkuna sameshimai Matsumura et Ishihara, 1945. Mushi 16(10):68
Kakuna sameshimai Matsumura et Ishihara, 1945. Mushi 16(10):69
Delphacodes sameshimai Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:54
Harmalia sameshimae (sic) Fennah, 1971. Insects of Micronesia 6(8):582
Harmalia samesimae Okada, 1977. Food & Fert. Tech. Cen. Asia & Pac. Reg. 15
Harmalia sameshimai Yang, 1989. NSC Special Publ. 6:202-203

Features: Body length 3.33 mm; pale brown planthopper with yellowish white pronotum between lateral carinae and posterior margin; dark brown to black frons except carinae, coxae, and abdomen; forewings semihyaline and light brown; vertex at submedian as long as wide at base, at apex slightly narrower than at base, apical margin acutely formed medially, submedian carinae merged apically, basal compartment wider at base than greatest length about 1.5:1, widest apical third; proboscis passed trochanter II; antennae bypassed the frontoclypeal suture, basal segment longer than wide, shorter than second about 1:2; tibial spur with about 19 teeth, very wide, half as wide as long; forewings longer than broadest part about 2.8:1; pygofer in profile rather broad, laterodorsal angle widely formed, opening wider than long viewed posteriorly, lateral margins ill-defined; aedeagus without tooth, tubular; suspensorium acutely rounded dorsally, ring-like in ventral two-thirds; parameres relatively long, slightly sinuate, outer angle with lobe-like process, inner angle with rod-like process and basal angle forms a distinct small process; anal segment collar-shaped, lateroapical angles each forming into a strong spinose process with right corner angulated at base.

Host plant: Unknown
Economic importance: Low
Distribution: Japan, Taiwan, and South Mariana Island

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

25. Genus *TOYA Distant, 1906*

Toya Distant, 1906. Fauna of India 3:472
Type species: *Toya attenuata* Distant, 1906

Toya Distant, 1906. Fauna of India 3:472
Toya Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):56
Toya Fennah, 1978. Ann. Zool. (Wars.) 34(9):221
Toya Kuoh, 1983. Econ. Insects Fauna China 27:153
Toya Yang, 1989. NSC Special Publ. 6:219
Toya Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 73
Toya Ding & Zhang, 1994. China Agric. Sci. Tech. Press 121

Generic features: Body length 1.13–3.50 mm; pale yellow-brown with dark brown area between carina; forewings hyaline; head narrower than pronotum; vertex as wide as to slightly broad at base than long submedially, apical margin transverse, submedian carinae merge at apex, Y-shaped carina distinct to weak; frons longer at midline than broad, widest part about 2:1; lateral carinae slightly convex; clypeus at base wider than frons at apex; rostrum reaching coxae III; antennae cylindrical, basal segment longer than wide, and shorter than segment II; ocelli distinct; pronotum with lateral carinae not reaching hind margin; tibial spur with around 20 teeth; pygofer with strongly developed laterodorsal angle, directed mesad, lateral margins concave and ventral margin shallowly concave; medioventral process absent; aedeagus short and stout, with or without teeth; parameres moderately long, flattened, and diverging; anal segment deeply sunken in dorsal cavity of pygofer.

25.1 *Toya propinqua* (Fieber, 1866)
Plates 3l, 8d, 13d, 20e, 26g, 30i, 33n-o

Delphax (*Delphacodes*) *propinqua* Fieber, 1866. Verh. Zool. Bot. Ges. Wien. 16:525
Delphax hamulata Kirschbaum, 1868. Cicad. Wiesbadem 38
Liburnia propinqua Fieber, 1875. Rev. Mag. Zool. 79:135
Liburnia propinqua Melichar, 1896. Cicad. V. Mit.-Eur. 79
L. terminalis Van Duzee, 1907. Bull. Buff. Soc. Nat. Sci. 8:49
Delphax propinqua Oshamin, 1908. Verz. Pallark. Hem. 2:317
D. p. Matsumura, 1910. Schad. U. Nutz. Ins. Zuckerrohr Formosas 29
Liburnia tuckeri Van Duzee, 1912. Bull. Buff. Soc. Nat. Sci. 10:506
L. propinqua Matsumura, 1917. Appl. Entomol. Form. Ser. 38
Delphacodes neopropinqua Muir, 1917. Proc. Hawaii Entomol. Soc. 7:335
D. subfusca Muir, 1919. Can. Entomol. 51:38
Liburnia (*Delphax*) *propinqua* Matsumura, 1920. Dainippon Gaichu Zencho 263
Delphacodes propinqua Wolcott, 1923. J. Dept. Agric. Puerto Rico 8:111
Liburnia p. Matsumura, 1932. Dainippon Gaichu Zusetsu 224
Liburnia albicallis Haupt, 1935, nec Motschulsky, 1863. Tiewelt Mittoleuropas 4(3):44
Delphacodes propinqua Esaki et Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 33

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

D. p. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:52
Delphacodes shirozui Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:53
Calligypona propinqua Wagner, 1954. Bull. Soc. Faud ler Entomol. Kairo 38:217
D. propinqua Fennah, 1956. Insects of Micronesia 6(3):122
Metadelphax propinqua Wagner, 1963. Mitt. Hamburg Zool. Mus. Inst. 60:70
Toya propinqua Fennah, 1964. Trans. R. Entomol. Soc. Lond. II6(7):142
Toya propinqua Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):56
T. p. Fennah, 1971. Insects of Micronesia 6(8):581
T. p. Fennah, 1973-75. Entomol. Scand. Suppl. 4:115
T. p. Yang, 1989. NSC Special Publ. 6:219-223
T. p. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 73
T. p. Ding & Zhang, 1994. China Agric. Sci. Tech. Press 122-123

Features: Body length 1.13–1.34 mm (brachypterous form); 2.87–3.40 mm (macropterous form); pale yellowish brown with brownish frons and darker stripes along both sides of carinae; forewings hyaline; abdomen dark brown, including pygofer with whitish laterodorsal projection; vertex almost as long submedially as with whitish laterodorsal projection; vertex almost as long submedially as wide at base, obtusely rounded toward frons at apex as wide as at base, basal compartment wider basally than greatest length about 2:1; frons longer at midhalf than wide at widest part by about 2:1, broadest at midlength, apically wider than at base, lateral carinae convex; clypeus slightly wider at base than frons at apex, shorter than wide at base; antennae reaching midclypeus, segment I longer than wide about 1.6:1, shorter than segment II about 1:1.8; tibial spur with 14–18 short and weak teeth; pygofer with laterodorsal angle strongly developed, as long dorsally as ventrally, opening wider than long in posterior view; aedeagus relatively short, armed with six distinct teeth dorsally, sometimes 2–6 dorsally and 0–5 ventrally; parameres moderately long and wide, strongly divergent, inner margin shallowly concave, inner angle slightly formed mesad, outer angle slightly produced obtusely lateral, apex truncate, in lateroventral view basal production apically rounded; anal segment with lateroapical angles narrowly apart, each projected ventrally into a long spinose process, directed ventrocaudal and slightly laterad.

Host plant: rice, *Saccharum officinarum*, *Setaria* sp., and *Echinochloa crus-galli*
Economic importance: Low
Distribution: Widespread and had been reported in Africa, Americas, Australia, Cambodia, China, Japan, India, Laos, Philippines, Taiwan, Vietnam, Western Micronesia, Malaysia, Sri Lanka, Pakistan, and Europe

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

26. Genus *EUIDELLANA* Metcalf

Euidellana Metcalf, 1950. B. P. Bishop Mus. Occ. Pap. 20(5):61
Type species: *Euidellana carolinensis* Metcalf, 1950

Euidellana Metcalf, 1950. B. P. Bishop Mus. Occ. Pap. 20(5):61
Euidellana Fennah, 1978. Ann. Zool. (Wars.) 34(9):220
Euidellana Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 72

Generic features: Body length 3.4–4.3 mm; brown-bodied planthopper with hyaline wings; head including eyes wider than pronotum about 1.09x; vertex slightly projected in front of eyes; wider at base than long about 1.3:1, apical margin truncate, submedian carina slightly prominent uniting at base of frons; Y-shaped carina distinct, stem feeble; frons broader apically than base about 1.33:1, longer than wide by 2.75x at widest subapical point, lateral carinae subparallel apically, narrowed basally, fork of median carinae almost at level of ocelli; vertex longer than pronotum by 1.19x; mesonotum 1.14x longer than combined length of vertex and pronotum; clypeus wider at base than apex of frons, median carina very prominent, somewhat sharp; rostrum reaching trochanter III; antennae both cylindrical, segment I shorter than II, the latter about 2.2x longer than the first; pronotum with lateral carinae not reaching hind margin; tibial spur with 26–29 teeth; pygofer oblongately narrow, viewed caudally, opening longer than wide, venter strongly rounded; anal segment distinctly sunken in apex of pygofer; parameres simple, subparallel to slightly converging apically, apices blunt.

26.1 *Euidellana celadon* Fennah, 1975
Plates 4a, 8e, 13e, 20f, 26h, 30j, 34a, 40l

Euidellana celadon Fennah, 1975. Entomol. Scand. Suppl. 4:89
E. c. Fennah, 1978. Ann. Zool. (Wars.) 34(9):220
E. c. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 72

Features: Body length 3.4–4.3 mm; pale brown-bodied planthopper with uniformly transparent wings except for light brownish veins and granulations, head including eyes wider than pronotum about 1.09x; vertex slightly projected in front of eyes; wider at base than long about 1.3:1, apical margin truncate, submedian carina slightly prominent uniting at base of frons; Y-shaped carina distinct, stem feeble; frons broader apically than base about 1.3:1, longer than wide by 2.75x at widest subapical point, lateral carinae subparallel apically, narrowed basally, fork of median carinae almost at level of ocelli; vertex longer than pronotum by 1.19x; mesonotum 1.14x longer than combined length of vertex and pronotum; clypeus wider at base than apex of frons, median carina very prominent, somewhat sharp; rostrum reaching trochanter III; antennae both cylindrical, segment I shorter than II, the latter about 2.2x longer than the first; pronotum with lateral carinae not reaching hind margin; tibial spur with 26–29 teeth; pygofer oblongately narrow, viewed caudally opening longer than wide, venter strongly rounded; anal segment distinctly sunken in apex of pygofer;

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

parameres simple, subparallel to slightly converging apically, apices blunt; aedeagus with a short spinose process ventrally on left subapically, directed lateroventrally; tip forming two spines viewed laterally.

Host plant: rice
Economic importance: low
Distribution: Bangladesh, India, Philippines, Sri Lanka, and Vietnam

27. Genus *CEMUS* Fennah, 1964

Cemus Fennah, 1964. Trans. R. Entomol. Soc. Lond. 116(7):147
Type species: *Cemus leviculus* Fennah, 1964

Cemus Fennah, 1964. Trans. R. Entomol. Soc. Lond. 116(7):147
Cemus Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):19
Cemus Fennah, 1978. Ann. Zool. (Wars.) 34(9): 227
Cemus Kuoh, 1983. Econ. Insects Fauna China 27:63
Cemus Yang, 1989. NSC Special Publ. 6:123
Cemus Wilson & Claridge, 1991. CAB Intern. and Nat. Resources Inst. 70
Cemus Ding & Zhang, 1994. China Agric. Sci. Tech. Press 42

Generic features: Body length 1.60–4.03 mm; pale brown to dark brown, wings subhyaline with C-shaped brown band on apical areas; head including eyes narrower than pronotum; vertex submedially shorter than wide at base, widely and obtusely rounding into frons, submedian carinae not merged apically; Y-shaped carina visible, basal compartment wider basally than greatest length about 2.5:1; frons at midline longer than broad at widest part about 1.8:1, broadest at level of simple eyes; median carina bifurcate at level of ocelli; clypeus at base slightly wider than frons at apex, about as long at middle as wide at base; rostrum extended to trochanter III, apical segment as long as subapical; antennae almost reaching apex of postclypeus, segment I longer than wide more than 2:1, segment III longer than I, ocelli distinct, very close to anterior margin of genae; pronotum with lateral carinae not reaching hind margin; fore and middle femora and tibiae somewhat compressed; spinal formula of leg III 5-7-4; tibial spur with about 30 teeth; pygofer distinctly long and strongly convex ventrally, rather short dorsally, posterior opening relatively small, prominently longer than wide, weakly developed laterodorsal angle, strongly inflected, medioventral process short, quadrate, and wider than long; anal segment distinctly ring-like, lateroapical angles each projected ventrally forming a slender spinose process; parameres simple, short to narrow, often tapering distally to acute apex, dorsally projected, slightly diverging viewed posteriorly; aedeagus long, somewhat distally decurved, bearing a long flagellum borne at apex, directed cephalad.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

27.1 *Cemus sauteri* (Muir, 1917)
Plates 4b, 8f, 13f, 20g, 26i, 29b, 31a, 34b

Phyllodinus sauteri Muir, 1917. Proc. Hawaii Entomol. Soc. 3:319
P. s. Esaki & Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 44
P. s. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:76
P. s. Fennah, 1950. Bernice P. Bishop Mus. Bull. 202:44
Cemus sauteri Fennah, 1964. Trans. R. Entomol. Soc. Lond. 116(7):147
C. s. Fennah, 1973-1975. Entomol. Scand. Suppl. 4:87
C. s. Fennah, 1978. Ann. Zool. (Wars.) 34(9):21
C. s. Yang, 1989. NSC Special Publ. 6:127

Features: Body length 1.66–2.50 mm (brachypterous), 3.16–3.86 mm (macropterous); black planthopper with yellowish brown head, thorax; spots on frons, base, and apex of tibiae, tibial spur, and second segment of metatarsi; antennae with black segment I, dorsally with elongate oval yellowish band, segment II dark brown, lateral lobes of pronotum and tegulae creamy white; forewings hyaline, black tinge from node to anal angle then submarginally to apex of tegmen, end of Sc, along both sides of R_1, Rs, and end of clavus, granulose black; pygofer black with cresentric whitish yellow band on each lateral side of genital opening; vertex shorter than broad at base, broadly and obtusely rounded toward frons; basal compartment wider, greatest length about 3:1; submedian carinae meeting on frons; at middle frons longer than wide at broadest point about 1.8:1, widest just above ocelli level, straight lateral margins below level of simple eyes; segment I of antennae longer than wide, shorter than II about 1:1.7; tibial spur with 21–24 teeth; forewings longer than broadest part about 3:1; pygofer distinctly longer ventrally than dorsally in profile, laterodorsal angle narrowly developed caudally, opening quite small, longer than wide; aedeagus long, dorsally curved with broad flagellum borne subapically, directed dorsad and cephalad, at midlength with a hooked process emanating at left side, projected mesad, a long process formed at right side, parallel with aedeagus; parameres slender, slightly diverging, apical third of outer margin with a large obtuse process, strongly sinuate viewed laterally; anal segment with lateroapical angles each formed into a strong short spinose process, projected ventrally.

Host plant: Rice
Economic importance: Low
Distribution: Philippines (new record), Fiji, Sri Lanka, Taiwan, and Vietnam

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

27.2 *Cemus nigromaculosus* (Muir, 1917)
Plates 4c, 8g, 13g, 20h, 26j, 31b, 34c, 40m

Phyllodinus nigromaculosus Muir, 1917. Proc. Hawaii Entomol. Soc. 3:319
P. n. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:76
P. n. Fennah, 1956. Insects of Micronesia 6(3):111
Cemus nigromaculosus Fennah 1964. Trans. R. Entomol. Soc. Lond. 116(7):148
C. m. Fennah, 1971. Insects of Micronesia 6(8):572
C. m. Yang, 1989. NSC Special Publ. 6:135-136

Features: Body length 2–2.7 mm; dark brown planthopper except for light brown to yellowish lateral areas of pronotum, carinae of head and thorax, segment II of antenna, spots on frons, anterior and posterior ends of femora and tibiae, hind tarsi and along hind tibiae, base of abdomen and anal tube; forewings hyaline, light yellowish brown, fuscous toward apical area, veins white with distinct black granules, each bearing a whitish yellow hair; head as wide as long close to midlength; antennae surpass middle of clypeus to slightly beyond, segment I shorter than II, the latter slightly clavate; femora and tibiae of legs I and II clearly compressed moderately, forewings not much protruded beyond abdominal tip, just reach pygofer; pygofer short viewed dorsally, ventrally long, opening longer than broad; medioventral margin with a small quadrate thin lip; anal segment large with a pair of long curved spines; parameres with slightly wide base, slender and thin becoming acute toward apex, knife-like in lateral view, slightly sinuate; aedeagus complex, basally thin, apex forming a large barb with corners directed basad, left side with a curved spine, right side with a longer and slender spine and a shorter one near base.

Host plant: Rice
Economic importance: Low
Distribution: Fiji, Japan, Philippines, New Guinea, New Caledonia, Taiwan, Tonga, and West Micronesia

27.3 *Cemus changchias* Kuoh, 1981
Plates 4d, 8h, 13h, 20i ,26k, 34d

Cemus changchias Kuoh, 1981. Acta Entomol. Sin. 24(4):422
C.c. Kuoh, 1983. Econ. Insects Fauna China 27:66
C.c. Yang, 1989. NSC Special Publ. 6:133-134

Features: Body length 4–4.4 mm; uniformly pale brown, darker on genae; intercarinal areas of frons mottled with yellowish spots; forewings hyaline, marked black from anterior margin along nodal line to posterior apical half margin, along R_1 and Rs, below Cu_1 and a short diagonal stripe at base; vertex wider at base than long submedially about 1.4:1; apical margin transverse, lateral carinae concave, submedian carinae not merging apically; basal compartment wider at base than longer part about 2.5:1; frons

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

at midlength longer than wide at broadest part about 1.8:1 at ocelli level; median carina bifurcate at level of simple eyes; basally clypeus as wide as apex of frons; basal segment of antenna longer than broad by about 2:1; shorter than segment II about 1:1.7; tibial spur with 27–32 teeth; forewings 3x longer than greatest width; pygofer roundish to slightly ovoid, in profile about as wide ventrally as dorsally, opening as long as wide viewed posteriorly, medioventral process broad and slightly cleft medially; aedeagus tubular, reflected cephalad in two processes apically, left side lobe-like, apex curved left, right one directed right then cephalad, outer margin medially with a small blunt structure; suspensorium Y-shaped with short arms; parameres rather short, gradually diverging at apex, outer margins strongly concave at midlength; anal segment deeply embedded in pygofer, lateroapical angles each form a long spinose process extended to base of parameres.

Host plant: Rice
Economic importance: Low
Distribution: China, Philippines (new record), and Taiwan

27.4 *Cemus* sp. A

Plates 4e, 9a, 13i, 20j, 26l, 31c, 34e, 40n

Features: Body length 3.8–4.0 mm; generally brown but darker in the lateral sides of pronotum and mesonotum; light brown wings with transparent areas toward apical margins; granulations brown with white hairs; head including eye slightly wider than the pronotum; vertex at base 1.35x wider than long, submedian carina not united in front of vertex; basal compartment visibly deep and each lobe-like, wider basally than long; pronotum at median point shorter than vertex; mesonotum at median line 1.33x longer than combined length of vertex and pronotum; frons 2.05x longer than wide at broadest part at level of ocelli and junction of median Y-carina; frons with two pairs of yellowish spots at apical one-half; similar to *C. changchias* Kuoh except for differently structured pygofer, parameres, and process on anal segment; in particular the lateroapical angle not produced; lateral margins of pygofer constricted at midlength, thin and whitish yellow, brown medioventral process thin, broad, and evenly emarginated; parameres moderately constricted in outer midlength; anal segment with thick and brown margins and short, brown style, the pair of processes long and thin curved outward after tip of parameres, then curved downward subcoiling bases of parameres toward the inside.

Host plant: Rice
Economic importance: Low
Distribution: Philippines (Luzon Island and Leyte Island)

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

27.5 *Cemus* sp. B
Plates 4f, 9b, 14a, 20k, 27a, 31d, 40o

Features: Body length 3.8 mm; similar to *Cemus* sp. A but basal compartment of vertex and midanterior one-third of pronotum and midposterior mesonotum with yellow-orange tinge; pronotum with hind inner margins of lateral carinae with whitish spots; posterior submedian part of mesonotum with a black spot and entire lateral part pale brown; head narrower than pronotum taken across eyes; vertex 1.76x wider than long at base, slightly longer than pronotum; mesonotum twice as long as combined length of vertex and pronotum; frons mottled with 16 whitish yellow spots, 8 spots on each side, 2x longer than wide, widest across level of antennal bases, slightly above ocelli level and bifurcation of median carina; antenna with basal segment shorter than segment II, its base distinctly narrower than apex; spinal formula of hind leg 5-7-4.

Host plant: Rice
Economic importance: Low
Distribution: Philippines (Luzon Island)

28. Genus *OPICONSIVA* Distant, 1917

Opiconsiva Distant, 1917. Trans. Linn. Soc. Lond. Zool. 17:301
Type species: *Opiconsiva fuscovaria* Distant

Opiconsiva Distant, 1917. Trans. Linn. Soc. Lond. Zool. 17:301
Opiconsiva Fennah, 1964. Ibid. 116(7):143
Corbulo Fennah, 1965. Bull. Brit. Mus. Nat. Hist. (Entomol.) 17:48
Opiconsiva Fennah, 1978. Ann. Zool. (Wars.) 34(9):20
Opiconsiva Ding, 1980. Econ. Insects Fauna China 27:130
Opiconsiva Yang, 1989. NSC Special Publ. 6:214
Opiconsiva Wilson and Claridge, 1991. CAB Intern. & Nat. Resources Inst. 73
Opiconsiva Ding & Zhang, 1994. China Agric. Sci. Tech. Press 78

Generic features: Head including eyes wider than pronotum; vertex slightly longer submedially than wide at base, about as wide at apex as at base, apical margin truncate, Y-shaped carina distinct or with its stem feeble, submedian carinae merged at apex or extreme base of frons; frons longer at midline than wide at broadest part about 2:1, widest near middle; proboscis passed the trochanter II; ocelli present; antennae cylindrical with segment I slightly longer than wide; pronotum with lateral carinae not reaching the hind margin; spinal fomula of leg III 5-7-4; tibial spur with about 20 teeth; pygofer in profile moderately short, opening longer than wide viewed posteriorly; phallus tubular, dorsobasal half thickened; suspensorium ringlike; diaphragm with dorsal margin produced dorsad medially; anal segment small but ringlike as well, sometimes collarlike, lateroapical angles each produced into a spinose process; parameres short.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

28.1 *Opiconsiva dodona* (Fennah, 1965)
Plates 17c, 23g, 39a

Corbulo dodona Fennah, 1965. Bull. Brit. Mus. Nat. Hist. Entomol. 17:48
Opiconsiva dodona Fennah, 1978. Ann. Zool. (Wars.) 34 (9):220

Features: Body length 2.85–3.6 mm; pale brown to grayish brown planthopper except for pallid yellow to dirty white vertex, disc and hind margin of pronotum, carinae of frons and clypeus, basal segment of rostrum, ventrites at posterolateral angles and dorsal angles of pygofer; apical segment of proboscis, legs, and antennae reddish brown; forewings hyaline with very dilate fuscous tinge, veins reddish brown, a linear spot between common claval vein and commissural margin dark gray-brown; vertex as long medially as broad at base or slightly longer than wide; subrectangularly obtuse rounding into frons, somewhat narrower at apex than at base, lateral margins straight, apical margin truncate with moderately distinct submedian carinae similar to Y-shaped carinae; submedian carina merged at apex of vertex; basal compartment of vertex wider at hind margin than greatest length; frons at midline longer than wide at widest part 2.2:1, broadest at two-thirds from base, lateral margins shallowly convex, median carina simple; clypeus slightly wider than frons at apex; clypeus moderately convex; proboscis passed trochanter II only; antennae slightly pass the frontoclypeal suture, segment II longer than I; ocelli distinct; pronotum slightly longer at midline than broad at anterior margin; lateral carinae weakly concave, not reaching hind margin; mesonotum distinctly longer than scutellum by about 2.4:1; tibial spur with around 19 teeth; pygofer ovoid, wider laterally and strongly convex with medioventral area rather truncate, without any process; parameres basally contiguous, medially concave in inner side, emarginate at apex, inner part smaller than outer part; anal segment with a pair of diverging processes; laterodorsal angle distinct.

