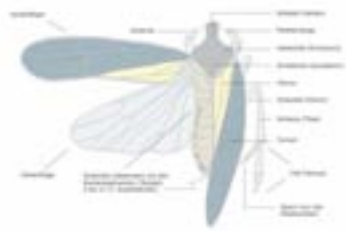


Planthopper Identification

March 2007

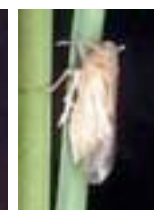
PEET Workshop
New York State Museum Albany, NY



Planthoppers

General notes

- All plant feeders
 - But nymphs of Derbidae and Achilidae (& others?) on **fungus**
 - Several groups w/ nymphs on roots/base of plant
 - Plant “virus” vectors
- NA diversity highest in the Southwestern US!
 - Many specialized forms
- Wing polymorphism common in some taxa
- Males frequently needed for species (or genus) identification



Nilaparvata lugens (Stål) –
Brachypter & Macropter

Taxonomic Overview

- ~10,818 species in 21 families WW
- Nearctic Families
 1. Acanaloniidae (84 spp.)
 2. Achilidae (456 spp.)
 3. Caliscelidae (*)
 4. Cixiidae (1,954 spp.)
 5. Delphacidae (2,086+ spp.)**
 6. Derbidae (1,459 spp.)
 7. Dictyopharidae (696 spp.)
 8. Flatidae (918 spp.)**
 9. Fulgoridae (568 spp.)
 10. Issidae (1,004 spp.)*
 11. Kinnaridae (93 spp.)
 12. Nogodinidae (186 spp.)**
 13. Tropiduchidae (375 spp.)
- WW Species numbers mostly from O’Brien 1985
- Other Families
 1. Achilixiidae (Tropics) (part of Cixiidae or Achilidae?) (“9” species NW; 24 spp WW)
 2. Eurybrachidae (OW tropics) (179 spp.)
 3. Gengidae (Africa) (5? spp.)
 4. Hypochthonellidae (Africa) (1 sp.)
 5. Lophopidae (Tropics) (138 spp.)
 6. Meenoplidae (OW) (158 spp.)
 7. Ricaniidae (OW) (366 spp.)
 8. Tettigometridae (OW) (70 spp.)**

updated FLOW, except **
Online Identification --- AUSTRALIA & NZ
<http://www.agric.nsw.gov.au/Hort/ascu/fulgor/fulg0.htm>

*Issids inc. Caliscelidae here

Key Features

- Tibiae, Tarsi
 - Apical tibial spur (Delphacidae)
 - Tibial spines
 - 2nd Tarsomere spines
 - Row
 - 2
 - none



Images - Murray Fletcher

Key Features

- Wings
 - Reticulate/not
 - Costal/Apical crossveins, cells
 - Wax/tubercles
 - Apical overlap



Key Features

- Terminal beak seg length
 - short in Derbidae
- Head Projection
 - Dictyopharidae, Fulgoridae (rarely others)



Family Cixiidae

- Features
 - “Primitive”
 - Recognized by absence of features of other families
 - 2nd hind tarsomere with row of spines
 - Wings not reticulate (usu. Long)
 - “Orthopteroid” ovipositor
 - Median ocellus often present
 - Shared only with kinnarids



Family Cixiidae

- North American Diversity
 - 2 Subfamilies, 5 tribes, 15 genera, 177 species
 - Revised by Kramer (1977-1983)
 - Traditional generic ID relatively easy, species ID difficult
 - Considerable recent change in generic nomenclature
 - “Oliarus” → *Melanoliarus*, *Reptalus*, *Pentastiridius*
 - *Myndus* → *Haplaxius*
 - Hosts varied
 - Palm disease vectors



Family Delphacidae

Features

- Hind leg with spur (calcar)
 - Primitively “spinelike”
 - Flattened with teeth in most
- Apex of 2nd hind tarsomere with row of spines
- Small (most 3mm or less)
- Often wing polymorphic



Family Delphacidae

- North American Diversity
 - Largest family
 - 4 subfamilies, 6 tribes, 57 genera, 319 species NA
 - 6 subfamilies, 436+ genera, 2,084 spp WW
 - No effective generic keys published
 - Best features genitalic (males!)
 - Largest genus → *Delphacodes* is polyphyletic
 - Others (*Eurysa*, *Euides*, *Kormus*, *Liburnia*) dubious status
- Mostly grass feeders (inc. corn, rice, sugarcane, wheat, cereals)
 - Introduced *Perkinsiella saccharicida* (sugarcane)

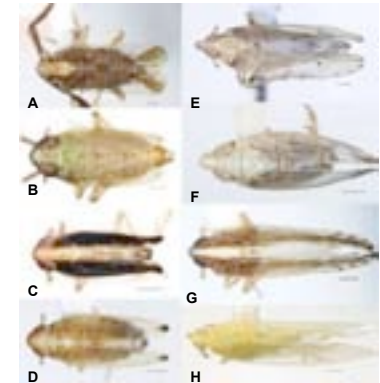
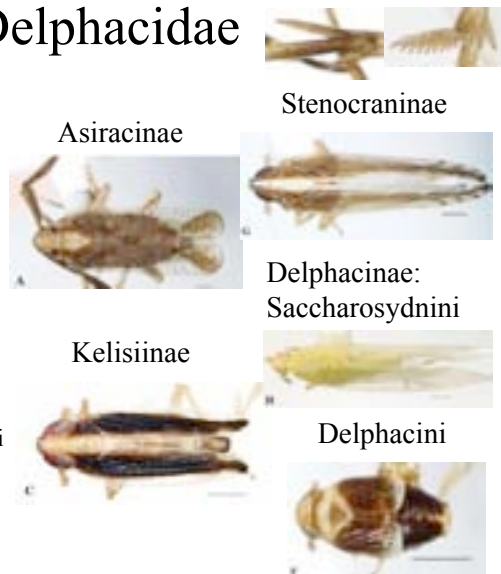


Figure 14. Dorsal habitus of Delphacidae (scale = 0.5 mm). A. *Copicerus irroratus* (Asiracinae: Asiracini), B. *Pentagramma vittatifrons* (Asiracinae: Idiosystanini), C. *Kelisia parvicurvata*, D. *Kelisia vesiculata* (Kelisiinae), E. *Keliscranus arundiniphagus*, F. *Obtusiscranus bicarimus*, G. *Stenocranus lautus* (Stenocraninae), H. *Saccharosydne saccharivora* (Delphacinae: Saccharosydni).