Host plant: Rice
Economic importance: Low
Distribution: Australia and the Philippines, may be widespread in the Oriental region

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

29. Genus *LAODELPHAX* Fennah, 1963

Laodelphax Fennah, 1963. Proc. R. Entomol. Soc. Lond. (B) 32:15
Type species: *Delphax striatella* Fallen

Laodelphax Fennah, 1963. Proc. R. Entomol. Soc. Lond. (B) 32:15
Callidelphax Wagner, 1963. Mitt. Hamburg Zool. Inst. 60:167
Laodelphax Kuoh, 1983. Econ. Insects Fauna China 27:147
Laodelphax Yang, 1989. NSC Special Publ. 6:216
Laodelphax Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 66
Laodelphax Ding & Zhang, 1994. China Agric. Sci. Tech. Press 112

Generic features: Head including eyes narrower than pronotum; vertex quadrate, as long as wide submedially at base, apical margin transverse, lateral carinae straight to parallel to each other, submedian carinae not merged at apex, Y-shaped carina distinct; basal compartment longer at base than widest length about 1.4:1; frons at middle line longer than wide at widest point about 2:1, widest below level of ocelli; clypeus as wide at base as frons at apex; proboscis just passes trochanter II; ocelli present; antennae cylindrical, segment I longer than wide, shorter than segment II about 1:1.9; pronotum with lateral carinae not reaching hind margin; spinal formula of leg III 5-7-4; tibial spur with about 17 teeth; pygofer very short dorsally, longer and convex ventrally in profile, in posterior view, lateral margins strongly produced caudad basally, without medioventral process; phallus tubular, compressed laterally, broad along basal half, pointed apically; suspensorium ringlike with two long arms along dorsal margins, directed dorsocephalad; diaphragm very wide; anal segment ringlike, lateroapical angles each produced into a spinose process; parameres short and simple.

29.1 *Laodelphax striatellus* (Fallen, 1826)
Plates 4g, 14b, 27b, 34f, 40p

Delphax striatellus Fallen, 1826. Hem. Suec. Cicad. 75
Liburnia s. Sahlberg, 1842. Acta Soc. Sci. Fenn. 1:435
Achortile striatella Oshanin, 1870. Mem. Soc. Amis. Sci. Nat. Moscow 6:48
Liburnia striatella lateralis Fieber, 1878. Cicad. d'Europe 4:72
Delphax striatella fimbriata Rey, 1894. Echarge 10:14
Liburnia devastans Matsumura, 1900. Entomol. Nachr. 26:262
L. nipponica Matsumura, 1900. Ibid
L. minomensis Matsumura, 1900. Ibid. 26:263
L. marginata Haupt, 1935. Tier. Mitteleuropas 4(3):142
L. haupti Lindberg, 1936. Comm. Boil. 4(9):17
Delphacodes striatella reyana Metcalf, 1943. Gen. Cat. Hemip. Fasc. IV (3):518
Delphacodes striatella Esaki & Ishihara, 1943. Cat. Araeopid. Imp. Jpn. 31
D. s. Matsumura & Ishihara, 1945. Mushi 16:60
D. s. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:49
Laodelphax striatella Fennah, 1963. Proc. R. Entomol. Soc. Lond. (B)32:15
Callidelphax s. Wagner, 1963. Mitt. Hamburg Zool. Mus. Inst. 60:175

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Laodelphax striatellus Nasu, 1967. Major Insect Pests of Rice 493
L. s. Okada, 1977. Food Fert. Tech. Cen. Asia Pac. Reg. 12
L. s Yang, 1989. NSC Special Publ. 6:217
L. s. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 66
L. s. Ding & Zhang, 1994. China Agric. Sci. Tech. Press 112

Features: Body length 3.33–4 mm; general color black; vertex, carinae of frons, antennae, tip of mesoscutellum, and legs yellowish white; pronotum white with areas behind eyes black; forewings hyaline, yellowish brown, near end of clavus with black markings; vertex as long submedially as wide at base, obtusely rounded toward frons, as wide at apex as at base, lateral carinae straight, submedian carinae not merging at apex of vertex, basal compartment wider at base than greatest length about 1.4:1; frons in middle line longer than wide at widest point about 2.1:1, broadest just below ocelli; lateral carina very slightly convex; clypeus as wide at base as apex of frons, little longer than wide basally; antennae passed the frontoclypeal suture, segment I longer than wide about 1.6:1, shorter than segment II about 1:1.9; tibial spur with 17–20 teeth; forewings longer than widest part about 3.3:1; pygofer in profile distinctly longer ventrally than dorsally, in posterior view with opening wider than long, laterodorsal angle slightly formed mesad; phallus very wide at basal two-fifths, abruptly attenuate apically, apical fifth slender, pointed apically; suspensorium elongate oval, narrowed ventrally, with long arms at dorsal side; diaphragm very broad, median area strongly produced caudad, each midlateral area strongly sclerotized and produced caudad, dorsal margin produced dorsad and apically truncated; anal segment short, lateroapical angles each produced ventrad in a stout process; parameres very short, transverse, outer angles each widely produced laterally.

Host plant: Rice and *Saccharum officinarum* L.
Economic importance: High
Distribution: Taiwan, China, Mongolia, Ryukyu Island, Japan, Micronesia, Philippines, Korea, Siberia, Europe, and former Soviet Union

30. Genus *CORONACELLA* Metcalf, 1950

Coronacella Metcalf, 1950. B. P. Bishop Mus. Occ. Pap. 20(5):59
Type species: *Coronacella bella* Metcalf, 1950

Coronacella Metcalf, 1950. B. P. Bishop Mus. Occ. Pap. 20(5):59
Coronacella Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):47
Coronacella Yang, 1989. NSC Special Publ. 6:313
Coronacella Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 73

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

30.1 *Coronacella sinhalana* (Kirkaldy, 1906)
Plates 17d, 39b-c

Liburnia frontalis Melichar, 1903. Homop. Faun. v. Ceylon 100
Delphacodes sinhalanus Kirkaldy, 1906. Can. Entomol. 38:156
Delphax puella Kirkaldy, 1907 [nec van Duzee]. Hawaii Sugar Plant Assoc. Div. Entomol. Bull. 3:1
Kelisia kirkaldyi Muir, 1917. Proc. Hawaii Entomol. Soc. 3:329
Coronacella bella Metcalf, 1950. B. P. Bishop Mus. Occ. Pap. 20(5):59
Coronacella sinhalana Fennah, 1973-75. Entomol. Scand. Suppl. 4:108

Features: Body length 2.86–3.26 mm; pitchy black; lateral carina of vertex and frons, median line of pronotum and mesonotum white, segment II of antenna and legs yellowish brown except femora III slightly brownish to dark brown; forewings subhyaline, yellowish brown, near end of clavus with distinct black markings; vertex submedially longer than wide at base about 1.3:1, at apex narrower than at base, lateral carinae slightly convex, Y-shaped carina moderately distinct, submedian carinae merged at apex, basal compartment wider posteriorly than greatest length about 1.2:1; frons at middle line longer than wide at widest point about 2.4:1, widest just below level of ocelli, lateral carina slightly convex, median carina simple; clypeus basally wider than apex of frons, about as wide as long; antennae surpassing frontoclypeal suture, basal segment longer than wide about 1.5:1, shorter than segment II about 1:2; tibial spur with about 18 teeth; pygofer with posterior margin slightly incised near base, laterodorsal angle obtusely rounded, not reflected mesad, opening wider than long in posterior view, lateral margins not very distinct; phallus short, tubular with several teeth dorsally near apex; orifice on lower side near apex; diaphragm broad, dorsal margin evenly convex medially; anal segment long, lateroapical angles closely approximated, each process ventrad in a slender spinose process, slightly projected laterally; parameres short, inner angle strongly projected mesad, inner margin strongly concave at apical half, outer margin almost straight.

Host plant: Rice
Economic importance: low
Distribution: Australia, Fiji, Gilbert Island, Micronesia, Philippines, Taiwan, Sri Lanka, Samoa, Tahiti, New Caledonia, and New Hebrides

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

31. Genus *NILAPARVATA* Distant, 1906

Nilaparvata Distant, 1906. Fauna Brit. Ind. 3:473
Type species: *Nilaparvata greeni* Distant, 1906

Nilaparvata Distant, 1906. Fauna Brit. Ind. Rhynch. 3:473
Kalpa Distant, 1906. Ibid. 474
Hikona Matsumura, 1935. Insecta Matsumurana 9:139
Nilaparvata Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:67
Nilaparvata Nasu, 1967. Major Insect Pests of Rice Plant 500
Nilaparvata Okada, 1977. Food Fert. Tech. Cen. Asia & Pac. Reg. 2
Nilaparvata Fennah, 1978. Ann. Zool. (Wars.) 34(9):219
Nilaparvata Mochida & Okada, 1979. Int. Rice Res. Newsl. 22
Nilaparvata Yang, 1989. NSC Special Publ. 6:275
Nilaparvata Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 49
Nilaparvata Ding & Zhang, 1994. China Agric. Sci. Tech. Press 82

Generic features: Body length 3.5–4.8 mm; generally brown planthopper; head including eyes narrower than pronotum; vertex slightly longer submedially than wide at base, sometimes subequal, submedian carinae not merged apically, Y-shaped carina distinct; frons longer at midline than wide at widest point about 2.4:1, widest at middle, median carina forked at base, sometimes not; clypeus at base slightly wider than frons at apex; proboscis reaching trochanter II; ocelli present; antennae cylindrical, only a little beyond frontoclypeal suture, with basal segment longer than wide, shorter than segment II about 1:2; pronotum with lateral carinae not reaching hind margin; spinal formula of leg III 5-7-4; first tarsal segment with 1–5 teeth; tibial spur with 15–33 teeth; pygofer longer ventrally than dorsally in profile, laterodorsal angle slightly projected, opening wider than long viewed posteriorly, medioventral process present or absent; phallus shape variable; suspensorium with broad stem, ventral half ring-like; parameres long and complex.

31.1 *Nilaparvata bakeri* (Muir, 1922)
Plates 29c, 39d

Delphacodes bakeri Muir, 1917. Proc. Hawaii Entomol. Soc. 3:336
Nilaparvata bakeri Muir, 1922. Rec. Indian Mus. 24:351
N. b. Muir, 1923. Philipp. J. Sci. 22:158
N. b. Ishihara, 1949. Sci. Rep. Matsuyama Agric. Coll. 2:69
N. b. Okada 1977. Major Insect Pests of Rice 4
N. b. Mochida & Okada, 1979. Intern. Rice Res. Newsl. 24
N. b. Yang, 1989. NSC Special Publ. 6:278
N. b. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 52
N. b. Ding & Zhang, 1994. China Agric. Sci. Tech. Press 88

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Features: Body length 4.26 mm; dark brown to blackish brown; vertex, frons, antennae, and legs paler in color; forewings hyaline, with apex of claval area black; vertex slightly wider at base than long submedially, apical margin transverse, submedian carina not merging apically, basal compartment wider at base than greatest length about 2:1; frons longer than wide at broadest point about 2.4:1, widest at level of ocelli, lateral carinae slightly convex, median carina forked along basal one-fourth; antennae surpassing frontoclypeal suture, with segment I longer than wide about 1.7:1, shorter than segment II about 1:2; tibial spur with about 33 teeth; forewings longer than widest portion about 3.2:1; pygofer with laterodorsal angle strongly projected, hind margin above medioventral process roundish caudally, medioventral process large, broad basally, narrowed at apical one-half in profile; opening wider than long, lateral margins ill-defined, medioventral process with both sides toothed, attenuating apically, viewed posteriorly; phallus tubular, apical third curved downward, apical half with 5 dorsal teeth, 6 ventrally; orifice terminal, right; suspensorium with broad stem, ventral ring normal; diaphragm broad, dorsal margin evenly incised medially; anal segment small, lateroapical angles separated, each forming into strong but short spinose process; parameres large, inner margin with process medially, pointing ventrally, apical fourth attenuating to apex.

Host plant: *Leersia japonica* Makino and *Leersia hexandra* Swartz.
Economic importance: Low
Distribution: China, Taiwan, Japan, Indonesia, India, Korea, Malaysia, Philippines, Thailand, Sri Lanka

31.2 *Nilaparvata muiri* China, 1925
Plates 29d, 39e

Nilaparvata muiri China, 1925. Ann. Mag. Nat. Hist. 9(16):480
N. m. Okada, 1977. Food Fert. Tech. Cen. Asia Pac. Reg. 4
N. m. Fennah, 1978. Ann. Zool. (Wars.) 34(9):219
N. m. Mochida & Okada, 1979. Int. Rice Res. Newsl. 28
N. m. Ding, 1983. Econ. Insects Fauna China 27:139
N. m. Yang, 1989. NSC Special Publ. 6:280
N. m. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 52
N. m. Ding & Zhang, 1994. China Agric. Sci. Tech. Press 86

Features: Body length 3.5–3.83 mm; pale yellowish brown with brown abdomen, hyaline wings except black end of clavus; vertex almost as long submedially as wide at base, at apex slightly narrower than at base, submedian carinae not merged at apex, basal compartment wider at base than greatest length 2:1; frons longer in midline than wide at widest portion about 2.2:1; widest at level of ocelli, median carina forked basally; clypeus wider at base than frons at apex; antennae reaching over frontoclypeal suture, segment I longer than wide about 2:1, shorter than segment II about 1:1.5; tibial spur with about 26–30 teeth; forewings longer than widest portion about 3.15:1;

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

in profile pygofer slightly wider ventrally than dorsally, laterodorsal angle concave, medioventral process simple, distinct with the distinct process at level of base of parameres, in posterior view, opening wider than long; phallus slightly sinuate in dorsal view, dilate at apical half with right side armed with 11 teeth, left with 6, basal left membranous, right side at apex with beak-like process; suspensorium asymmetrical, inverse Y-shaped, left arm directed left, membranous apically; diaphragm somewhat broad, dorsal margin sharply incised medially; anal segment quite small, collar shaped; parameres stout, bifurcate apically, above middle with a short process.

Host plant: Rice and other Graminae such as *Digitaria, Echinochloa, Isachne,* and *Phalaris*
Economic importance: Low
Distribution: China, Japan, Korea, Taiwan, and Vietnam

31. 3 *Nilaparvata albostriata* (Kirkaldy, 1907)
Plates 17e, 39f-g

"*Delphax*" *albostriata* Kirkaldy, 1907. Hawaii Sugar Plant Assoc. Entomol. Bull. 3:154
Nilaparvata albostriata Okada, 1977. Food Fert. Tech. Cen. Asia & Pac. Reg. 3
Nilaparvata albostriata Mochida & Okada, 1979. Int. Rice Res. Newsl. 27

Features: Body length 2.25–2.75 mm; dark grayish brown to blackish, slightly paler on the vertex; eyes castaneous or gray brownish castaneous; antennae, carinae on frons, clypeus, legs all fuscotestaceous; pronotum, posterolateral margins of scutellum, subcostal vein, apical margin of forewings and last two to three abdominal tergites opaque white; carinae all very prominent including those in clypeus; head dorsally longer than wide, produced a little in front; frons broadening curvedly toward the apex but narrowing very slightly at the apical margin; pronotal carinae divergent, not curving under the eyes and not reaching the hind margin; scutellum shorter than pronotum; forewings nearly squarish, extending to about half the length of the abdomen, subtruncate apically and contiguous along the commissure; tibial spur with about 16 well-developed spines; pygofer apically roundish to ovate, the rim thickened about the anal third and forming a short spine; parameres broad, bifid at apex.

Host plant: Unknown
Economic importance: Low
Distribution: Australia, Guam, and New Caledonia

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

31.4 *Nilaparvata myersi* Muir, 1923
Plate 39h

Nilaparvata myersi Muir, 1923. Trans. New Zealand Inst. 54:258
N. m. Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1): 25
N. m. Okada, 1977. Food Fert. Tech. Cen. Asia & Pac. Reg. 3
N. m. Mochida & Okada, 1979. Int. Rice Res. Newsl. 28

Features: Body length 3.5 mm; generally stramineous but paler along vertex, pronotal disc and mesonotum, abdominal terga V-VII glossy brownish black except in middle line and tergum VIII shiny brownish black only along margins, pygofer castaneous-glossy brownish black except at dorsolateral angles, parameres and diaphragm piceous; vertex longer submedially than broad at base about 1.2:1, subacutely rounded toward frons, distinctly narrower apex of vertex, basal compartment of vertex wider at hind margin than greatest length about 1.5:1, and than median length about 1.7:1; frons in midline longer than wide at widest part about 2:1, broadest at middle, lateral margins shallowly convex, median carina simple or at most forked only at extreme base; clypeus wider at base than frons at apex, disc as broad at base as long; moderately convex in profile; anteclypeus rather strongly convex with entire clypeus in profile strongly interrupted convex or biconvex; antennae moderately surpassing frontoclypeal suture, basal segment longer than broad about 1.7:1, segment II longer than segment I about 1.5:1; ocelli small; pronotum with disc longer in midline than broad at anterior margin almost 1.3:1, lateral carinae concave, diverging laterally but not reaching hind margin; tibial spur with 19 teeth; pygofer moderately long, posterior opening about as broad as long, dorsolateral angles not produced caudad, inflected mesad; diaphragm with dorsal margin feebly convex; medioventral process absent; aedeagus relatively long, straight with about seven teeth along dorsal margin; a long narrow process arising ventrally near middle and extending caudad below main axis of aedeagus and parallel with it; anal segment relatively long, distinctly broad, lateroapical angles wide apart, each forming ventrad in a curved spinose process; parameres moderately long, stout, in posterior view each asymmetrically Y-shaped, strongly formed caudad subbasally; process of inner apical angle strongly curved cephalad.

Host plant: Unknown
Economic importance: Low
Distribution: New Zealand

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

31.5 *Nilaparvata lugens* (Stål, 1854)
Plates 4h, 9c, 14c, 17f, 23h, 29e, 34g, 39i

Delphax lugens Stål, 1854. Ofv. Svenska Vet. Ak. Forh. 11:246
D. sordescens Motschulsky, 1863. Bull. Soc. Nat. Moscow 36:109
D. oryzae Matsumura, 1906. List Injur. Insects Jpn. 13
Nilaparvata greeni Distant, 1906. Fauna Brit. Ind. 3:486
Kalpa aculeata Distant, 1906. Ibid. 474
Dicranotropis anderida Kirkaldy, 1907. Hawaii Sugar Plant. Assoc. Entomol. Bull. 3:133
Delphax ordovix Kirkaldy, 1907. Ibid. 3:152
D. parysatis Kirkaldy, 1907. Ibid. 153
Nilaparvata lugens Muir & Giffard, 1924. Ibid. 15:16
Hikona formosana Matsumura, 1935. Insecta Matsumurana 9:139
Nilaparvata lugens Fennah, 1956. Insects of Micronesia 6(3):121
N. l. Fennah, 1965. Bull. Brit. Mus. Nat. Hist. 17(1):24
N. l. Okada, 1977. Food & Fert. Tech. Cen. Asia & Pac. Reg. 3
N. l. Mochida & Okada, 1979. Int. Rice Res. Newsl. 25
N. l. Fennah, 1978. Ann. Zool. (Wars.) 34(9):219
N. l. Yang, 1989. NSC Special Publ. 6:276
N. l. Wilson & Claridge, 1991. CAB Intern. & Nat. Resources Inst. 50
N. l. Ding & Zhang, 1994. China Agric. Sci. Tech. Press 83

Features: Body length 3.7–5 mm (macropterous), 2.4–3.3 mm (brachypterous); brown to dark brown; forewings hyaline, with apex of claval area black; vertex quadrate, nearly as long as wide, apical margin transverse, submedian carinae not merged apically, basal compartment wider than base and than its greatest length about 1.7:1; frons longer in middle line than wide at widest point about 2.2:1, widest at level of ocelli, lateral carinae almost straight, median carina forked at basal fourth; antennae passed frontoclypeal suture, with basal segment longer than wide about 2:1, shorter than segment II about 1:2; tibial spur with 24–29 teeth; forewing longer than widest point about 3.3:1; pygofer with opening wider than long in posterior view, lateral margins not well defined, medioventral process absent; phallus tubular, slender, narrowed, and upturned at apical third; orifice at apical third, right, below orifice with five small teeth; suspensorium with slender stem, ventral ring turned right angle to stem, left side sclerotized, remainder membranous; diaphragm very broad, dorsal margin evenly incised medially; anal segment in deep emargination of pygofer, lateroapical angles separated, each produced into a long, spinose process; parameres large, inner margin roundly emarginate at middle, inner angle strongly projected, apex pointed, viewed caudolaterally.

Host plant: Rice
Economic importance: High
Distribution: Australia, Bangladesh, Cambodia, China, East Timor, Fiji, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, New Guinea, Pakistan, Palau, Philippines, Taiwan, Thailand, Vietnam, and Yap Island

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

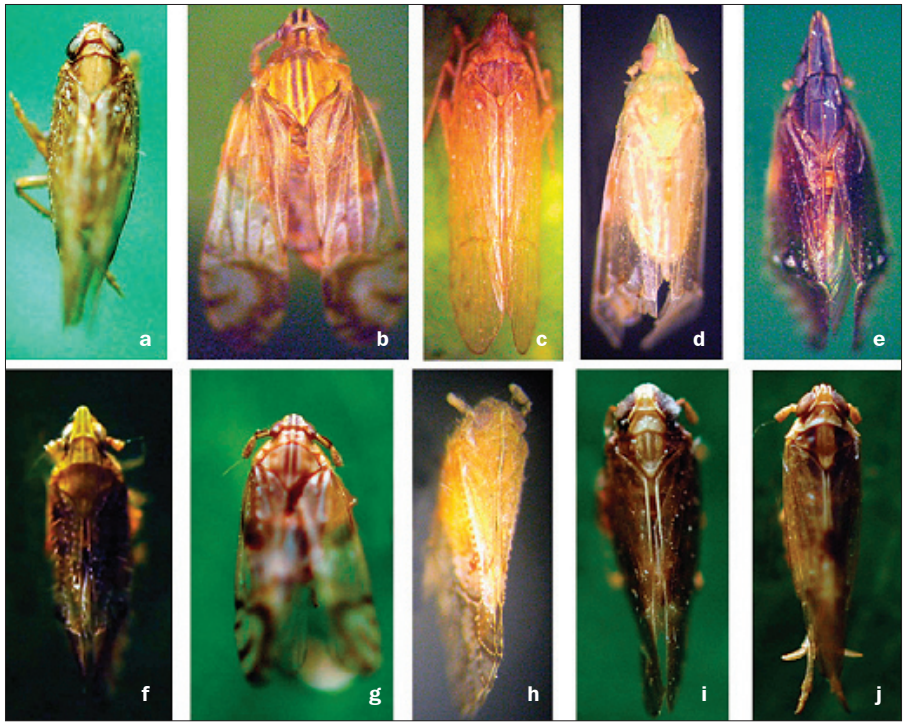

Plate 1. General habitus: (a) *Melanesia pacifica* Kirkaldy; (b) *Melanugyops* sp.; (c) *Ugyops vittatus* (Matsumura); (d) *Tropidocephala* sp.; (e) *Tropidocephala nigra* (Matsumura); (f) *Tropidocephala brunnipennis* Signoret; (g) *Tropidocephala festiva* (Distant); (h) *Arcofacies fullawayi* Muir; (i) *Tarophagus persephone* (Kirkaldy); (j) *Sogatella furcifera* (Horvath).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

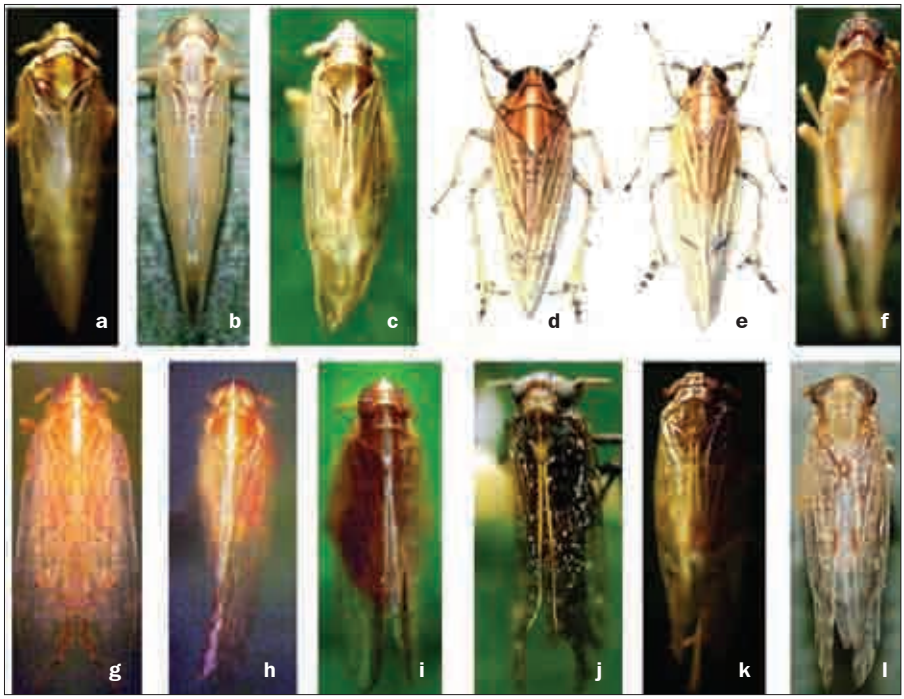

Plate 2. General habitus: (a) *Sogatella vibix* (Haupt); (b) *Sogatella kolophon* (Kirkaldy); (c) *Tagosodes pusanus* (Distant); (d) *Terthron albovittatum* (Matsumura); (e) *Unkanodes sapporonus* Matsumura; (f) *Stenocranus* sp. A; (g) *Stenocranus pacificus* Kirkaldy; (h) *Stenocranus* nr. *pseudopacificus* Kirkaldy; (i) *Stenocranus* sp. B; (j) *Perkinsiella* sp. A; (k) *Perkinsiella vastatrix* Muir; (l) *Perkinsiella pseudomaidis* Muir.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

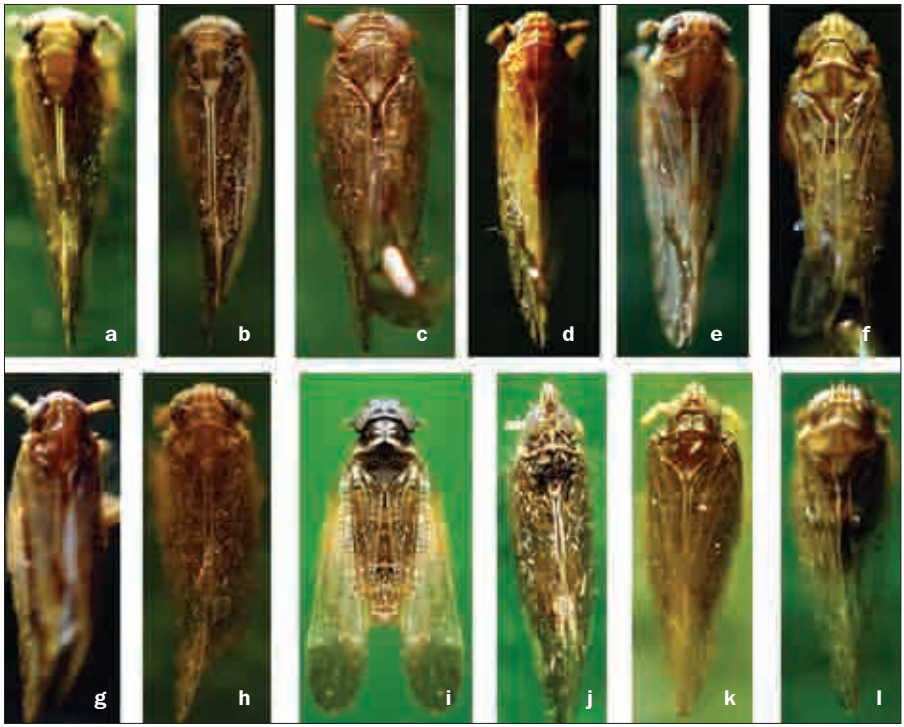

Plate 3. General habitus: (a) *Perkinsiella* nr. *bakeri* Muir; (b) *Perkinsiella saccharicida* Muir; (c) *Perkinsiella graminicida* Muir; (d) *Peregrinus maidis* (Ashmead); (e) *Euidella* sp.; (f) *Dicranotropis* sp.; (g) *Numata muiri* (Kirkaldy); (h) *Nycheuma cognatum* (Muir, 1917); (i) *Metropis nigrifrons* Kusnezov; (j) *Sardia rostrata* (Kirkaldy); (k) *Harmalia heitensis* (Matsumura); (l) *Toya propinqua* (Fieber).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

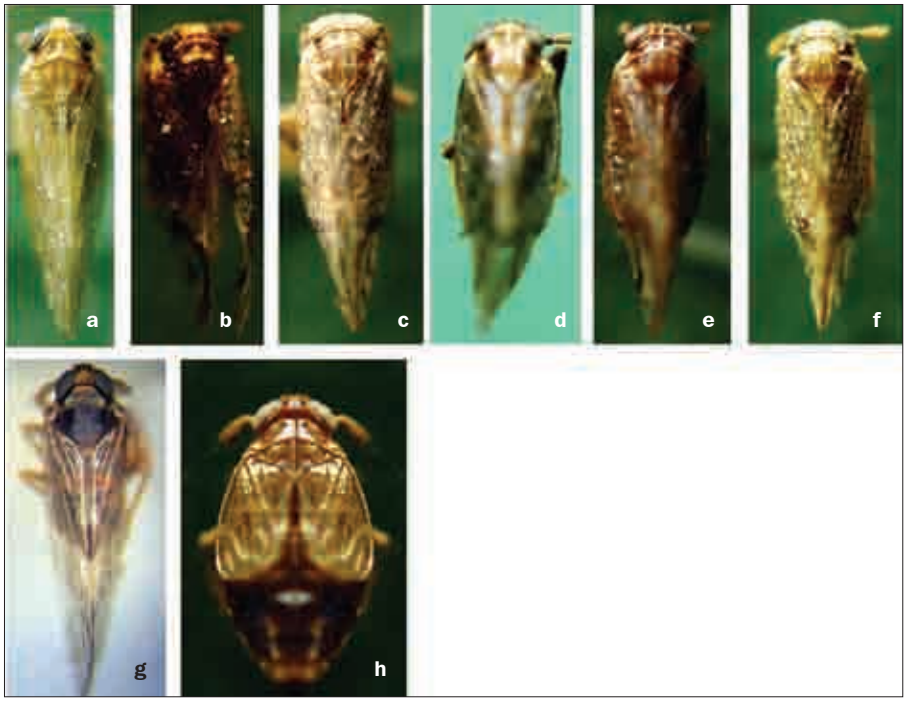

Plate 4. General habitus: (a) *Euidellana celadon* Fennah; (b) *Cemus sauteri* (Muir); (c) *Cemus nigromaculosus* (Muir); (d) *Cemus changchias* Kuoh; (e) *Cemus* sp. A; (f) *Cemus* sp. B; (g) *Laodelphax striatellus* (Fallen); (h) *Nilaparvata lugens* (Stål).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

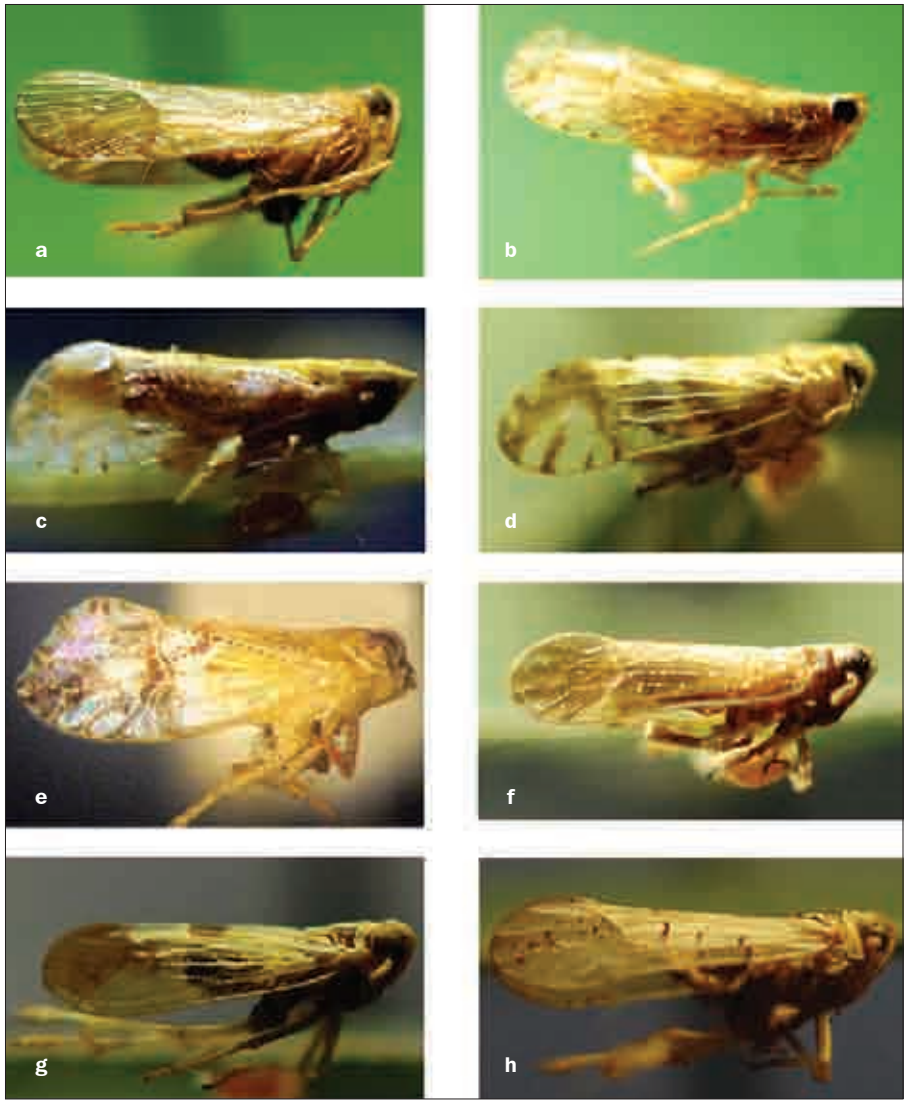

Plate 5. Lateral view of body: (a) *Melanesia pacifica* Kirkaldy; (b) *Ugyops vittatus* (Matsumura); (c) *Tropidocephala brunnipennis* Signoret; (d) *Tropidocephala festiva* (Distant); (e) *Arcofacies fullawayi* Muir; (f) *Tarophagus persephone* (Kirkaldy); (g) *Sogatella furcifera* (Horvath); (h) *Sogatella vibix* (Haupt).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

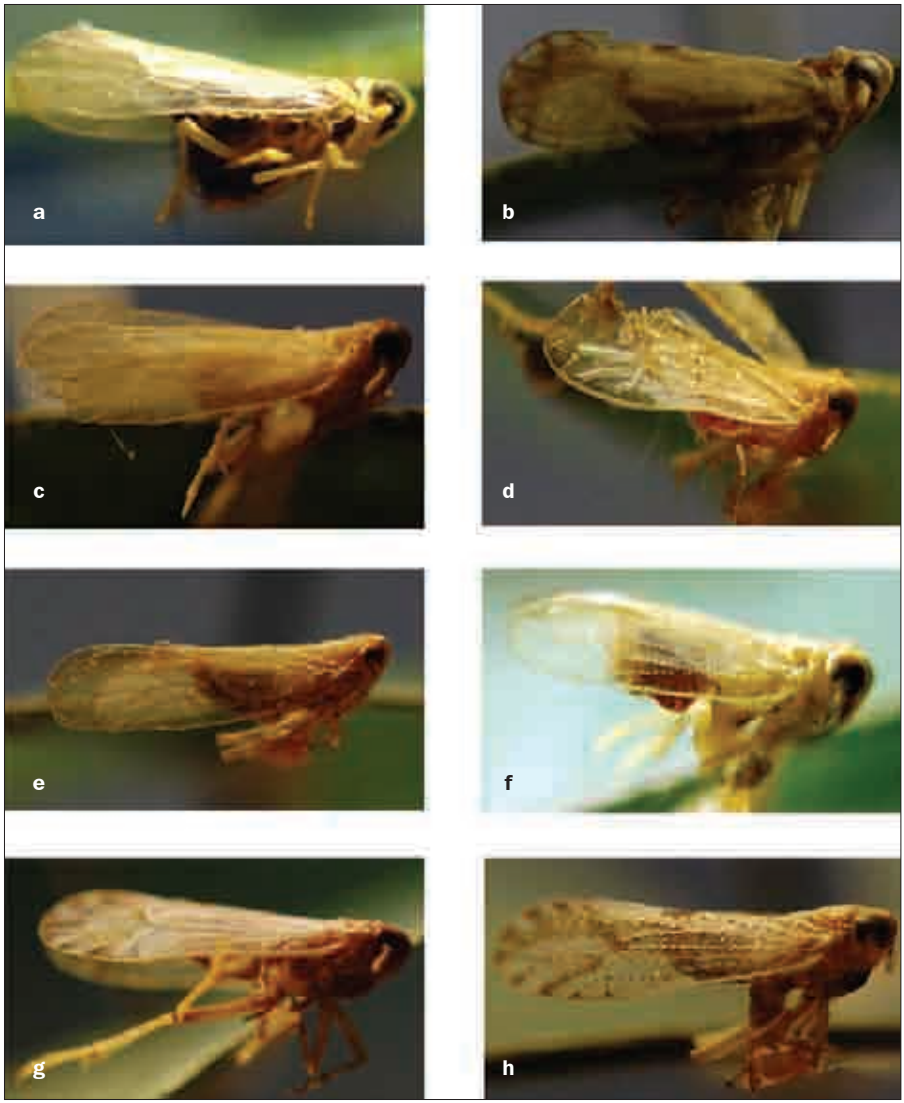

Plate 6. Lateral view of body: (a) *Sogatella kolophon* (Kirkaldy); (b) *Tagosodes pusanus* (Distant); (c) *Stenocranus* sp. A ; (d) *Stenocranus pacificus* Kirkaldy; (e) *Stenocranus* nr. *pseudopacificus* Kirkaldy; (f) *Stenocranus* sp. B; (g) *Perkinsiella vastatrix* Muir; (h) *Perkinsiella pseudomaidis* Muir.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 7. Lateral view of body: (a) *Perkinsiella* nr. *bakeri* Muir; (b) *Perkinsiella saccharicida* Muir; (c) *Perkinsiella graminicida* Muir; (d) *Peregrinus maidis* (Ashmead); (e) *Euidella* sp.; (f) *Dicranotropis* sp.; (g) *Numata muiri* (Kirkaldy); (h) *Nycheuma cognatum* (Muir).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

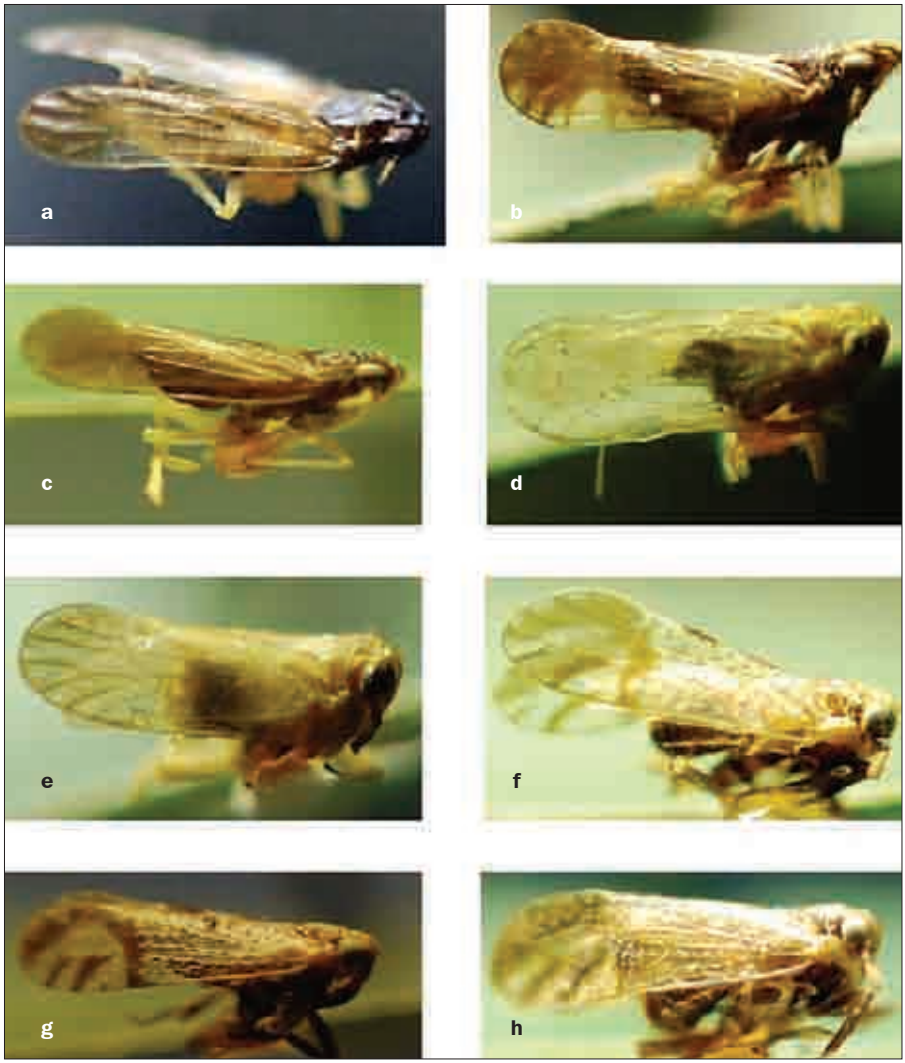

Plate 8. Lateral view of body: (a) *Metropis nigrifrons* Kusnezov; (b) *Sardia rostrata* (Kirkaldy); (c) *Harmalia anacharsis* Fennah ; (d) *Toya propinqua* (Fieber); (e) *Euidellana celadon* Fennah; (f) *Cemus sauteri* (Muir); (g) *Cemus nigromaculosus* (Muir); (h) *Cemus changchias* Kuoh.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 9. Lateral view of body: (a) *Cemus* sp. A; (b) *Cemus* sp. B; (c) *Nilaparvata lugens* (Stål).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 10. Dorsal view of head and thorax: (a) *Melanesia pacifica* Kirkaldy; (b) *Melanugyops* sp.; (c) *Ugyops vittatus* (Matsumura); (d) *Tropidocephala* sp.; (e) *Tropidocephala nigra* (Matsumura); (f) *Tropidocephala brunnipennis* Signoret; (g) *Tropidocephala festiva* (Distant); (h) *Arcofacies fullawayi* Muir; (i) *Tarophagus persephone* (Kirkaldy).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

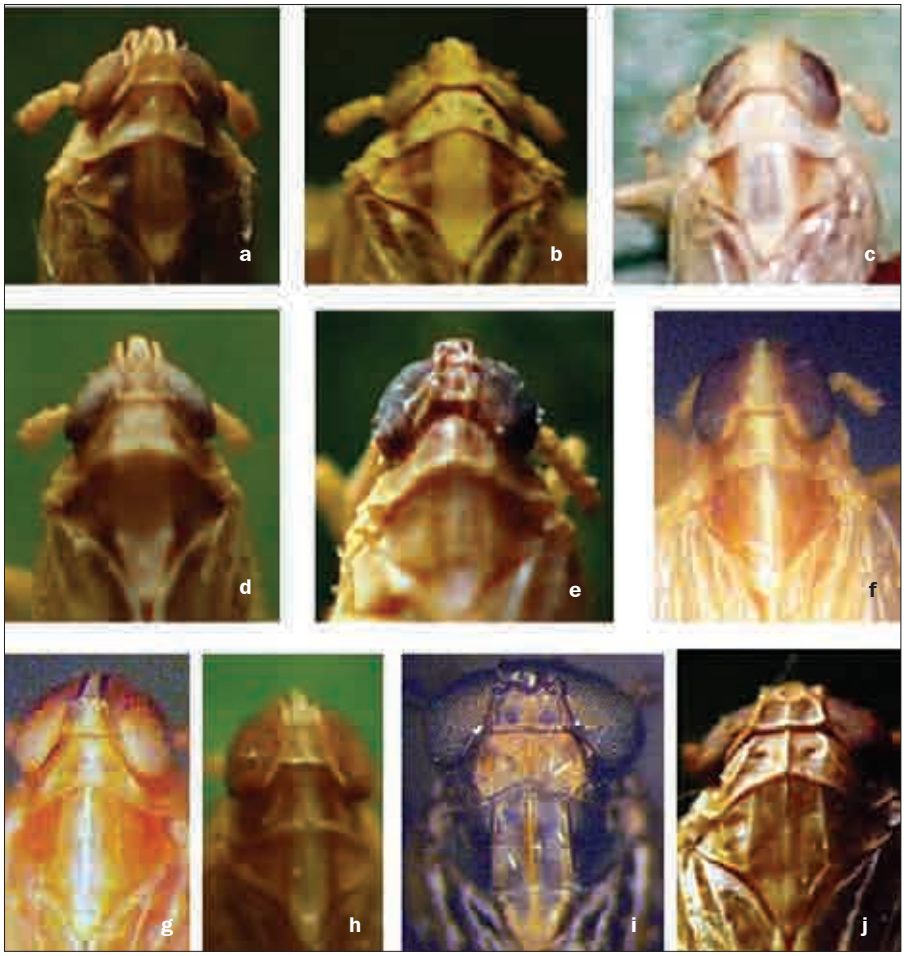

Plate 11. Dorsal view of head and thorax: (a) *Sogatella furcifera* (Horvath); (b) *Sogatella vibix* (Haupt); (c) *Sogatella kolophon* (Kirkaldy); (d) *Tagosodes pusanus* (Distant); (e) *Stenocranus* sp. A; (f) *Stenocranus pacificus* Kirkaldy; (g) *Stenocranus* nr. *pseudopacificus* Kirkaldy; (h) *Stenocranus* sp. B; (i) *Perkinsiella* sp. A; (j) *Perkinsiella vastatrix* Muir.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 12. Dorsal view of head and thorax: (a) *Perkinsiella pseudomaidis* Muir; (b) *Perkinsiella* nr. *bakeri* Muir; (c) *Perkinsiella saccharicida* Muir; (d) *Perkinsiella graminicida* Muir; (e) *Peregrinus maidis* (Ashmead); (f) *Euidella* sp.; (g) *Dicranotropis* sp.; (h) *Numata muiri* (Kirkaldy); (i) *Nycheuma cognatum* (Muir).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 13. Dorsal view of head and thorax: (a) *Metropis nigrifrons* Kusnezov; (b) *Sardia rostrata* (Kirkaldy); (c) *Harmalia heitensis* (Matsumura); (d) *Toya propinqua* (Fieber); (e) *Euidellana celadon* Fennah; (f) *Cemus sauteri* (Muir); (g) *Cemus nigromaculosus* (Muir); (h) *Cemus changchias* Kuoh; (i) *Cemus* sp. A.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 14. Dorsal view of head and thorax: (a) *Cemus* sp. B; (b) *Laodelphax striatellus* (Fallen); (c) *Nilaparvata lugens* (Stål).

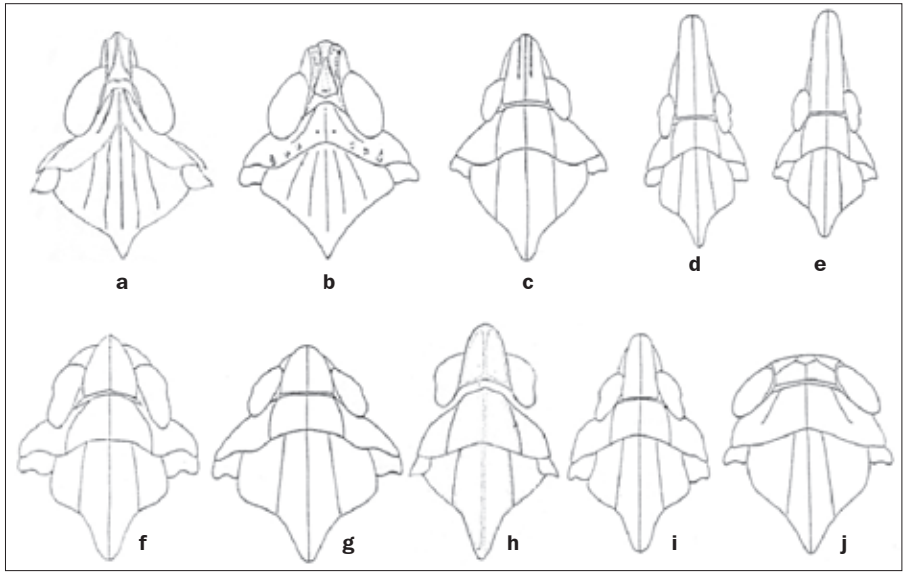

Plate 15. Dorsal view of head and thorax (line drawing): (a) *Ugyops vittatus* (Matsumura); (b) *Ugyops tripunctatus* (Kato); (c) *Tropidocephala flavovittata* Matsumura; (d) *Tropidocephala dimidia* Yang & Yang; (e) *Tropidocephala sinuosa* Yang & Yang; (f) *Tropidocephala grata* Yang & Yang; (g) *Tropidocephala formosa* Matsumura; (h) *Tropidocephala brunnipennis* Signoret; (i) *Tropidocephala saccharivoriella* Matsumura; (j) *Epeurysa nawaii* Matsumura.

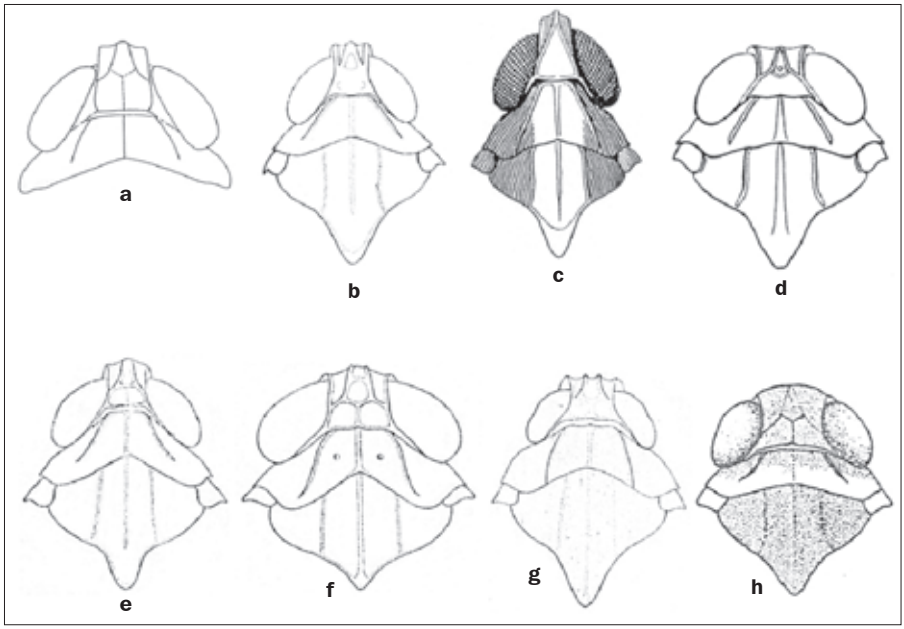

Plate 16. Dorsal view of head and thorax (line drawing): (a) *Tarophagus colocasiae* (Matsumura); (b) *Sogatella furcifera* (Horvath); (c) *Latistria eupompe* (Kirkaldy); (d) *Terthron albovittatum* (Matsumura); (e) *Unkanodes sapporonus* Matsumura; (f) *Perkinsiella saccharicida* Muir; (g) *Peregrinus maidis* (Ashmead); (h) *Metropis nigrifrons* Kusnezov.

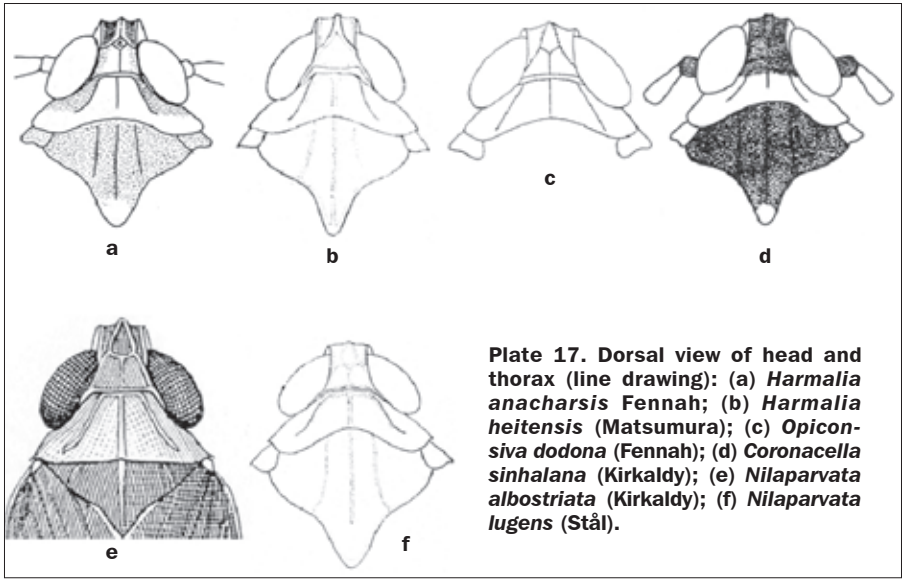

Plate 17. Dorsal view of head and thorax (line drawing): (a) *Harmalia anacharsis* Fennah; (b) *Harmalia heitensis* (Matsumura); (c) *Opiconsiva dodona* (Fennah); (d) *Coronacella sinhalana* (Kirkaldy); (e) *Nilaparvata albostriata* (Kirkaldy); (f) *Nilaparvata lugens* (Stål).

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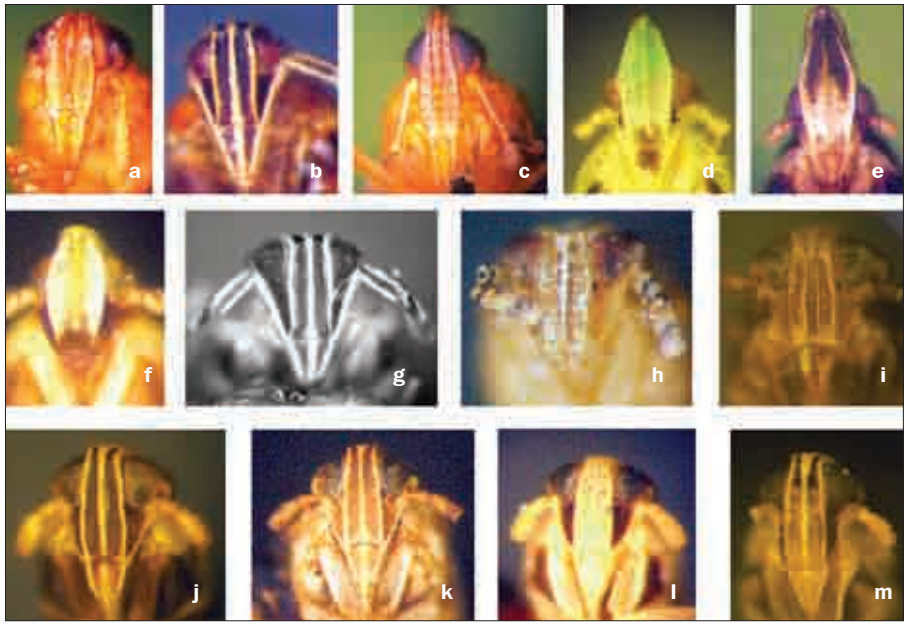

Plate 18. Frontal view of head: (a) *Melanesia pacifica* Kirkaldy; (b) *Melanugyops* sp.; (c) *Ugyops vittatus* (Matsumura); (d) *Tropidocephala* sp.; (e) *Tropidocephala nigra* (Matsumura); (f) *Tropidocephala brunnipennis* Signoret; (g) *Tropidocephala festiva* (Distant); (h) *Arcofacies fullawayi* Muir; (i) *Tarophagus persephone* (Kirkaldy); (j) *Sogatella furcifera* (Horvath); (k) *Sogatella vibix* (Haupt); (l) *Sogatella kolophon* (Kirkaldy); (m) *Tagosodes pusanus* (Distant).

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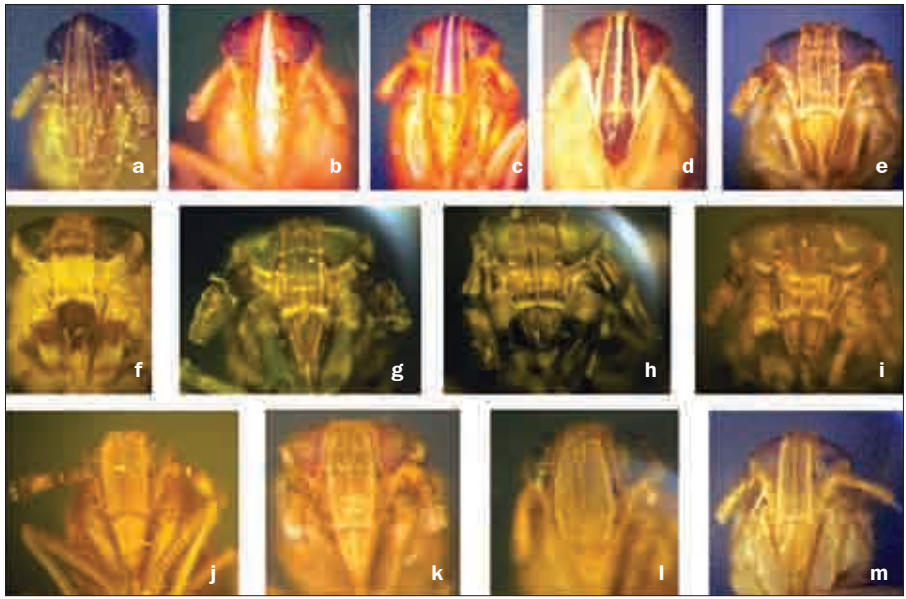

Plate 19. Frontal view of head: (a) *Stenocranus* sp. A; (b) *Stenocranus pacificus* Kirkaldy; (c) *Stenocranus* nr. *pseudopacificus* Kirkaldy); (d) *Stenocranus* sp. B; (e) *Perkinsiella vastatrix* Muir; (f) *Perkinsiella pseudomaidis* Muir; (g) *Perkinsiella* nr. *bakeri* Muir; (h) *Perkinsiella saccharicida* Muir; (i) *Perkinsiella graminicida* Muir; (j) *Peregrinus maidis* (Ashmead); (k) *Euidella* sp.; (l) *Dicranotropis* sp.; (m) *Numata muiri* (Kirkaldy).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 20. Frontal view of head: (a) *Nycheuma cognatum* (Muir); (b) *Metropis nigrifrons* Kusnezov; (c) *Sardia rostrata* (Kirkaldy); (d) *Harmalia heitensis* (Matsumura); (e) *Toya propinqua* (Fieber); (f) *Euidellana celadon* Fennah; (g) *Cemus sauteri* (Muir); (h) *Cemus nigromaculosus* (Muir); (i) *Cemus changchias* Kuoh; (j) *Cemus* sp. A; (k) *Cemus* sp. B.

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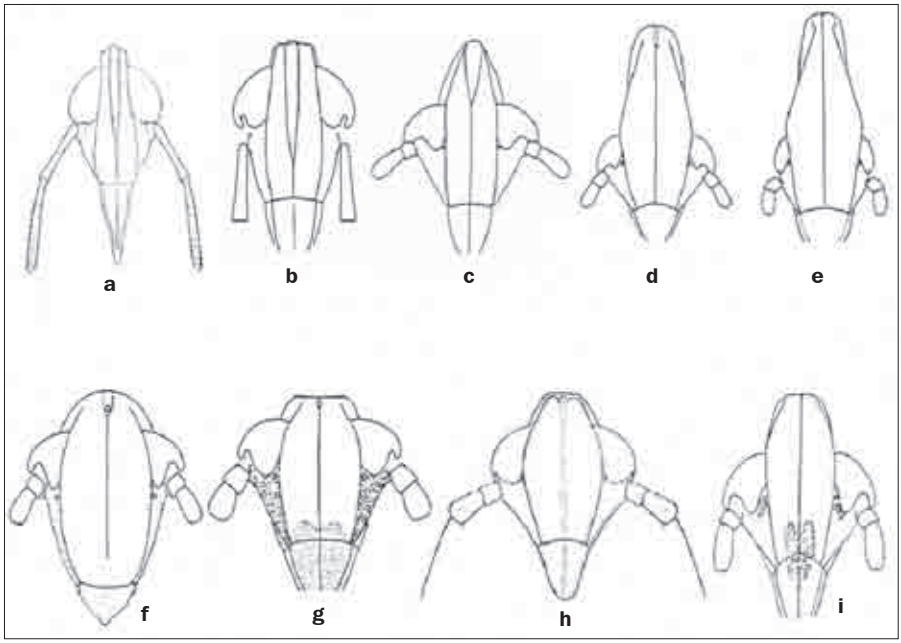

Plate 21. Frontal view of head (line drawing): (a) *Ugyops vittatus* (Matsumura); (b) *Ugyops tripunctatus* (Kato); (c) *Tropidocephala flavovittata* Matsumura; (d) *Tropidocephala dimidia* Yang & Yang; (e) *Tropidocephala sinuosa* Yang & Yang; (f) *Tropidocephala grata* Yang & Yang; (g) *Tropidocephala formosa* Matsumura; (h) *Tropidocephala brunnipennis* Signoret; (i) *Tropidocephala saccharivoriella* Matsumura.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

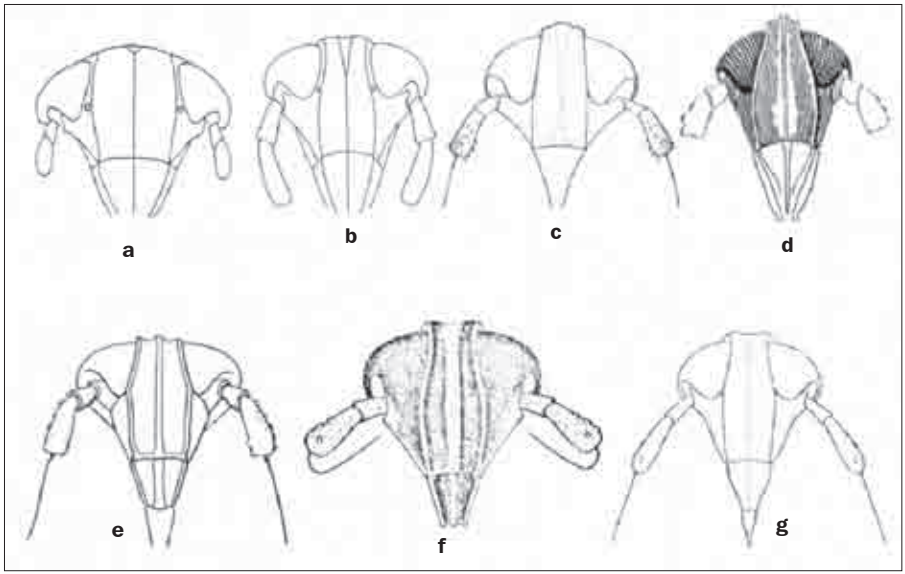

Plate 22. Frontal view of head (line drawing): (a) *Epeurysa nawaii Matsumura*; (b) *Tarophagus colocasiae* (Matsumura); (c) *Sogatella furcifera* (Horvath); (d) *Latistria eupompe* (Kirkaldy); (e) *Terthron albovittatum* (Matsumura); (f) *Unkanodes albifascia* (Matsumura); (g) *Unkanodes sapporonus* Matsumura.

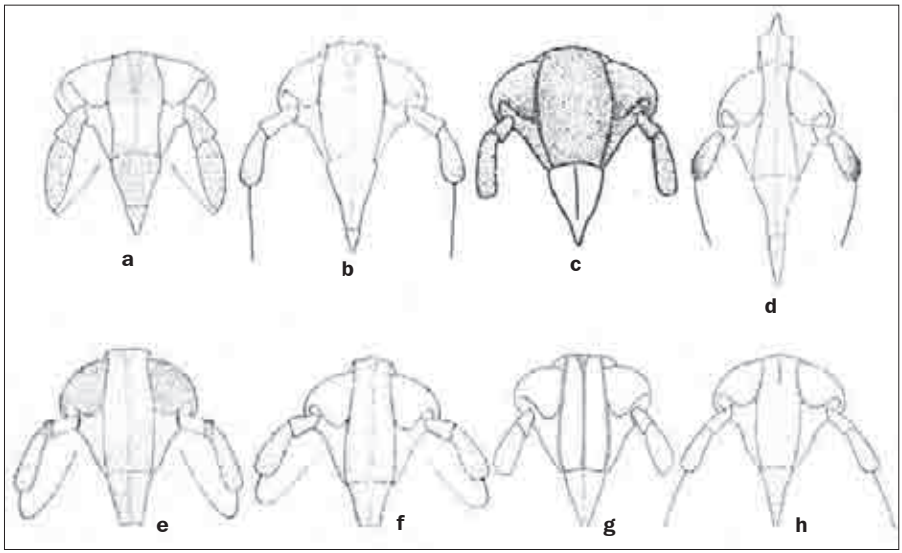

Plate 23. Frontal view of head (line drawing): (a) *Perkinsiella saccharicida* Muir; (b) *Peregrinus maidis* (Ashmead); (c) *Metropis nigrifrons* Kusnezov; (d) *Sardia rostrata* (Kirkaldy); (e) *Paradelphacodes paludosa* (Flor); (f) *Harmalia heitensis* (Matsumura); (g) *Opiconsiva dodona* (Fennah); (h) *Nilaparvata lugens* (Stål).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

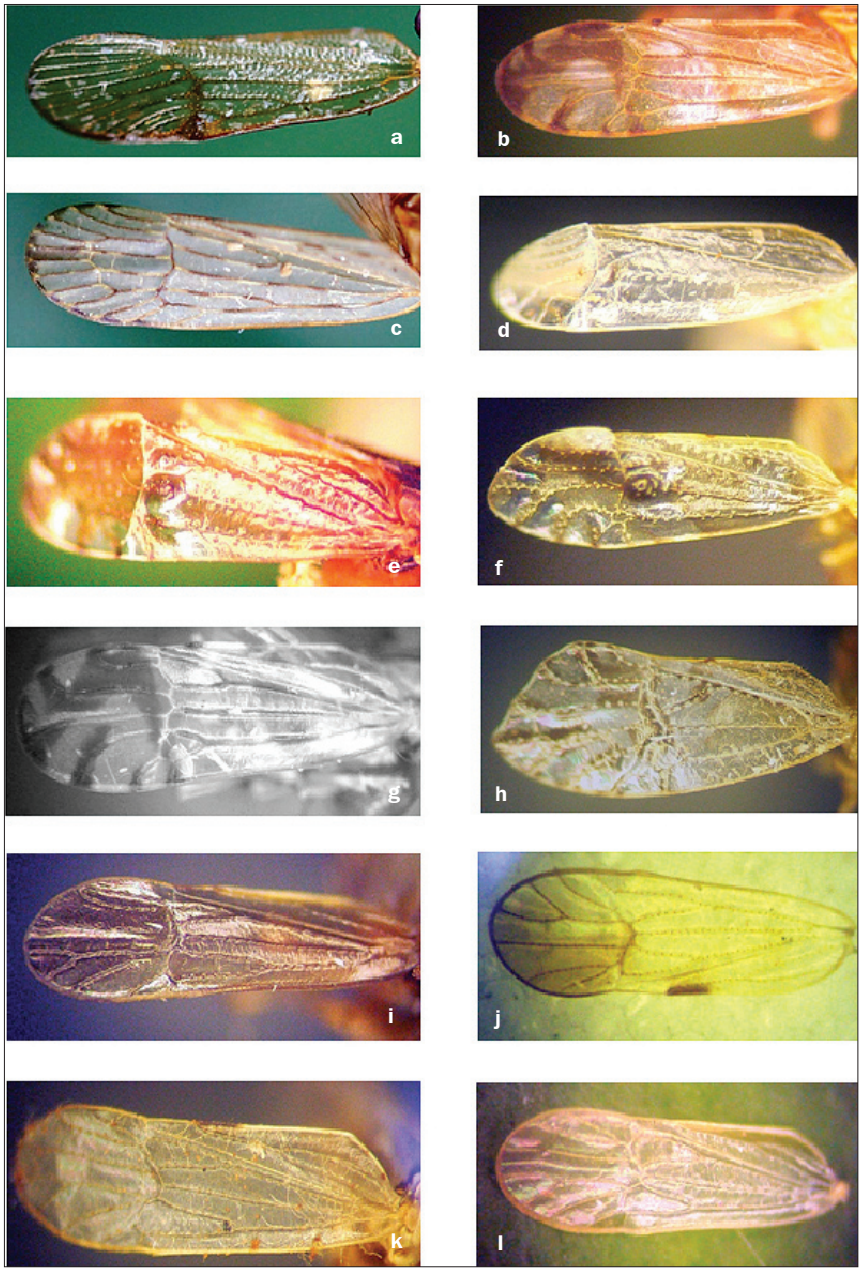

Plate 24. Wing venation: (a) *Melanesia pacifica* Kirkaldy; (b) *Melanugyops* sp.; (c) *Ugyops vittatus* (Matsumura); (d) *Tropidocephala* sp.; (e) *Tropidocephala nigra* (Matsumura); (f) *Tropidocephala brunnipennis* Signoret; (g) *Tropidocephala festiva* (Distant); (h) *Arcofacies fullawayi* Muir; (i) *Tarophagus persephone* (Kirkaldy); (j) *Sogatella furcifera* (Horvath); (k) *Sogatella vibix* (Haupt); (l) *Sogatella kolophon* (Kirkaldy).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

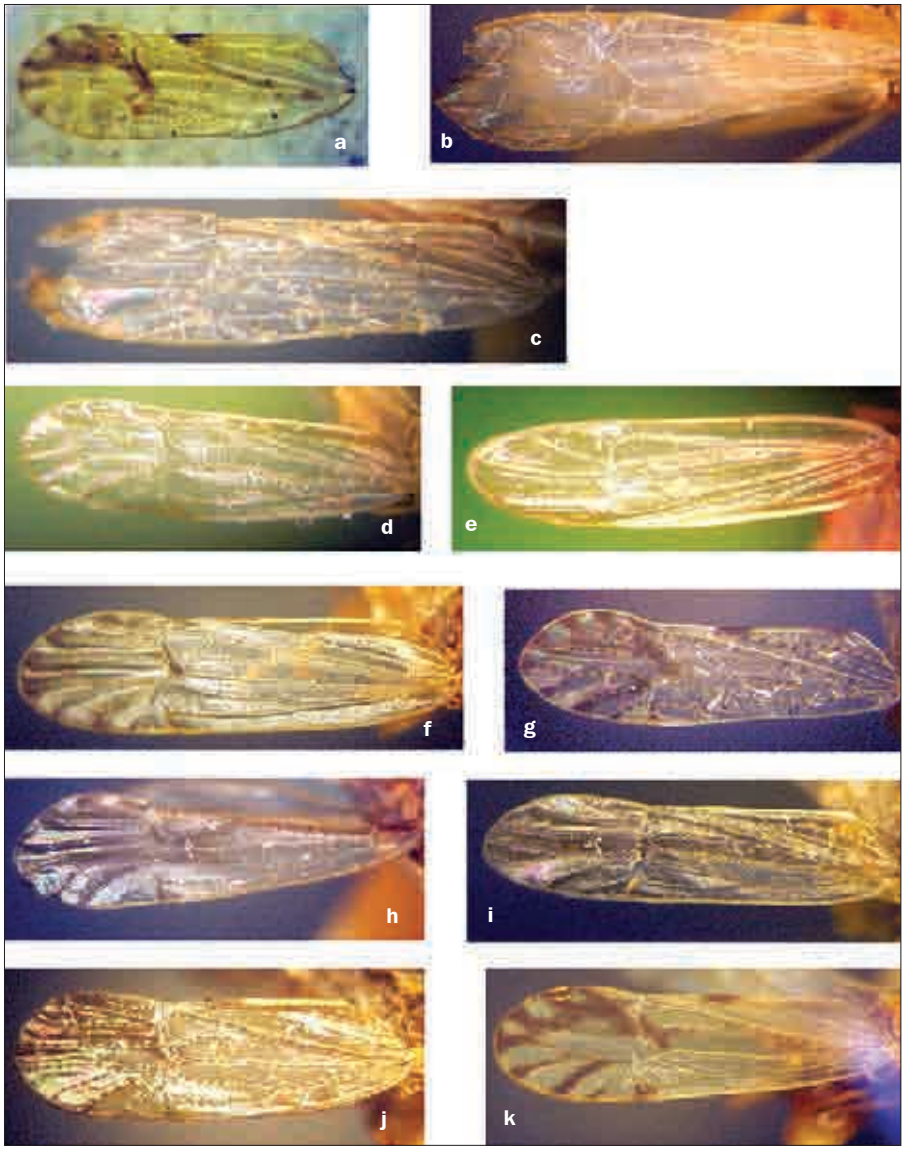

Plate 25. Wing venation: (a) *Tagosodes pusanus* (Distant); (b) *Stenocranus* sp. A; (c) *Stenocranus pacificus* Kirkaldy; (d) *Stenocranus* nr. *pseudopacificus* Kirkaldy; (e) *Stenocranus* sp. B; (f) *Perkinsiella vastatrix* Muir; (g) *Perkinsiella pseudomaidis* Muir; (h) *Perkinsiella* nr. *bakeri* Muir; (i) *Perkinsiella saccharicida* Muir; (j) *Perkinsiella graminicida* Muir; (k) *Peregrinus maidis* (Ashmead).

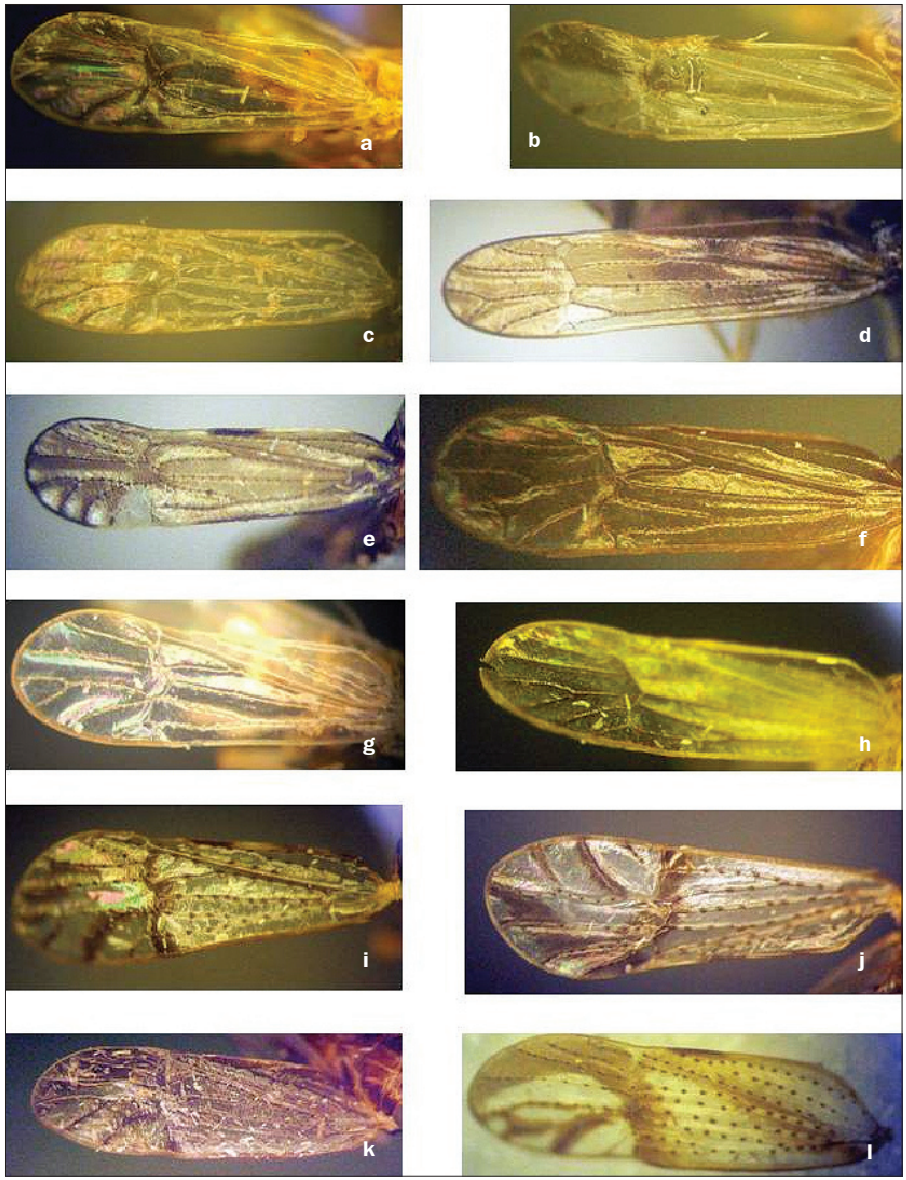

Plate 26. Wing venation: (a) *Euidella* sp.; (b) *Numata muiri* (Kirkaldy); (c) *Nycheuma cognatum* (Muir); (d) *Metropis nigrifrons* Kusnezov; (e) *Sardia rostrata* (Kirkaldy); (f) *Harmalia heitensis* (Matsumura); (g) *Toya propinqua* (Fieber); (h) *Euidellana celadon* Fennah; (i) *Cemus sauteri* (Muir); (j) *Cemus nigromaculosus* (Muir); (k) *Cemus changchias* Kuoh; (l) *Cemus* sp. A.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

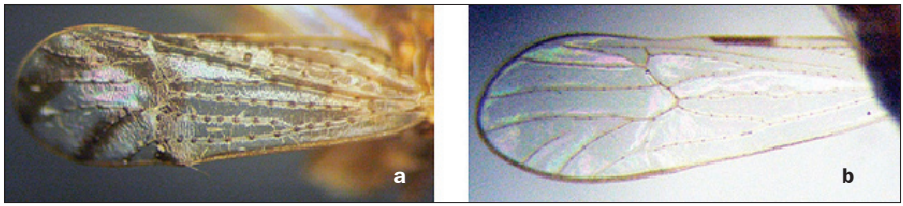

Plate 27. Wing venation: (a) *Cemus* sp. B; (b) *Laodelphax striatellus* (Fallen).

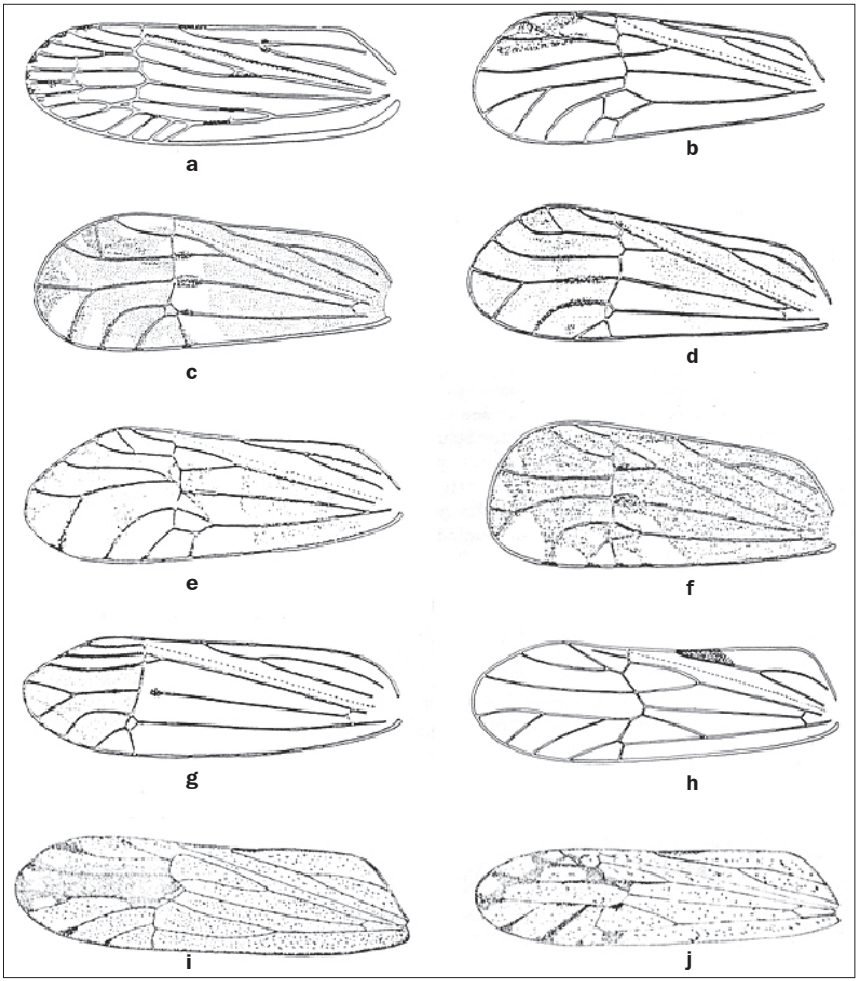

Plate 28. Wing venation (line drawing): (a) *Ugyops tripunctatus* (Kato); (b) *Tropidocephala flavovittata* Matsumura; (c) *Tropidocephala dimidia* Yang & Yang; (d) *Tropidocephala sinuosa* Yang & Yang; (e) *Tropidocephala grata* Yang & Yang; (f) *Tropidocephala formosa* Matsumura; (g) *Tropidocephala saccharivoriella* Matsumura; (h) *Tarophagus colocasiae* (Matsumura); (i) *Perkinsiella saccharicida* Muir; (i) *Peregrinus maidis* (Ashmead).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

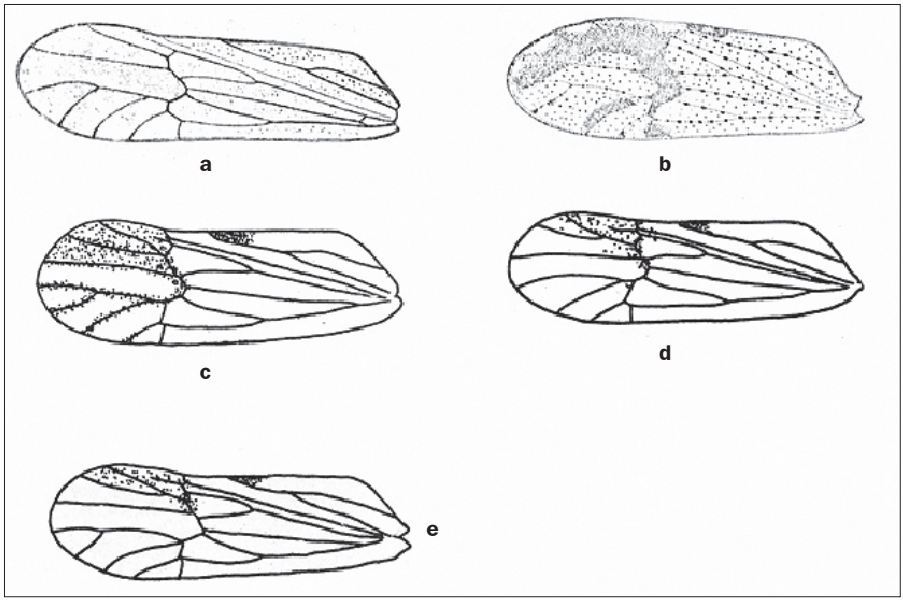

Plate 29. Wing venation (line drawing): (a) *Sardia rostrata* (Kirkaldy); (b) *Cemus sauteri* (Muir); (c) *Nilaparvata bakeri* (Muir); (d) *Nilaparvata muiri* China; (e) *Nilaparvata lugens* (Stål).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

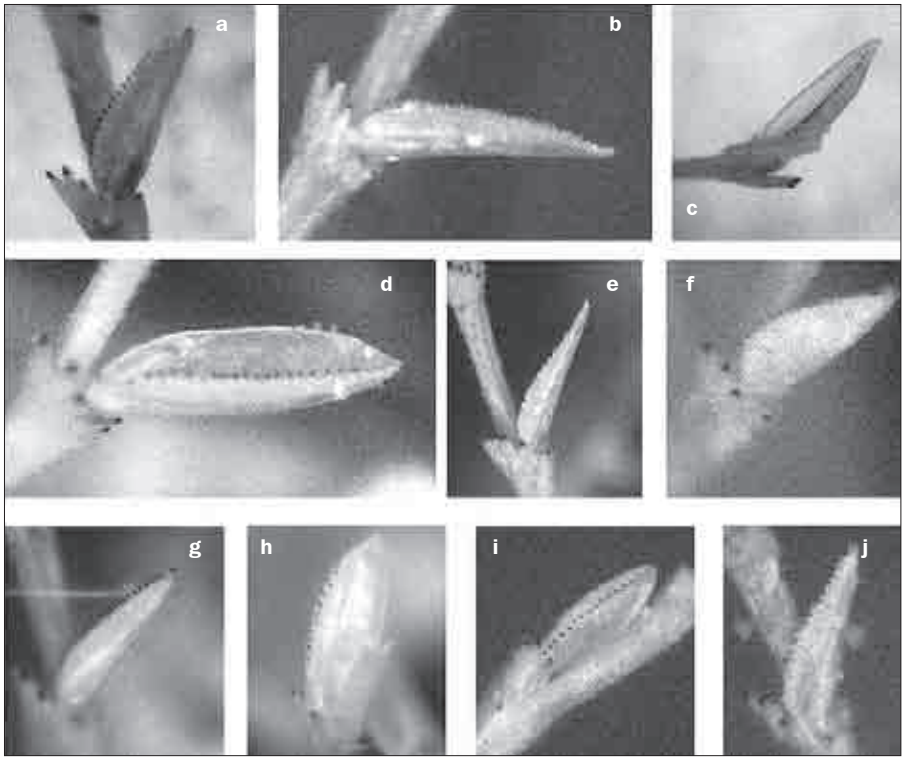

Plate 30. Tibial spur: (a) *Tarophagus persephone* (Kirkaldy); (b) *Sogatella furcifera* (Horvath); (c) *Sogatella vibix* (Haupt); (d) *Sogatella kolophon* (Kirkaldy); (e) *Tagosodes pusanus* (Distant); (f) *Dicranotropis* sp.; (g) *Numata muiri* (Kirkaldy); (h) *Harmalia heitensis* (Matsumura); (i) *Toya propinqua* (Fieber); (j) *Euidellana celadon* Fennah.

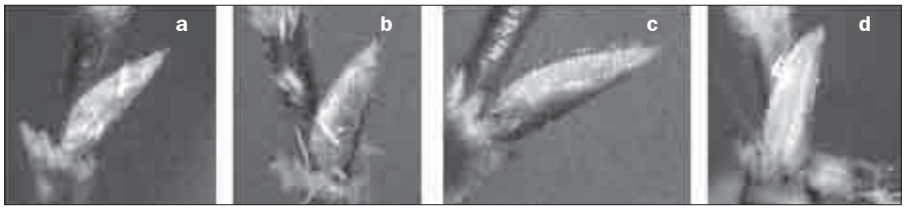

Plate 31. Tibial spur: (a) *Cemus sauteri* (Muir); (b) *Cemus nigromaculosus* (Muir); (c) *Cemus* sp. A; (d) *Cemus* sp. B.

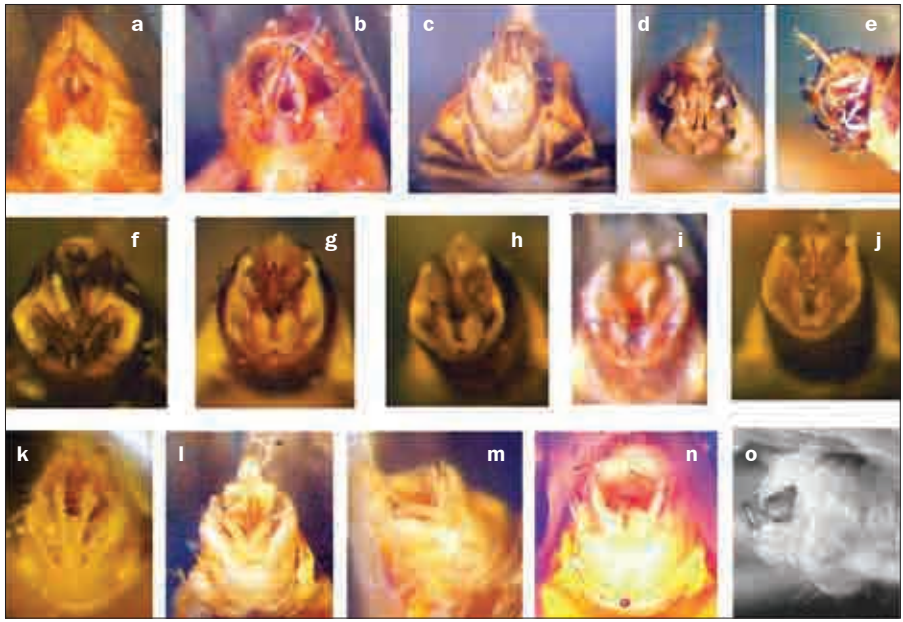

Plate 32. Male genitalia: (a) *Melanesia pacifica* Kirkaldy; (b) *Ugyops vittatus* (Matsumura); (c) *Tropidocephala nigra* (Matsumura); (d,e) *Tropidocephala brunnipennis* Signoret; (f) *Tarophagus persephone* (Kirkaldy); (g) *Sogatella furcifera* (Horvath); (h) *Sogatella vibix* (Haupt); (i) *Sogatella kolophon* (Kirkaldy); (j) *Tagosodes pusanus* (Distant); (k) *Stenocranus* sp. A; (l,m) *Stenocranus pacificus* Kirkaldy; (n,o) *Stenocranus* nr. *pseudopacificus* Kirkaldy.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

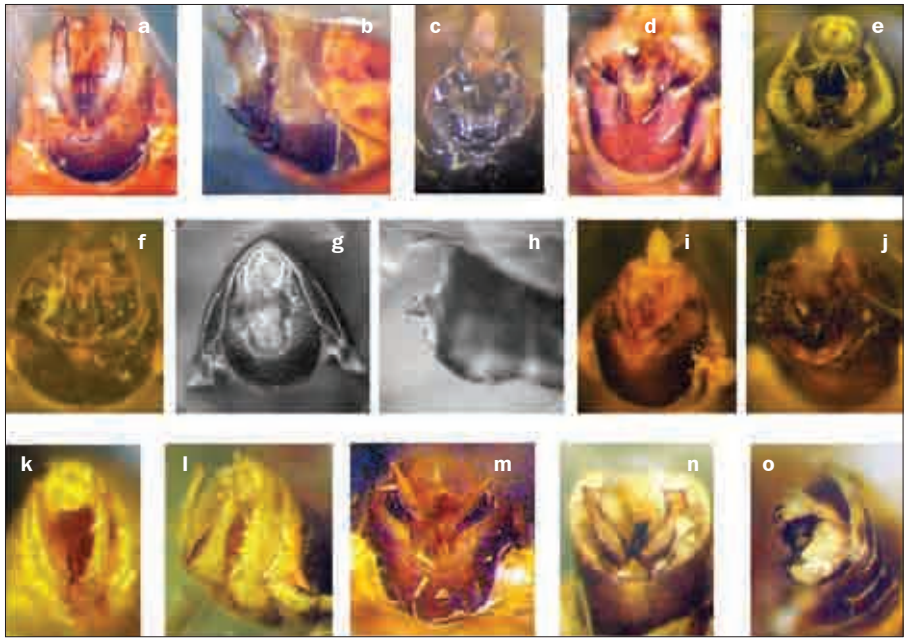

Plate 33. Male genitalia: (a,b) *Stenocranus* sp. B; (c) *Perkinsiella* sp. A; (d) *Perkinsiella* nr. *bakeri* Muir; (e) *Perkinsiella saccharicida* Muir; (f) *Perkinsiella graminicida* Muir; (g,h) *Peregrinus maidis* (Ashmead); (i) Euidella sp.; (j) *Dicranotropis* sp.; (k,l) *Numata muiri* (Kirkaldy); (m) *Nycheuma cognatum* (Muir); (n,o) *Toya propinqua* (Fieber).

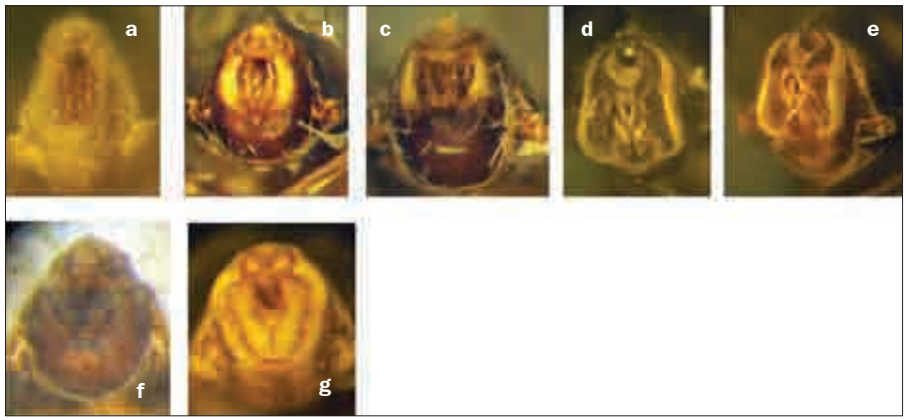

Plate 34. Male genitalia: (a) *Euidellana celadon* Fennah; (b) *Cemus sauteri* (Muir); (c) *Cemus nigromaculosus* (Muir); (d) *Cemus changchias* Kuoh; (e) *Cemus* sp. A; (f) *Laodelphax striatellus* (Fallen); (g) *Nilaparvata lugens* (Stål).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

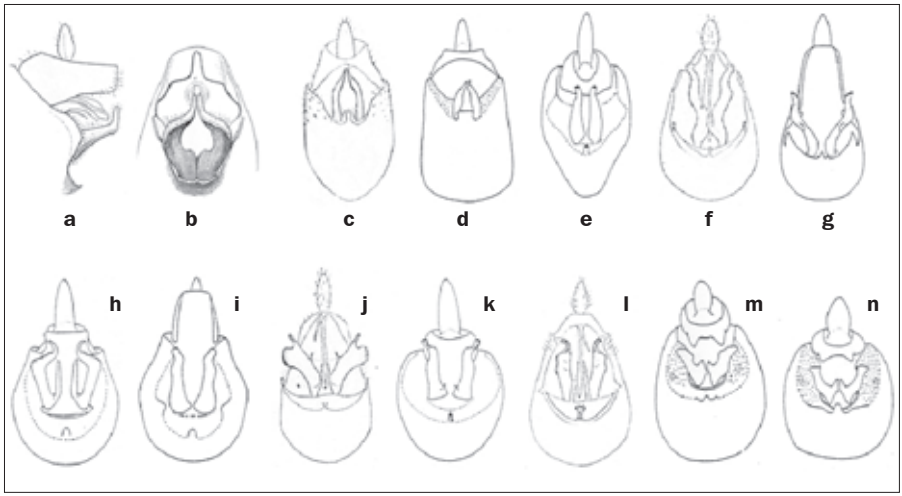

Plate 35. Male genitalia (line drawing): (a,b) *Melanesia pacifica* Kirkaldy; (c) *Ugyops vittatus* (Matsumura); (d) *Ugyops tripunctatus* (Kato); (e) *Tropidocephala flavovittata* Matsumura; (f) *Tropidocephala nigra* (Matsumura); (g) *Tropidocephala sinuosa* Yang & Yang; (h) *Tropidocephala grata* Yang & Yang; (i) *Tropidocephala formosa* Matsumura; (j) *Tropidocephala brunnipennis* Signoret; (k) *Tropidocephala saccharivoriella* Matsumura; (l) *Tropidocephala festiva* (Distant); (m) *Epeurysa abatana;* (n) *Epeurysa nawaii* Matsumura. Sources: Kirkaldy (1907), Ishikara (1949), Yang and Yang (1986), Yang (1989).

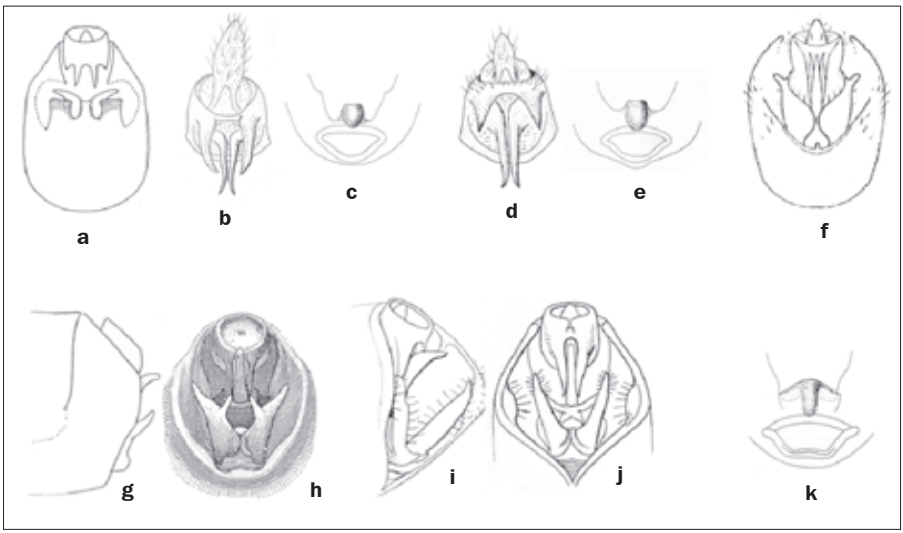

Plate 36. Male genitalia (line drawing): (a) *Tarophagus colocasiae* (Matsumura); (b,c) *Sogatellana geranor* (Kirkaldy); (d,e) *Sogatellana quadrispinosa* (Muir); (f) *Sogatella furcifera* (Horvath); (g,h) *Sogatella kolophon* (Kirkaldy); (i,j) *Latistria eupompe* (Kirkaldy); (k) *Tagosodes pusanus* (Distant) [c, e, and k = diaphragms of pygofer]. Sources: Kirkaldy (1907), Asche and Wilson (1990), Wilson and Claridge (1991).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

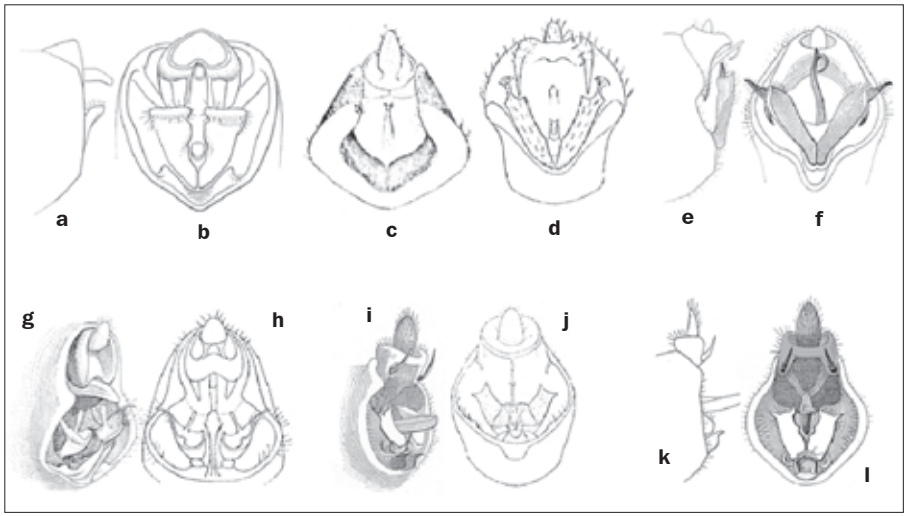

Plate 37. Male genitalia (line drawing): (a,b) *Terthron albovittatum* (Matsumura); (c) *Unkanodes albifascia* (Matsumura); (d) *Unkanodes sapporonus* Matsumura; (e,f) *Stenocranus pacificus* Kirkaldy; (g,h) *Perkinsiella vastatrix* Muir; (i,j) *Perkinsiella saccharicida* Muir; (k,l) *Perkinsiella graminicida* Muir (a, e, g, i, and k in lateral view). Sources: Kirkaldy (1907), Ishikara (1949), Fennah (1978), Yang (1989).

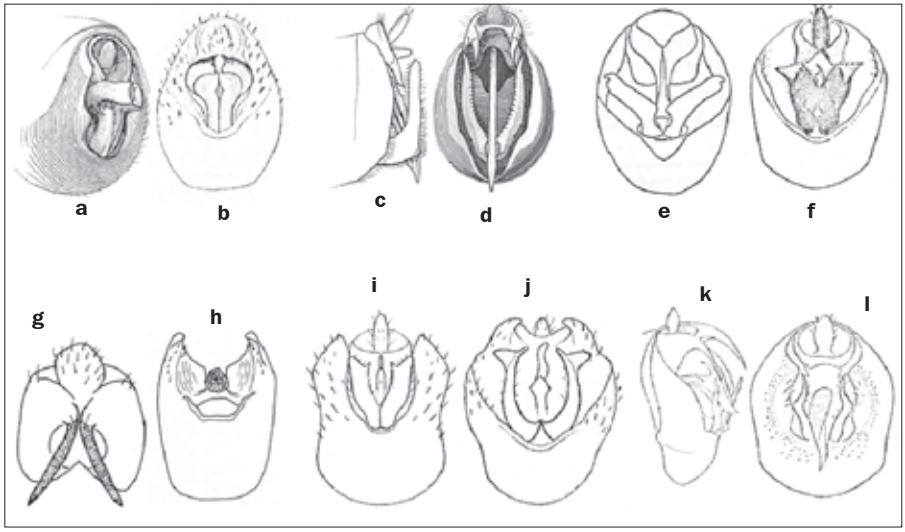

Plate 38. Male genitalia (line drawing): (a,b) *Peregrinus maidis* (Ashmead); (c,d) *Numata muiri* (Kirkaldy); (e) *Metropis nigrifrons* Kusnezov; (f) *Paradelphacodes paludosa* (Flor); (g,h) *Harmalia anacharsis* Fennah; (i) *Harmalia heitensis* (Matsumura); (j) *Harmalia samesimae* (Matsumura & ishihara); (k,l) *Cemus sauteri* (Muir). Sources: Kirkaldy (1907), Ishikara (1949).

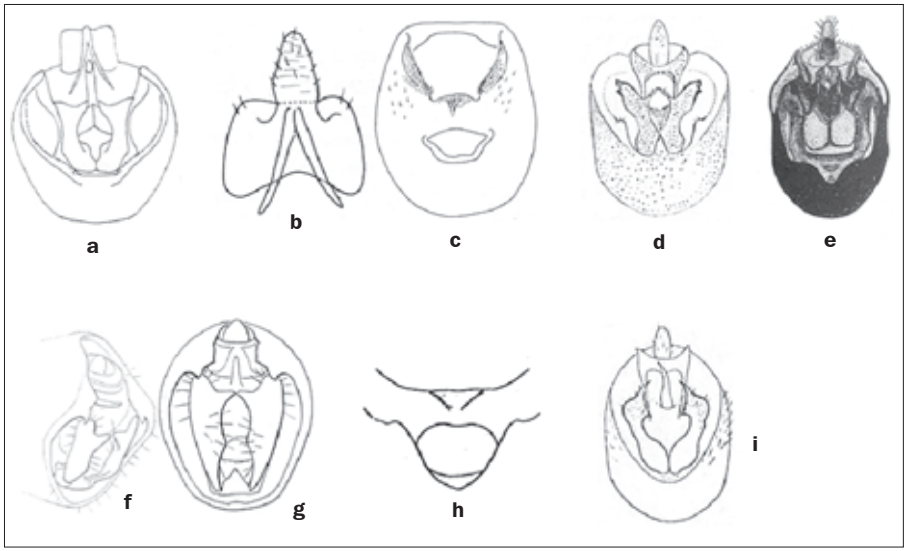

Plate 39. Male genitalia (line drawing): (a) *Opiconsiva dodona* (Fennah); (b,c) *Coronacella sinhalana* (Kirkaldy); (d) *Nilaparvata bakeri* (Muir); (e) *Nilaparvata muiri* China; (f,g) N*ilaparvata albostriata* (Kirkaldy); (h) *Nilaparvata myersi* Muir; (i) *Nilaparvata lugens* (Stål). Sources: Kirkaldy (1907), Mochida and Okada (1979), Wilson and Claridge (1991).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Plate 40. Female genitalia: (a) *Melanugyops* sp.; (b) *Tropidocephala* sp.; (c) *Tarophagus persephone* (Kirkaldy); (d) *Tagosodes pusanus* (Distant); (e) *Perkinsiella pseudomaidis* Muir; (f) *Perkinsiella* nr. *bakeri* Muir; (g) *Perkinsiella saccharicida* Muir; (h) *Peregrinus maidis* (Ashmead); (i) *Euidella* sp.; (j) *Metropis nigrifrons* Kusnezov; (k) *Harmalia heitensis* (Matsumura); (l) *Euidellana celadon* Fennah; (m) *Cemus nigromaculosus* (Muir); (n) *Cemus* sp. A; (o) *Cemus* sp. B; (p) *Laodelphax striatellus* (Fallen).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Biology of planthoppers

A major salient feature in the biology of planthopper species is their ontogenetic development. This is the universal process in planthoppers occurring immediately after bisexual reproduction. It consists of sequential stages—from the immediate product of reproduction (= fertilized egg or zygote), instar nymphs, till the formation of mature dimorphic adults (= fully-winged macropterous and truncate-winged brachypterous forms) of both sexes. Planthoppers exhibit incomplete or hemimetabolous development. The duration of each stage depends on temperature and host cultivars. In the case of *Nilaparvata lugens* (Stål), Nasu and Suenaga (1956) and Mochida (1970) described its embryonic development.

Egg stage

Upon emergence of adult planthoppers, for instance, for the brown planthopper, *N. lugens*, bisexual mating occurs and their oviparous female starts laying eggs from the day following mating. The pre-oviposition period of planthoppers ranges from 3 to 8 days. Brachypterous females have a shorter pre-oviposition period (3 to 4 days) than macropterous females (3 to 10 days) under cool conditions. Brachypters begin to oviposit earlier than macropters. More eggs (60 to 500) are laid as egg-groups by brachypterous females than the macropters. In most cases, the eggs are thrust in a straight line, generally on the lower part of the host plant along the mid-region of the leaf sheath, though sometimes eggs are laid in clusters of 4–10 in longitudinal rows within the leaf midribs. For instance, the female rice delphacid, *Tagasodes orizicolous* (Muir), lays 300 to 500 eggs in batches of 7 in the midribs of rice leaves (Dale 1994). *N. lugens* females lay 100 to 500 eggs depending on the stage of growth of the rice plant (Van Der Laan 1981). In the greenhouse, each female lays about 100 to 200 eggs. The number of eggs laid by female delphacids during their life span ranges between 0 and 1,474. The number of eggs laid is correlated to life span and ovipositional period.

Eggs are covered with a dome-shaped egg plug secreted by the accessory glands of the female. The white eggs of planthoppers are similar in shape (oblong or longitudinally ovate and slightly curved) and size (0.1 mm) but may vary in egg plug, wherein the whitebacked planthopper, *Sogatella furcifera* Horvath, has a longer and more pointed egg plug than *N. lugens*. Only the tips or minute operculum of eggs protrude from the plant surface. The number of eggs laid at a site varies in different countries. For instance, *S. furcifera* laid 164 eggs in India (Vaidya and Kalode 1981) and 300 to 350 in Japan (Suenaga 1963). The egg of *N. lugens* consists of the chorion, vittelline membrane, protoplasm, nucleus, yolk, and mycetocyte. Because of its shape, the mycetocyte is set apart from the other egg contents. Meanwhile, steps involved in embryo formation start to proceed after maturation, fertilization, and cleavage. This happens at the posterior pole of the egg on the first and second day after oviposition. A pit or depression appears on the posterior pole at 28 to 32 hours after oviposition and then develops into a deep slender tube. The mycetocyte remains situated on top of the vagination as invagination progresses. The process continues in such a way that the ventral surface of invagination faces the egg's dorsal side. On the other hand, the

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

posterior portion is in the direction of the egg's anterior pole. By the second day, the invagination develops; the movement of the mycetocyte is toward the anterior pole. The third day allows observers to distinguish the head, thoracic, and abdominal parts, and, by the fourth and early fifth day, the invagination's top and tail are bent. At the same time, the mycetocyte movement is along the egg's ventral side—specifically the posterior pole. With the original position of the embryo reversed, the mycetocyte goes back to its original position. At this point, blastokinesis is said to be complete (Mochida and Okada 1979). Prior to hatching, red eye spots appear at the end of the eggs. In about 4 to 15 days, the eggs of planthoppers hatch. The egg stage of *N. lugens* is about 7 to 11 days in the tropics.

The hatchability and survival of planthopper eggs occur at around 25 °C. Eggs are very sensitive to dessication and soon shrivel when the host plant starts wilting (Kisimoto 1977). The embryonic and postembryonic developments of planthoppers occur at 10.8 and 9.0 °C, respectively.

The eggs in diapause were defined as those still alive after 24 hours at −4 °C. Diapause in the egg stage was reported to occur in planthoppers. Female planthoppers were induced to deposit diapausing eggs under low temperature coupled with short photoperiod in rice plants at the ripening stage (Miyake and Fujiwara 1962, Okamura 1963, Sugimoto 1967). Nasu (1967) studied the eggs in diapause in seven delphacids. In diapause eggs, embryonic development stopped just before the blastokinesis stage. Embryonic development ensued when eggs were kept at 25 °C within several days and the eggs hatched. These phenomena were not observed in the eggs of *N. lugens*.

Nymphal stage

After embryonic development, the eggs of planthoppers hatch into first-instar nymphs after being laid. The shell is normally burst open by the muscular activity of the nymph, which may swallow air or amniotic fluid, and thus increase its volume as the pressure exerts. Planthoppers have five-instar nymphs that actively feed on the host plant's phloem sap to become adults. In the case of *S. furcifera*, the nymphs prefer weeds for feeding. Usually, the newly-hatched first-instar nymph is cottony white and turns purple-brown within an hour in *N. lugens*, whereas, in *S. furcifera*, from white, it is transformed into strongly mottled dark gray or black and white in color.

In the case of *N. lugens*, the five nymphal stadia are distinguished by shapes of the mesonotum, and body size. Both embryonic and postembryonic development are influenced considerably by temperature. The nymphal period of planthoppers varies widely depending on food conditions, density during development, and other environmental factors. For example, *N. lugens* in the tropics takes about 10 to 18 days from the hatching of the first-instar nymph till adult stage, while *S. furcifera* takes 12 to 17 days. On seedlings of susceptible high-yielding cultivar Pelita 1-1, the periods of planthopper development are as follows: egg (8–9 days), nymphs (13–15 days), macropterous males (8–9 days), and macropterous females (11–12 days). In *N. lugens*, the nymphal period is shorter for the brachypterous form than for the macropterous form in both sexes and, even at high densities, the nymphal period of the brachypter-

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

ous insect is fairly constant, whereas that of the macropterous insect is lengthened by greater density (Kisimoto 1957).

The temperature conditions in the nymphal stage affect the longevity and oviposition of adult hoppers (Mochida 1964). At a temperature of 25 °C, the nymphal period of *L. striatellus* is about 2 weeks. In the case of *N. lugens*, the minimum growth of nymphs is at a temperature range of 28 to 30 °C in the daytime and at a slightly lower temperature at night. In warm humid climates, planthoppers remain active throughout the year and their population fluctuates according to the availability of host plants, activity of natural enemies, and other prevailing environmental factors. When fifth-instar female nymphs are irradiated at 15 to 20 Krad Cobalt 60, egg formation is interrupted (Mochida 1973).

Adult stage

The nymphs stay on the lower parts of host plants and the emergence of adults takes place at the basal part of the host plant. However, when the population is very high, for instance in Java with 500 hoppers per hill, adults were observed to swarm even on flag leaves, the uppermost internodes of panicles, and panicle axes. The dimorphic adults with two wing forms may have either the male longer (3.5 mm) than the female (2.0 mm) as in *L. striatellus* or vice versa as in *N. lugens*, wherein the male is shorter (4.5 mm) than the female (5.0 mm).

Female planthoppers initiate copulation by producing abdominal vibrations from a distance of 80 cm. Male *N. lugens* can mate with a maximum of nine females for 24 hours and an individual female can copulate more then twice during its lifetime (Mochida and Okada 1979).

The total life cycle of planthoppers is about 9 to 26 days or 3 to 4 weeks and a new generation may appear monthly. In Java, four to five generations of hoppers may develop in one rice crop. Mochida et al (1977) reported that *N. lugens* may have two to eight generations during one rice cropping season in tropical lowlands. In fact, *N. lugens* has five generations on a single rice crop in southern Japan (Mochida 1964), five or six generations in the central part of China (Lei and Wang 1958), and four or five generations in Java (Mochida et al 1977). *L. striatellus* has six to seven generations in a year and, in Japan, it hibernates as last-instar nymphs in winter wheat. The emerging adults then move into transplanted rice in late May and early June (Dale 1994).

Adult planthoppers live for 18 to 20 days, while a generation takes 3 to 4 weeks. The adult longevity of *N. lugens* differs considerably between laboratory and field conditions, the maximum values being 36.6 and 9.0 days, respectively. (For a more detailed discussion on the biology and ecology of planthoppers, please refer to Denno and Perfect [1994].)

The delphacid planthopper food web

Of the delphacid planthoppers dwelling in rice agroecosystems, the brown planthopper, *Nilaparvata lugens* (Stål) (Hemiptera: Delphacidae), is the first to have its food web

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

constructed (IRRI 1980, Barrion et al 1981). The BPH food web is simple and has only 76 taxa represented by 11 parasitoids, 11 secondary natural enemies, and the rest are predators dominated by 50 species of spiders (65.8% of total taxa in the web). In 1981, Yasumatsu et al (1981) reported the food chain relationship between planthoppers and leafhoppers of rice and their natural enemies in Thailand. The web reported 12 species of parasitic Hymenoptera attacking the egg stage, namely, *Paracentrobia* (two species) and *Oligosita* (three species) in the family Trichogrammatidae; *Anagrus* (three species), *Gonatocerus, Mymar, Gonatocerus,* and *Polynema* in family Mymaridae; and *Tetrastichus formosanus* Timberlake in family Eulophidae. At the nymphal stage, the dryinids (*Haplogonatopus orientalis, Pseudogonatopus hospes,* and *Echthrodelphax fairchildii*), a strepsipteran (*Elenchus yasumatsui*), and an unidentified nematode are listed. Although three big-headed flies—*Tomosvaryella oryzaetora*, *T. subvirescens,* and *Pipunculus mutillatus*—are included in the food chain, these flies are specific to green leafhoppers, *Nephotettix* and *Balclutha*. Within the same web are the predators represented by more than 20 species of insects and series of unidentified taxa of invertebrates (ants, damselflies, and spiders) and vertebrates (fishes, birds, and bats). It is surprising that toads and frogs are excluded in the planthopper and leafhopper food chain in Thailand.

In 1988, the International Rice Research Institute (IRRI) reported the second planthopper food web representing *Sogatella* spp. (*S. furcifera, S. vibix,* and *Tagosodes pusanus*). The whitebacked planthopper (WBPH) food web has 199 species consisting of 139 predators and 33 parasitoids. Of total predators, spiders once again are the major players and most abundant, accounting for as much as 70% (63 species) of total taxa. We presume that spiders must have played a major regulatory function against planthoppers. Overall, the key predators in the WBPH food web are similar to those of the brown planthopper.

The present version of the delphacid planthopper food web (Fig. 6) is an expanded model of the intricate relationships of the invertebrates (insects, mites, and spiders), vertebrates, nematodes, and pathogens in the rice agroecosystems in tropical Asia. It consists of 244 species, with 89.34% (218 species) invertebrates, 6.97% (17 species) vertebrates, 2.46% (6 species) pathogens, and 1.23% (3 species) nematodes (Table 2). This excludes the 48 taxa of hyperparasites/hyperpredators and the spiders that may behave as hyperpredators as well.

Egg parasitoids of delphacid planthoppers

Members of the superfamily Chalcidoidea are among the parasitic Hymenoptera that play an important role in regulating planthopper populations in the agricultural landscape of rice agroecosystems. These are often called “little murderers” as their parasitic action disables planthopper eggs from developing ahead and becoming adults. Members of the group are basically parasitoids and parasitic in their pre-imaginal stages and free-living as adults. Similar to leafhoppers (Freytag 1983), planthoppers are heavily regulated by egg parasitoids.

About 56 species of parasitic Hymenoptera use the eggs of some 23 species of planthoppers in tropical Asia (Table 3). The egg parasitoids belong to four chalcidoid

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

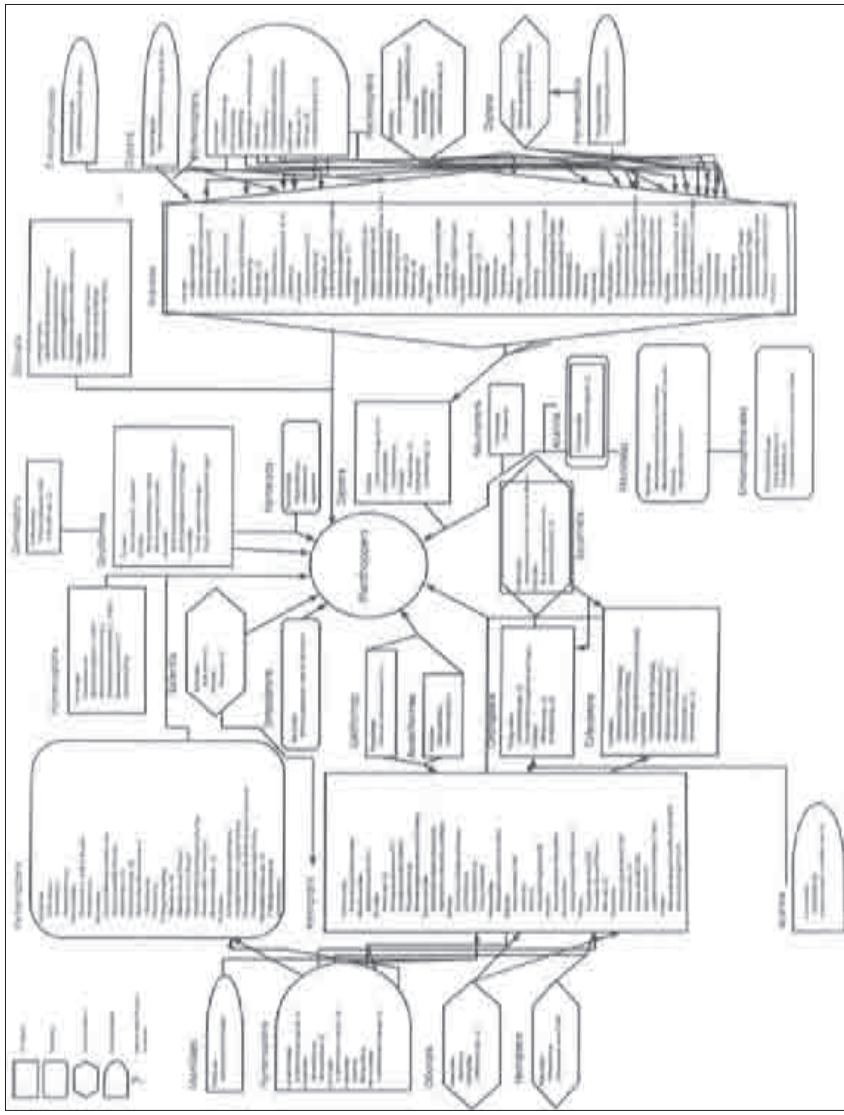

Fig. 6. Food web of planthoppers in the rice agroecosystems of tropical Asia.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Table 2. Summary of natural enemies of delphacid planthoppers in tropical Asia.

Group	No. of species	Composition (%)
Invertebrates	(218)	(89.34)
Parasitic Hymenoptera	66	27.04
Strepsiptera	1	0.41
Acarina	1	0.41
Predators	150	61.48
Araneae	72	29.51
Hemiptera	34	13.93
Coleoptera	11	4.51
Orthoptera	9	3.69
Odonata	7	2.87
Diptera	7	2.87
Hymenoptera	6	2.46
Dermaptera	3	1.23
Neuroptera	1	0.41
Vertebrates	17	(6.97)
Gruiformes	7	2.87
Salientia	3	1.23
Squamata	3	1.23
Anseriformes	2	0.82
Galliformes	2	0.82
Nematodes	3	(1.23)
Nematoda	3	1.23
Pathogens	6	(2.46)
Entomophthorales	3	1.23
Moniliales	2	0.82
Stilbaceae	1	0.41
Total	244	100

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Table 3. Summary of the parasitic Hymenoptera egg parasitoids of delphacid planthoppers and their host range.

Parasitoids	Species (no.)	Composition (%)	Delphacid hosts
Family Mymaridae			
Anagrus	17	30.4	*L. striatellus, Toya* sp., *Delphacodes* sp., *U. sapporonus, Dicranotropis nagaragawana, Stenocranus* sp., *N. lugens, N. bakeri, Stenocranus minutus, Delphacidae, Sogatella vibix, P. maidis, Hirozunka japonica, Tagosodes pusanus, Perkinsiella saccharicida* *Tarophagus proserpina, Sogatella furcifera, T. propinqua* *Pundaluoya simplicia, Harmalia sameshimai*
Gonatocerus	6	10.7	*N. lugens, U. sapporonus, T. pusanus, N. bakeri* *Sogatella vibix, ?Perkinsiella/?Peregrinus, Toya* sp., *Sogatella furcifera*
Mymar	3	5.4	*N. lugens, T. pusanus, Sogatella furcifera*
Acmopolynema	2	3.6	*T. pusanus, Toya propinqua*
Anaphes	1	1.79	*N. lugens*
Camptoptera	1	1.79	*Tarophagus colocasiae*
Eomymar	1	1.79	Undet. Delphacidae
?Ooctonus	1	1.79	*N. lugens, Sogatella furcifera*
Polynema	1	1.79	*N. lugens,* Undet. Delphacidae
Family Trichogrammatidae			
Oligosita	11	19.6	*N. lugens, T. pusanus,* planthopper, *N. bakeri* *S. furcifera, Toya* spp. *(2), U. sapporonus, S. vibix, Tarophagus colocasiae*
Paracentrobia	4	7.14	*N. lugens, N. bakeri, Toya* spp. (2), planthopper *H. sameshimai, S. furcifera, S. vibix, T. pusanus*
Aphelinoidea	1	1.79	*N. lugens*
Trichogramma	1	1.79	*N. lugens*
Family Eulophidae			
Ootetrastichus	2	3.6	*N. lugens*
Eotetrastichus	1	1.79	*N. lugens, S. furcifera, T. pusanus*
Tetrastichus	1	1.79	Undet. Delphacidae
Family Pteromalidae			
Panstenon	2	3.6	*N. lugens, N. bakeri, Toya* spp. (2), *S. vibix, U. sapporonus*

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

families—Mymaridae (33 species and 9 genera), Trichogrammatidae (17 species and 4 genera), Eulophidae (4 species and 3 genera) and Pteromalidae (2 species and 1 genus). Among the mymarids, the most dominant egg parasitoids are in two genera—Anagrus (17 species) and Gonatocerus (6 species). Other members of the family Mymaridae reported on eggs—*Acmopolynema*, *Anaphes*, *Camptoptera*, *Eomymar*, *Mymar*, *Ooctonus*, and *Polynema* played a small role in natural control of planthoppers based on their records of occurrence on reared egg masses. Equally important are the tiny wasps in the family Trichogrammatidae best represented by two genera—Oligosita (11 species) and Paracentrobia (four species). Occasionally reared from the eggs are the eulophids and pteromalids with four and two species, respectively. However, the latter group is considered an egg predator rather than egg parasitoid. An example is *Panstenon* sp. (Hymenoptera: Pteromalidae), reported by Claridge (1987) as an egg predator.

We conclude that the four genera of chalcidoids—*Anagrus* and *Gonatocerus* (family Mymaridae) and *Oligosita* and *Paracentrobi*a (family Trichogrammatidae)—are the key egg parasitoids that inflict heavy pressure on planthoppers. Egg parasitization, however, may vary from 12% to 100% depending on the environmental quality and perturbations (Otake 1977, Chandra 1978, Miura et al 1979, Vungsilabutr 1981, Kim et al 1982, Claridge 1987).

Nymphal-adult parasitoids/parasites of delphacid planthoppers

Table 4 documents the parasitoids and parasites attacking the nymphs and adults of planthoppers in rice agroecosystems. There are 21 species of natural enemies at the nymphal-adult stage of planthoppers. In terms of species richness, the order of preponderance of these natural enemies is as follows—Drynidae (10 species) > pathogens (6 species) > nematodes (3 species) > mite and strepsiptera (2 species). The dryinids are perhaps the most interesting among the parasitoids of nymphs and adults because of their dual type of behavior, namely, as a parasitoid and as a predator. In both cases, the dryinids incapacitate or kill the host. Planthoppers parasitized by dryinids show an enlarged encapsulation called “thylacium” attached to the body of the host. This structure contains the larva of the dryinid. The color (varying from black to reddish brown or brown) and skin design (smooth and shiny or netted) of the thylacium can be used to identify the species at the generic level. It (thylacium) bursts and opens when the larva is ready to pupate. Pupae wrapped by light brown or whitish silken threads are commonly seen attached on or glued to the rice or grass foliage. Dryinids have two forms—wingless with chelate leg I and winged. The winged form (except for *Echthrodelphax*) is often identified as a braconid wasp belonging to the genus *Cotesia*. But the number of antennal segments (only about 10) and the distinctly long segments are unique among winged dryinids, and these features isolate them from braconids.

In rice agroecosystems, the most common species of dryinids belong to the four genera, namely, *Pseudogonatopus* (five species), *Haplogonatopus* (three species), and one each for *Echthrodelphax* and *Gonatopus*. Olmi (1984) provided a solid understanding of the taxonomy of family Dryinidae at the world level.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

Table 4. Checklist of parasitoids and parasites attacking the nymphal-adult stages of planthoppers.

Parasitoid/parasite	Delphacidae hosts
Hymenoptera: Dryinidae	
Echthrodelphax fairchildii Perkins	*N. lugens, S. furcifera, L. striatellus, P. saccharicida*
Haplogonatopus apicalis Perkins	*N. lugens, L. striatellus, S. furcifera, T. pusanus*
Gonatopus yasumatsui Olmi	*N. lugens*
Haplogonatopus oratorius (Westwood)	*L. striatellus*
Haplogonatopus atratus Esaki & Hashimoto	*L. striatellus*
Pseudogonatopus sarawaki Moczar	*N. lugens, Sogatella* sp.
Pseudogonatopus nudus Perkins	*N. lugens, S. furcifera*
Pseudogonatopus fulgori (Nakagawa)	*S. furcifera, L. striatellus*
Pseudogonatopus flavifemur Esaki & Hashimoto	*N. lugens, S. furcifera, S. vibix, T. pusanus*
Pseudogonatopus hospes Perkins	*N. lugens, S. furcifera*
Strepsiptera: Elenchidae	
Elenchus japonicus Esaki & Hashimoto	*Harmalia* sp., *N. lugens, S. furcifera, S. vibix, L. striatellus*
Acarina: Erythraeidae	
Charletonia sp.	*N. lugens, S. furcifera, L. striatellus*
Nematoda: Mermithidae	
Agamermis sp.	*N. lugens*
Amphimermis sp.	*N. lugens*
Hexamermis sp.	*N. lugens*
Moniliales: Moniliaceae	
Beauveria bassiana (Balsamo) Vuillemin	*N. lugens*
Metarhizium anisopliae (Metchnikoff) Sorokin	*N. lugens, S. furcifera, T. pusanus*
Moniliales: Stilbaceae	
Hirsutella strigosa Petch	*N. lugens, S. vibix, S. furcifera, T. pusanus*
Entomophthorales: Entomophthoraceae	
Erynia delphacis Hori	*L. striatellus, N. lugens*
Conidiobolus sp.	*N. lugens*
Conidiobolus coronatus (Constantin) Batko	*N. lugens*

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

The biological control potential of the four genera *Echthrodelphax, Gonatopus*, *Haplogonatopus,* and *Pseudogonatopus* has been well recognized in China (HAAI 1978), Taiwan (Chiu 1979), Japan (Esaki 1932, Une et al 1989), Thailand (Yasumatsu et al 1981), Malaysia (Pagden 1934, Van Vreden and Ahmadzabidi 1986), and the Philippines (Chandra 1980, Chua and Dyck 1982). The potential for biocontrol of *Pseudogonatopus flavifemur* Esaki & Hashimoto against the brown planthopper was assessed only at the International Rice Research Institute in 1982. It was reported that *P. flavifemur* is a strong biocontrol agent because of the following attributes: (1) voracious feeder that can kill 38.8 brown planthoppers in a day, (2) strong preference for *N. lugens* compared with *Sogatella furcifera* (Horvath) and *Nephotettix* spp., (3) demonstrated a sigmoid functional response curve and positive aggregative behavior, (4) reduced *N. lugens* populations in the field and damage of planthopper to plants, and (5) short handling time and ease for mass rearing.

Pathogens and nematodes represent the other mortality factor for planthoppers. Their occurrence on planthoppers is relatively uncommon but they may at times impact the population of planthoppers if environmental conditions are conducive to their growth. Occasionally, *Metarhizium, Hirsutella,* and *Beauveria* are observed on the brown, whitebacked, and maize planthoppers while *Entomophthora* is on the taro planthopper. Overall in the tropics, the contribution of pathogens and nematodes to the control of planthoppers remains low, similar to the strepsipterans. Enhancing the effectiveness of these nymphal-adult parasitoids/parasites in mitigating planthopper populations in the agricultural landscape is a gray area for research.

Predators of planthoppers

Planthoppers in rice agroecosystems have an estimated total of 167 species of predators distributed into nine orders of invertebrates and five orders of vertebrates (Table 2). In terms of species richness, the top two invertebrate predators of planthoppers are in order Araneae (spiders) and order Hemiptera (true bugs), represented by 72 and 34 species, respectively. The rest belong to the third group with about 1–11 species. These are Coleoptera (11 species), Orthoptera (9), Odonata (7), Diptera (7), Hymenoptera (6), Dermaptera (3), and Neuroptera (1).

Among the predatory spiders, the family Lycosidae is the most known, being commonly abundant in rice agroecosystems and unique not only because it is species rich in having 15 species represented by at least five genera—*Arctosa, Hippasa, Pardosa, Pirata,* and *Trochosa*—but also because of its strong predatory attributes. These attributes are (1) excellent hunting behavior brought about by the 3-row eye arrangement with powerful vision exerted by the large posterior eyes—the posterior median (PME) and posterior lateral (PLE) eyes; (2) voracious and gregarious predator; (3) at home in both dryland and wetland environments; and (4) highly competitive. In tropical Asia, the most widespread species of wolf spiders (family Lycosidae) are *Pardosa pseudoannulata* (Boesenberg and Strand) and several species of *Pirata*. Both the biology and ecology of these taxa are well studied. Irregardless of crop age, lycosids are present in rice ecosystems where planthoppers may be present. However,

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

these spiders are highly visible during the vegetative to maximum tillering stages of the rice plant. Being semiaquatic, these lycosids can live under water submerged for quite some time if endangered. For the young nymphs of planthoppers, the predatory specialists belong to four families: Linyphiidae (*Atypena*, *Erigone*, *Gnathonarium*, *Ummeliata*, *Erigonidium*), Theridiidae (*Enoplognatha*, *Theridion*, and *Coleosoma*), Theridiosomatidae (*Theridiosoma* and *Wendilgardia*), and Tetragnathidae (*Tetragnatha* and *Dyschiriognatha*). Migrating populations of planthoppers do not escape predatory spiders. To a certain extent, a number of migrant populations get entangled in the network of spider webs nicely laid on the plant canopy in the early morning or late in the day when the weather is good. Those caught by these specialists belonging to the family Araneidae (*Araneus*, *Neoscona*, and *Argiope*) and Tetragnathidae (*Tetragnatha*, *Leucauge*, and *Taylorida*) succumb to death in the web, others are wrapped, while others are devoured by the spiders.

In the vertebrates, the order of preponderance is Gruiformes (seven species) > Salientia and Squamata (three each) > Anseriformes and Galliformes (two each).

In the true bugs, the spiders are perhaps best equaled in their capacity to control planthopper populations by the aquatic and semiaquatic bugs belonging to the families Gerridae, Veliidae, Mesoveliidae, Pleidae, Hydrometridae, and Miridae. However, except for the mirid bug, *Cyrtorhinus lividipennis* Reuter, and the veliid bug, *Microvelia douglasi atrolineata* Bergroth, and the spiders, *Pardosa pseudoannulata* (Boesenberg and Strand) and *Pirata* spp., little is known about their biology, their interactions with other players in the agroecosystems, the role of competition within and among predators, and the impact of the wide taxonomic array of predators on planthopper control.

Among the invertebrate predatory groups, the other notable species that prey on planthoppers are the larvae and adults of coccinellid beetles—*Micraspis*, *Harmonia*, and *Coccinella* (Coccinellidae), *Ophionea* (Carabidae), and *Paederus* (Staphylinidae) in order Coleoptera; *Conocephalus* (Tettigoniidae), *Metioche*, and *Anaxipha* (Gryllidae) in Orthoptera; *Agriocnemis*, *Ischnura*, and *Pseudagrion* (Coenagrionidae), and *Diplacodes*, *Crocothemis*, and *Pantala* (Libellulidae) in Odonata; *Ochthera* (Ephydridae) and *Drapetis/Elaphropeza* (Empididae) in Diptera; *Solenopsis* and *Monomorium* (Formicidae) in Hymenoptera; *Proreus* and *Euborellia* (Chelisochidae) in Dermaptera; and *Chrysopa* (Chrysopidae) in Neuroptera. Their collective effort in predation on planthoppers in the natural environment may have been undocumented but long hours of field observation on the natural history of these predators provided the proof of their important role in agroecosystems. Hence, we conclude that the combined network of predation by this broad array of predators thriving sympatrically in rice agroecosystems provides heavy pressure on the nymph and adult populations of planthoppers. These invertebrates are like well-oiled machines in terms of predation and they use the agroecosystem as a niche to effectively hunt their prey.

In general, delphacid planthoppers at various growth stages—instar I to adult—are good food supplements that comprise the nutritional diet requirements of predators. However, in terms of host (delphacid planthoppers)-natural enemy associations, most

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

records (>93%) are biased to a few taxa of delphacids, namely, *Nilaparvata lugens*, *Laodelphax striatellus*, and *Sogatella furcifera*.

Key to the parasitic Hymenoptera egg parasitoids (only for Trichogrammatidae and Mymaridae)

Plate 41a-e

1 Tarsi 3-segmented (Family Trichogrammatidae).....2
1' Tarsi 4-5 segmented (Family Mymaridae).....11

2 Antennal funicle with 2 ring-like segments and 2 longer segments; discal ciliation on forewings varies from sparse but arranged rows of cilia to a dense mat with short and randomly distributed cilia; marginal fringe of forewings short, distinctly less than half wing width 3
2' Antennal funicle of female with 2-segmented funicle (ring + funicle only); discal ciliation sparse but usually in rows; marginal fringe of forewings at least one-half width of the wings at its broadest point.....4

3 Forewing with a narrow smoky or brownish tinge across wing beneath stigma vein; scape as long as combined length of pedicel and funicle; gaster pale yellow with tergites laterodorsally dark brown ..... *Paracentrobia yasumatsui* Subba Rao
3' Forewing with a rounded brown mark beneath stigma vein; scape a little longer than combined length of pedicel and funicle; abdominal tergites I-IV uniformly brown .....*Paracentrobia andoi* Ishii

4 Marginal fringe of forewings one-third to one-half the maximum width of wings.....5
4' Marginal fringe of forewings slightly shorter or longer than maximum width of wings.....6

5 Discal cilia long and coarse; marginal fringe of forewing about half maximum width of wings and always greater than one-third; pedicel 3x as long as funicle segment, the latter prominently wider than long; scape broadened basally, funicle and basal two clubs bisected medially by a transverse row of long setae; light yellowish brown .....*Oligosita brevicilia* Girault
5' Discal cilia short, fine, and very sparse, at least 10 rows visible; marginal fringe barely one-third maximum width; pedicel about half of scape; stigma vein knoblike with subtruncate apex; orange-bodied species with light yellow-brown legs.....*Oligosita consanguinea* Girault

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

6 Pedicel as long as the short and clavate scape; funicular segment longer than broad; forewings with distinct and large substigmal cloud; yellow except for fuscous tips of coxae and midfemora, and dark brown basal half of abdomen ..... *Oligosita manii* Viggiani
6' Pedicel usually much shorter than scape 7

7 Pedicel almost as long as the narrow funicle; club as long as the combined length of pedicel, ring, and funicle segments; cilia on discal area very few and scarce, a single complete row lining the apical end of wing and 10 more cilia irregularly scattered at the distal end ..... *Oligosita shibuyae* Ishii
7' Pedicel at least twice as long as funicle 8

8 Marginal fringe of forewing as long as or longer than maximum width of wings; discal cilia moderately sparse 9
8' Marginal fringe of forewing more than 0.7 maximum width of wing 10

9 Marginal fringe of forewing distinctly longer than maximum wing width; pedicel more than twice the length of funicle, the latter slightly wider than pedicel; sheath of ovipositor not exserted ..... *Oligosita naias* Girault
9' Marginal fringe and maximum width of forewing equally long; funicle half the length of pedicel; sheath of ovipositor distinctly exserted ..... *Oligosita yasumatsui* Viggiani & Subba Rao
10 Marginal fringe of forewing only slightly shorter than maximum wing width; discal ciliation rather thick opposite subtriangular stigma vein, moderately scattered toward distal end; pedicel more than 2x longer than funicle ..... *Oligosita aesopi* Girault
10' Marginal fringe almost as in *O. aesopi*; funicle subglobular and less than half of pedicel; discal ciliation more evenly scattered toward distal end, without dense ciliation opposite the knoblike stigmal vein. *Oligosita nephotettica* Mani

11 Gaster with more or less distinct petiole, convexly rounded or subglobular basally; mesopostphragma not projecting into the gaster; tarsi 4-5 segmented 12
11' Gaster broadly connected to propodeum; mesopostphragma plainly projecting into gaster; a pair of distinctly separated plates behind scutellum; antennae 9-segmented in females, 13-segmented in males; tarsi 4-segmented (*Anagrus*) 22

12 Tarsi 5-segmented 13
12' Tarsi 4-segmented 20

13 Petiole long and slender; propodeum prominently carinated; antenna 11-segmented with 8 funicular segments and undivided club ..... *Ooctonus* sp.

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

13' Petiole short, wider than long; antennae of male 13-segmented and female 11-segmented, with 8 funicular segments; marginal vein not elongated, venation not reaching basal one-third of wing; gaster subsessile (*Gonatocerus* spp.) ... 14

14 Anal plate with 4 long hairs ... 15
14' Anal plate with more than 4 long hairs ... 17

15 Apical 4 funicular segments as long as or slightly shorter than the basal 4, 4th to 6th segment equally long and cylindrical, without sensory ridge; segments VII and VIII with a pair of sensory ridges each; median mesoscutum with a subglobular brown band in apical half; forewing 4.5x as long as wide; anal plate large, tapers apically and pygostyle indented sub-basally inside ... *Gonatocerus uttardecanus* Mani & Saraswat
15' Apical 4 funicular segments distinctly longer than basal 4 ... 16

16 Funicular segments V-VIII cylindrical to subcylindrical and longer than 4 basal segments, equally long with a pair each of sensory ridges; entire median area of mesoscutum occupied by a brown band except lateral margin near parapsidal furrow; forewing 3x longer than wide; anal plate short hairs in 2 rows, apex of plate pointed; pygostyle without indention; postphragma very flat ... *Gonatocerus narayani* (Subba Rao & Kaur)
16' Funicular segments V-VIII globular, each with sensory ridges except segment VI, and segment VIII with a cavity; mesoscutum moderately produced and rounded apicomedially with a brown band above tip of parapsidal furrow; forewing rather concave along anterior margin, about 4x as long as wide; marginal vein 7.4x as long as wide; proximal sensillium midway of distal sensilla and distal macrochaeta; 4 anal plate hairs in a transverse row in apical one-third and with cleft apex ... *Gonatocerus devitatacus* Mani & Saraswat

17 Anal plate triangular with 7 long hairs, mostly along margins; apicomedian band of mesoscutum reaching only the anterior pair of setae; forewing slightly constricted near stigma vein, nearly 4x as long as wide; marginal vein 14x as long as wide; stigma vein bears 3 distal sensilla; pedicel as long as funicular segment III, F6 = F7; club nearly as long as radicula and scape; abdomen light yellow except blackish brown tergites V and VI ... *Gonatocerus munarus* Mani & Saraswat
17' Anal plate subovoid to ovoid; funicular segments of various lengths ... 18

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

18 Anal plate ovoid with 5 hairs in 3 transverse rows; basal funicular segment of antennae shortest in both sexes, 0.7 as long as 2nd, 2nd and 3rd subequal, 4th to 8th equally long, a pair of sensory ridges only in segments V to VIII in female, all segments in male except scape and pedicel; lateral side of mesoscutum behind parapsidal furrow entirely yellowish brown to brown; forewing 4x as long as wide; proximal sensillium just below distal macrosetae; ovipositor highly exserted ..... *Gonatocerus cicadellae* Nikolskaya

18' Anal plate subovoid; basal 3 funicular segments equally long 19

19 Anal plate bluntly conical with 5 long hairs in 2 transverse rows medially; female antennae with 4th and 6th funicular segments globular and equal in length, 6th the shortest, paired sensory ridges in segments V, VII, and VIII; shortest funicular segment 1 (F1) as long as scape, club = F3 = F4 = F8 = F10 in male; discal hairs a little beyond base of marginal vein in origin; abdomen with alternating yellow and brown transverse bands ..... *Gonatocerus cincticipitis* Sahad

19' Anal plate narrowly conical with a subacute apex; female funicular segments IV, V, and VI globular and equally long, paired sensory ridges only in VII and VIII segments; funicular segment X (F10) as long as club, and longer than F6 to F8 in male; discal hairs emanate from base of marginal vein and form a prominent oblique line to posterior margin; abdomen with 4 brown interrupted transverse bands ..... *Gonatocerus miurai* Sahad

20 Hindwings abbreviated, filiform, and highly reduced, poorly developed into a whiplike process without the wing blade; forewing oarshaped, distal half of broad part dark brown with 1 clear row of setae traversing middle from shaded to light area and 2–3 short rows of setae dorsad shaded portion; marginal fringe 4x maximum wing width; scape medially thin, enlarged on both ends, funicle II longest and segment III to VI short and together with undivided club longer than F2 ..... *Mymar taprobanicum* Ward

20' Without the combination of above characters 21

21 Scape without scalelike structures; marginal vein thickened; prothoracic spiracle in normal position ..... *Polynena* sp.

21' Scape with scalelike markings, pedicel broad, funicles I-III long and in decreasing length, and in increasing diameter toward club; marginal vein thin; prothoracic spiracles positioned toward midbody, on the line between pronotum and mesoscutum ..... *Stephanodes imbricatus* (Narayanan & Subba Rao)

22 Funicular segment I long, usually 2x as long as wide; scape smooth without transverse ridges 23

22' Funicular segment I very short, subglobular; scape transversely carinated 24

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

23 Funicular segment I slender and longer than pedicel; antennae long and narrow; ovipositor hardly exserted, ratio of ovipositor and exserted part 20:1; disc of forewing narrow, nearly parallel-sided, with 1 row in basal two-thirds and 2 rows in apical one-third .....*Anagrus optabilis* (Perkins)
23' Funicular segment I shorter or as long as pedicel.....24

24 First funicular segment as long as pedicel; ovipositor highly exserted; apical 2 segments of tarsi III as long as the exserted part of ovipositor; disc of forewing with slightly dilated apical third, ciliation in an irregular row toward basal half and in 2–3 irregular rows in apical third.....*Anagrus perforator* Perkins
24' First funicular segment distinctly shorter than pedicel; ovipositor just moderately exserted, length of exserted part as long as apical segment of tarsus III; ratio of ovipositor and exserted part 5.4:1; proximal two-thirds of forewing parallel after marginal vein, distal one-third gradually expanded and curved with long marginal cilia, a long midlongitudinal line of discal hairs from discal end of marginal vein to wing apex present, accompanied by another irregular short line of 6–8 hairs dorsad of long line .....*Anagrus panicicolae* Sahad

25 Distal end of forewing disc dilated.....26
25' Distal end of forewing disc not dilated; second funicular (F2) segment longest.....28

26 Marginal vein with 2 long setae; forewing with 3–4 rows of discal hairs with distinct small bare space at widest part; F1 very small and subglobular, F2 longer than F3 and the longest; gaster conical; ovipositor moderately exserted..... *Anagrus flaveolus* Waterhouse
26' Marginal vein with only 1 long seta.....27

27 Forewing with 8–9 irregular rows of discal hairs and without bare or hyaline space at its widest part; 3rd funicle segment with only 1 sensory ridge; ovipositor moderately exserted, ratio of ovipositor and its exserted part 9.2:1 .....*Anagrus incarnatus* Haliday
27' Forewing with 2 regular rows (rarely 3) of discal hairs and with hyaline space in its widest part; ciliation moderately more toward proximal end; ovipositor clearly exserted beyond tip of abdomen; club with a single sensorium ..... *Anagrus* sp. A

28 Funicular segment II longest; segment IV to VI subequal in length and diameter; discal ciliation 2 lines, forms a long clear hyaline area distally; marginal fringe almost 3x the maximum width of wing; ovipositor short to slightly exserted .....*Anagrus frequens* Perkins
28' Funicular segment II as long as segment IV; may or may not be as long as segment VI; ovipositor short to long.....29

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

29 Ovipositor long, prominently exserted beyond tip of abdomen; ovipositor length a little over twice the length of apical segment of ovipositor sheath; 2nd funicular segment as long as 4th but shorter and much more slender than the broad 6th segment; 1 row of discal ciliation visible along the clear area ..... *Anagrus* sp. B

29' Ovipositor short, slightly exserted beyond abdomen; funicular segment II, IV, and VI subequal in length; distal end of forewing with a hyaline area; marginal fringe a little longer than the maximum wing width ..... *Anagrus armatus* (Ashmead)

Key to the Dryinids in rice agroecosystems

Plate 42a-f

1 Both sexes fully winged; notaulices completely distinct and jointed posteriorly in male; female with testaceous head, antennae, and pronotum; abdomen similarly testaceous except tergites 1, 2, and 4 partly brown; propodeum and petiole black; forewing transparent without dark transverse bands; maxillary palpi 3–4-segmented and labial palpi 2-segmented; segment I and 4 foretarsus equal in length; enlarged claw with subapical tooth and 4–5 lamellae; segment V of foretarsus with a single row of 9–12 lamellae, apex with a group of 6–11 lamellae; aedeagus with a deeply cleft apicomedian process..... *Echthrodelphax fairchildii* Perkins

1' Female apterous; male winged; other characters not as above 2

2 Enlarged claw without subapical tooth, with or without small tooth at the end of the longitudinal furrow 3

2' Enlarged claw with subapical tooth 6

3 Pronotum not crossed by a transverse depression, if so, impression feeble; labial palp 2-segmented 4

3' Pronotum with a prominent transverse depression 5

4 Maxillary palpi 2-segmented; enlarged claw with 3 bristles at end of longitudinal furrow; segment V with a row of 6 minute lamellae on distal half, apex with 6 lamellae; segment I of foretarsi longer than segment IV (11:9); black except for testaceous antennae and yellow legs ..... *Tetrodontochelys sakaii* (Esaki and Hashimoto)

4' Maxillary palpi 3-segmented; enlarged claw as above but with 5 peglike hairs; segment V with a row of 16–20 lamellae and a group of 8–10 lamellae at apex, proximal region with an inner serrate margin; segment I of foretarsi as long as segment IV; reddish testaceous antennae with black petiole; brown vertex and abdomen ..... *Tetrodontochelys lucens* Olmi

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

5 Maxillary palpi 3-segmented; labial palpi 2-segmented; enlarged claw with a bristle and 3 peglike hairs at end of longitudinal furrow; segment V of foretarsi with innerside proximally not serrate, with 2 rows of 12 lamellae and a group of 6 lamellae at apex; 1st segment of tarsi I longest, 2x longer than 4th and slightly longer than 5th; black species except for yellow malar area, clypeus, mandibles, and front of vertex and brownish antennae and legs ..... *Gonatopus yasumatsui* Olmi

5' Maxillary palpi 6-segmented; labial palpi 3-segmented; enlarged claw with 6 peglike hairs, innerside with 18–19 lamellae in 2 rows, apex with 14 lamellae in a group; 1st segment of tarsi I two-thirds of 4th, 5th segment 4x longer than 1st; head brownish red with yellow mandibles, clypeus, and front vertex; antennae brown with segments 1 and 2 yellow; thorax and abdomen blackish brown ..... *Gonatopus lucidus* (Rohwer)

6 Pronotum without or with very weak transverse depression; labial palpi 1-segmented; maxillary palpi 2-segmented 7

6' Pronotum clearly with a prominent depression; labial palpi 2-segmented; maxillary palpi 2- to 4-segmented 9

7 Female abdomen entirely testaceous to occasionally brown; propodeum yellow testaceous; enlarged claw with 3–6 lamellae, segment V with 2 rows of 7–10 lamellae and a group of 2–7 lamellae at apex; male with dorsal process of gonoforceps distally broadened and serrated ..... *Haplogonatopus apicalis* R.C.L. Perkins

7' Female abdomen uniformly black; male dorsal process of gonoforceps distally serrated or not serrated 8

8 Dorsal process of gonoforceps distally serrated but not broadened; segment V with 12 lamellae ..... *Haplogonatopus atratus* Esaki & Hashimoto

8' Dorsal process of gonoforceps long and slender, apex without a serrated margin; segment V with 11 lamellae, enlarged claw with 4 lamellae ..... *Haplogonatopus oratorius* (Westwood)

9 Legs testaceous; thorax and pronotum red testaceous with yellow scutum; maxillary palpi 2- to 4-segmented; sides of metanotum rounded; metathorax + propodeum with a feeble tract of median furrow; enlarged claw with subapical tooth and 6–7 lamellae, segment V of foretarsi with 2 rows of 19–20 lamellae and a group of 5–8 lamellae at apex; basal segment of foretarsi as long as 4th; dorsal process of gonoforceps slender, pointed at apex and with a subapical point ..... *Pseudogonatopus sarawaki* Moczar

9' Legs mostly yellow; thorax, propodeum, and abdominal coloration more or less different; metapleuron rounded or protruding; dorsal process of gonoforceps different from above 10

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

10 Metapleuron protruding, metathorax + propodeum without median furrow; maxillary palpi 4-segmented; enlarged claw with a subapical tooth and 6 lamellae; segment V of foretarsus with 2 rows of 14 lamellae and a group of 6 lamellae apically; basal segment of foretarsi as long as 4th segment; generally reddish testaceous except for black petiole and brown-red abdomen..... *Pseudogonatopus nudus* R.C.L. Perkins

10' Metapleuron rounded; body black to brownish black..... 11

11 Head, thorax, and propodeum brownish black; abdomen black; maxillary palpi 2-segmented; mandible tetradentate; metathorax and propodeum weakly granulated; enlarged claw with subapical tooth and 4–5 lamellae, segment V of foretarsi with 2 rows of 10–12 lamellae and a group of 5 or more at apex; basal segment of foretarsi one-fifth longer than 4th; dorsal process of gonoforceps broad and long, rounded at apex and with a lateral point ..... *Pseudogonatopus fulgori* (Nakagawa)

11' Without the combination of above characters..... 12

12 Body uniformly black except for brown head; propodeum without yellow area at apex; metathorax and propodeum dull and granulated; maxillary palpi 4-segmented; enlarged claw with a subapical tooth and 5 lamellae; segment V of foretarsi with 2 rows of 13 lamellae, apex with a group of 7 lamellae; segment I of foretarsi 1.24x longer than 4th; dorsal process of gonoforceps very short and pointed..... *Pseudogonatopus flavifemur* Esaki & Hashimoto

12' Thorax and propodeum black; propodeum with a yellow patch apically; abdomen brownish black and head brown; metanotum and propodeum with a tract of median furrow and indistinctly sculptured; maxillary palpi 2- to 4-segmented; enlarged claw with 4–9 lamellae; segment V of foretarsi with 2 rows of 20–25 lamellae, apex with a group of 7–10 lamellae; dorsal process of gonoforceps broadly long, pointed, and blade-like..... *Pseudogonatopus hospes* R.C.L. Perkins

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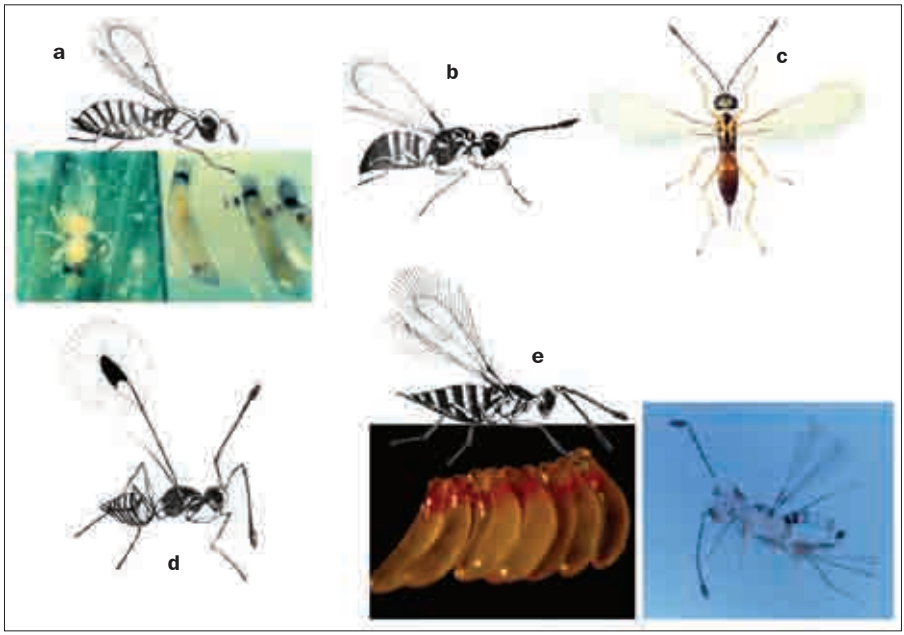

Plate 41. Representative examples of egg parasitoids: (a) *Oligosita naias* Girault (plus parasitized BPH eggs); (b) *Gonatocerus* sp.; (c) *Gonatocerus munnar*us Mani & Saraswat; (d) *Mymar taprobanicum* Ward.; (e) *Anagrus* spp. (plus parasitized BPH eggs).

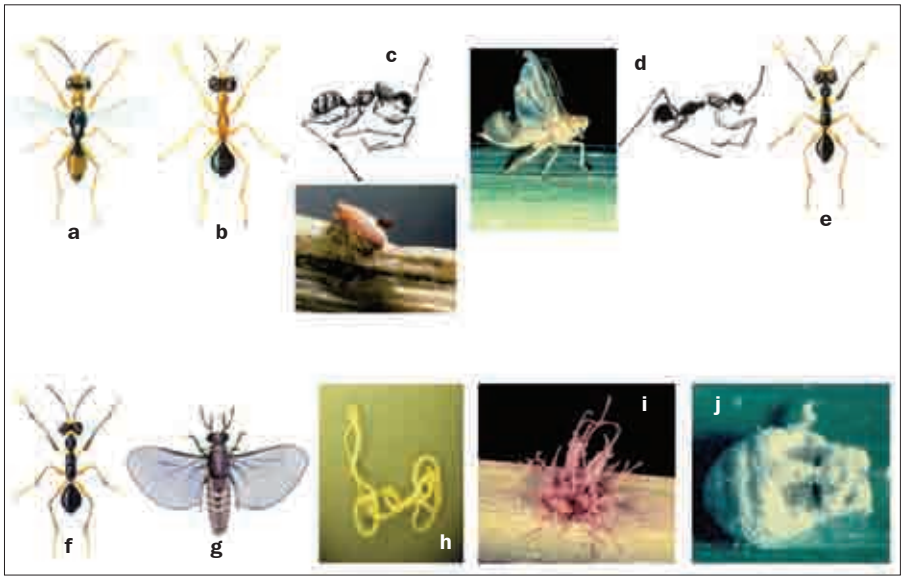

Plate 42. Representative examples of nymphal and adult parasitoids/parasites: (a) *Echthrodelphax fairchildii* R.C.L. Perkins; (b) *Haplogonatopus atratus* Esaki & Hashimoto; (c) *Haplogonatopus* sp. (plus parasitized BPH nymph); (d) *Pseudogonatopus nudus* R.C.L. Perkins (plus parasitized BPH nymph); (e) *Pseudogonatopus fulgori* (Nakagawa); (f) *Pseudogonatopus flavifemur* Esaki & Hashimoto; plus (g) *Elenchus japonicus* Esaki & Hashimoto; (h) *Hexamermis* sp.; (i) *Hirsutella citriformis* Speare, (j) *Beauveria bassiana* (Balsamo) Vuillemin.

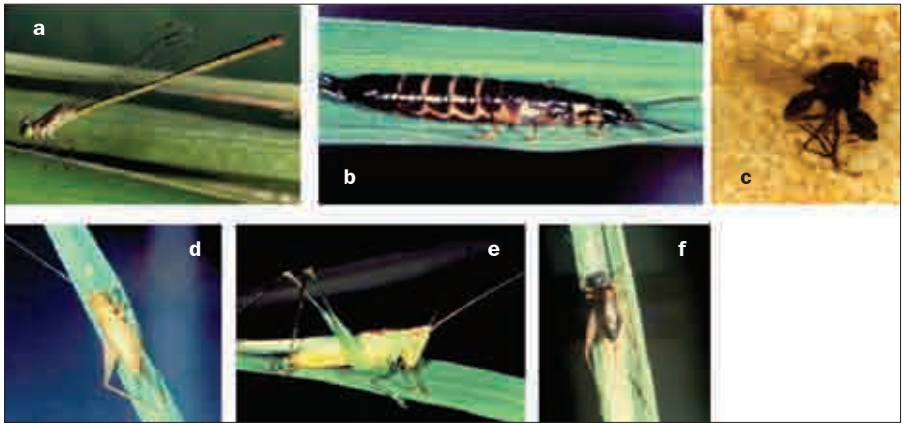

Plate 43. Insect predators: Odonata: (a) *Agriocnemis* sp.; Dermaptera: (b) *Euborellia stali* (Dohrn); Diptera: (c) *Ochthera sauteri* Cresson; Orthoptera: (d) *Anaxipha longipennis* (Serville); (e) *Conocephalus longipennis* (de Haan); (f) *Metioche vittaticollis* (Stål).

Pp 3-156 IN Heong KL, Hardy B, editors. 2009. Planthoppers: new threats to the sustainability of intensive rice production systems in Asia. Los Baños (Philippines): International Rice Research Institute.

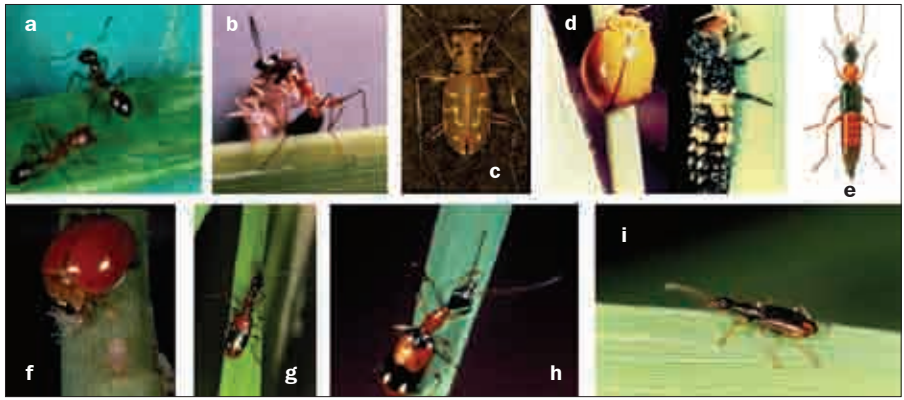

Plate 44. Insect predators: Hymenoptera: (a) *Solenopsis geminata* Fabricius; (b) *Pseudogonatopus* sp.; Coleoptera: (c) *Cicindela sumatrensis* Herbst; (d) *Harmonia octomaculata* (Fabricius) (adult and nymph); (e) *Paederus fuscipes* Curtis; (f) *Micraspis crocea* (Mulsant); (g) *Ophionea interstitialis* Schmidt-Goebel; (h) *Ophionea indica* (Thunberg); (i) *Anoplogenius* sp.

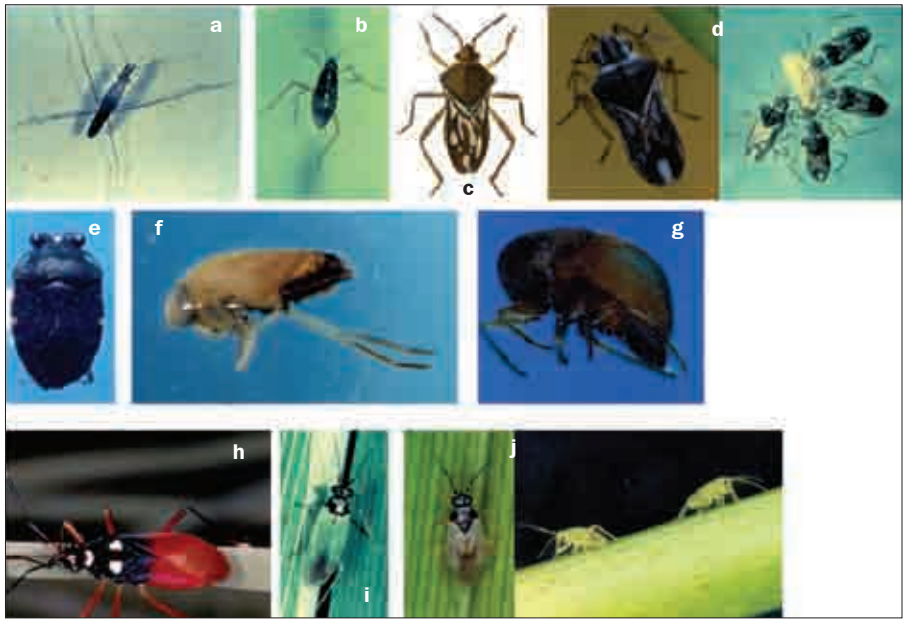

Plate 45. Insect predators: Hermiptera: (a) *Limnogonus fossarum* (Fabricius); (b) *Mesovelia vittigera* (Horvath); (c) *Microvelia douglasi* Scott; (d) *Microvelia douglasi atrolineata* Bergroth; (e) *Ochterus marginatus* (Latreille); (f) *Anisops kurowae* Matsumura; (g) *Paraplea sobrina* Stål; (h) *Dindymus pulcher* Stål; (i) *Cyrtorhinus lividipennis* Reuter; (j) *Tytthus chinensis* Stål (adult and nymphs).

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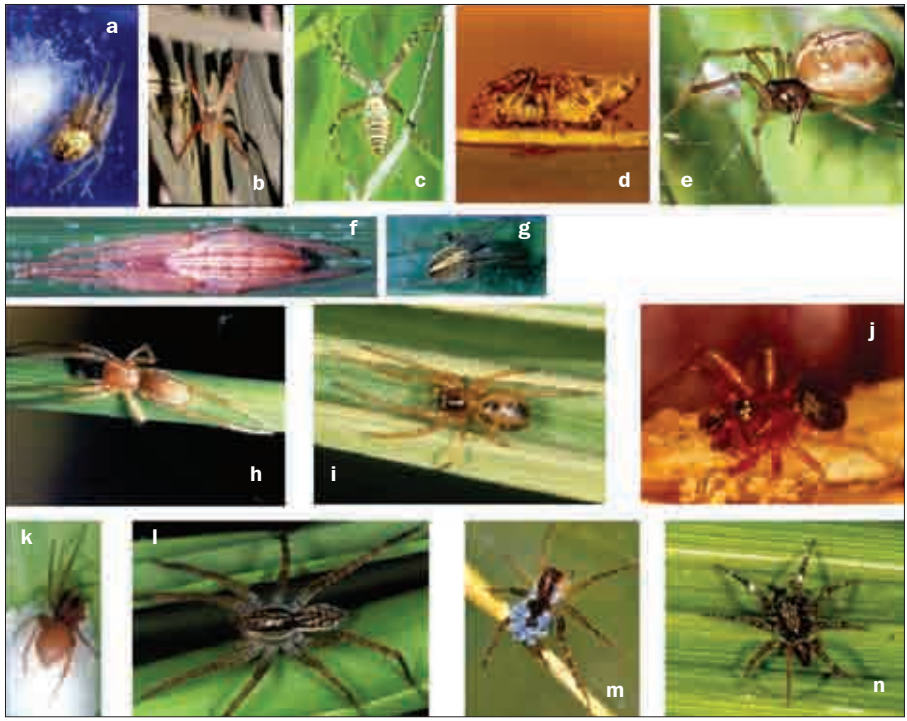

Plate 46. Family Araneidae: (a) *Araneus inustus* (C.L. Koch); (b) *Argiope catenulata* (Doleschall); (c) *Argiope bruennichii*(Scopoli); (d) *Cyclosa* sp.; (e) *Singa* sp.; (f) *Larinia phithiscica*; (g) *Neoscona theisi* (Walckenaer); Family Clubionidae: (h) *Clubiona japonicola* (Boesenberg & Strand); Family Linyphiidae : (i) *Atypena formosana* (Oi); (j) *Erigone prominens* (Boesenberg & Strand); (k) *Erigonidium graminicola* (Sundevall); Family Lycosidae: (l) *Pardosa pseudoannulata* (Boesenberg & Strand); (m) *Pirata subpiraticus* (Boesenberg & Strand); (n) *Arctosa tanakai* Barrion & Litsinger.

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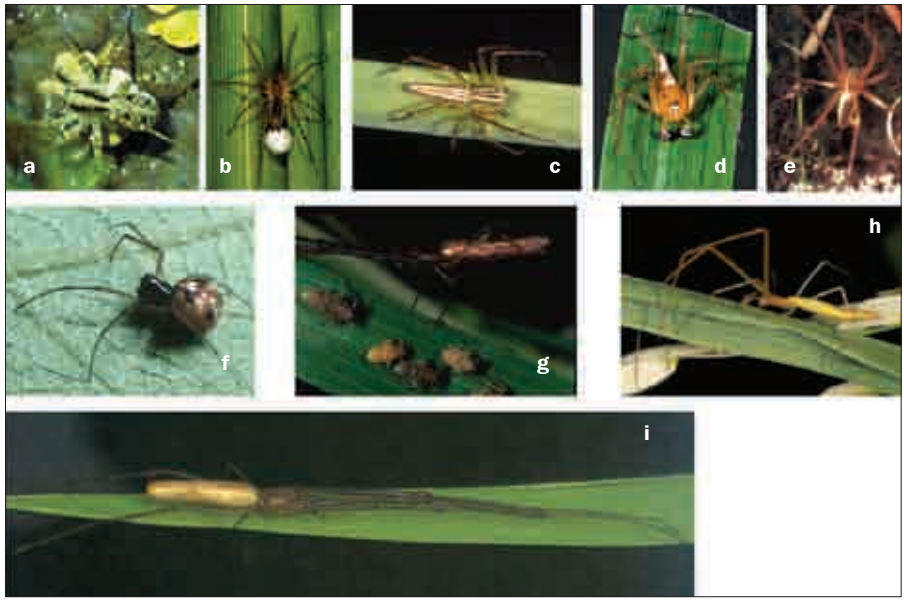

Plate 47. Family Lycosidae: (a) *Pardosa* sp.; (b) *Hippasa holmerae* Thorell; Family Oxyopidae: (c) *Oxyopes lineatipes* (C.L. Koch); (d) *Oxyopes javanus* Thorell; Family Pisauridae: (e) *Dolomedes* sp.; Family Tetragnathidae: (f) *Dyschirionatha dentata* Zhu & Wen (source: Akio Tanikawa); (g) *Tetragnatha maxillosa* Thorell; (h) *Tetragnatha javana* (Thorell); (i) *Tetragnatha nitens* Auduoin.

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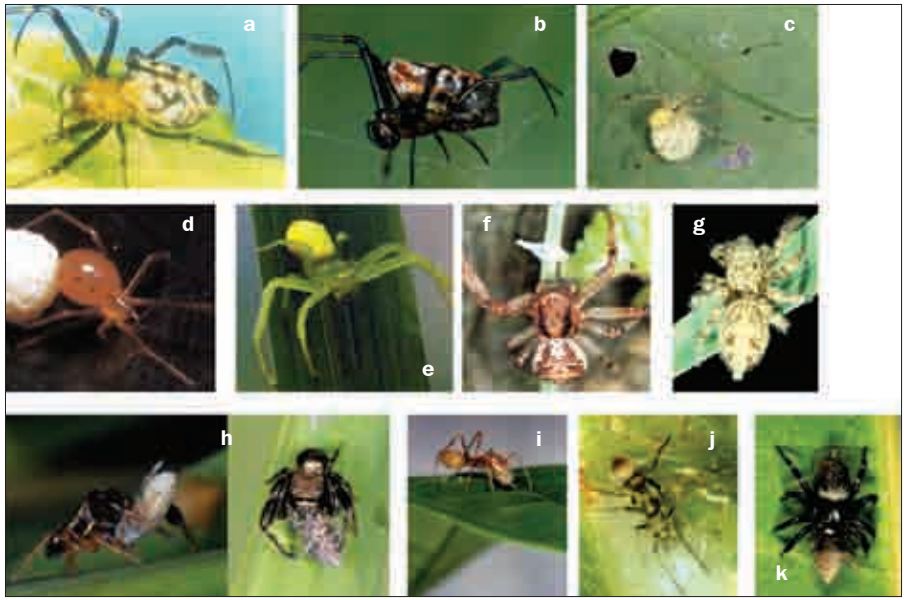

Plate 48. Family Tetragnathidae: (a) *Leucauge* sp.; (b) *Leucauge fastigata* (Simon); Family Theridiidae: (c) *Chrysso* sp.; (d) *Coleosom octomaculatum* (Boesenberg & Strand); Family Thomisidae: (e) *Misumena* sp.; (f) *Xysticus* sp.; Family Salticidae: (g) *Plexippus paykulli* (Audouin); (h) *Harmochirus brachiatus* (Thorell); (i) *Myrmarachne assimilis* Banks; (j) *Myrmarachne bidentata* Banks; (k) *Thiania* sp.

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Plate 49. Family Ranidae: (a) *Rana limnocharis* Boie; (b) *Rana tigrina rugulosa* (Wiegmann); Family Bufonidae: (c) *Bufo marinus* Linnaeus.

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