Family Delphacidae

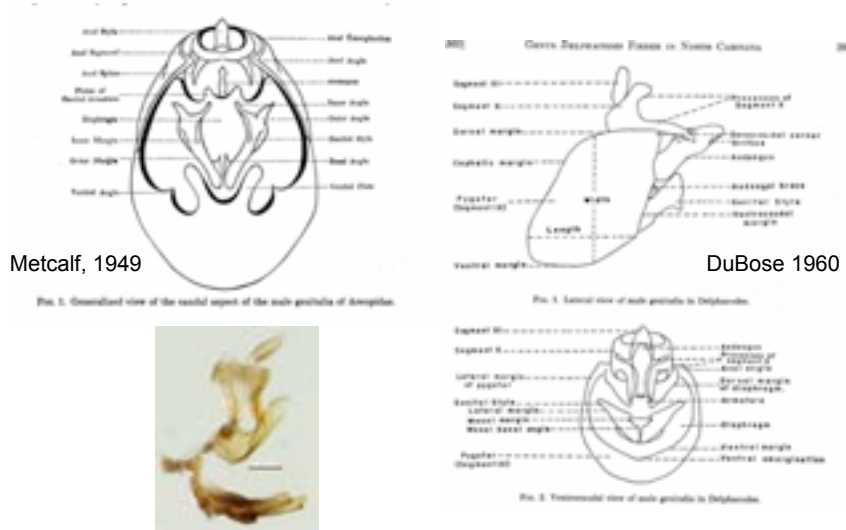
- North American Subfamilies
 - Asiracinae (2 Genera, 6 species NA)
 - Most primitive
 - Calcar spinelike
 - Stenocraninae (3 Genera, 16 species)
 - Kelisiinae (1 genus [*Kelisia*], 12 species)
 - Delphacinae: Saccharosydni (1 species)
 - Delphacinae: Delphacini (51 Genera, 284 species)



Delphacid Diversity

Taxon	# genera	# species	Distribution
Ugyopinae: Ugyopini s.s.	14	131	Pantropical
Neopunanini	1	8	Caribbean
Eodelphacini	7	21	Orient & Pacific
Asiracinae: Asiracini s.s.	12	13	Pantropical
Idiosystatini	3	14	New World temperate
Tetrasteirini	1	2	Neotropical
Platysystatini	2	3	Neotropical
Plesiodelphacinae	2	7	Neotropical
Kelisiinae	2	54	Laurasian
Stenocraninae	7	78	Mostly Laurasian
Delphacinae: Saccharosydni	3	9	Mostly Neotropical
Tropidocephalini	33	162	Gondwanan
Delphacini	268	1,569	Cosmopolitan
Totals	341	2,086	

Delphacid Genitalia Morphology



“Asiracine” Delphacids: “Protodelphacida”

Ugyopini (s.s.) (5 genera, 131 spp.,
Pantropical)



Ugyops stigmata - Belize

Asiracini (s.s.) (4 genera, 13 spp.;
Widespread, mostly Pantropical)



Membranous theca w/
terminal flagellum, etc



Asirica clavicornis - Germany



Calcar: without teeth; quadrate
or round in x-section



Other “Protodelphacida”

(Emeljanov 1996)

Asiracinae

Idiosystatini (3 gen., 14 spp.;
Temperate New World)



Idiosemus xiphias - Chile

Tetrasteirini (1 genus,
2 spp.; Neotropical)



Tetrasteira n. sp. - Belize

Platysystatini (2 gen., 3 spp.;
South America)



Platysystatus brunneus -
Venezuela



Unplaced:
2 genera, 3 spp.
(*Kiambroma*,
Notuchoides,
Australia; Ugyopini?)

Ugyopinae

Eodelphacini (7 genera,
21 spp.; Orient & Pacific)



Livatiella constellaris -
Caroline Islands

Neopunanini (1 genus, 8 spp.;
Caribbean)



Neopunana caribbensis -
British West Indies

Vizcayinae

- Subfamily described by Asche 1990
- All but 1 species described 1990 or after
- 2 Genera, 10 Species
- Tropical Asia
- Biology unknown
- “Phylogenetic Link” between Protodelphacida and Eudelphacida
- **Only subfamily not available for DNA!**



Vizcaya bakeri - Philippines

Spur with teeth, not flattened



Kelisiinae

2 genera, 54 species;
Laurasian distribution
(Temperate Northern
Hemisphere)

Sedge feeders



Kelisia guttula (Photo
by Keiji Morishima)



Spur with teeth, flattened

Subanal
process

Stenocraninae

7 genera, 78 species; *mostly*
Laurasian distribution
Most species in "*Stenocranus*"



Stenocranus matsumurai
(photo by Keiji Morishima)



Calcar tectiform,
With teeth

Embolophora britmusei –
South Africa

Undescribed, Brazil

Phallobase

Plesiodelphacinae

2 genera, 7 species
Neotropical

Burnilia
Host: *Heliconia*



Burnilia prob. pictifrons - Belize



Calcar flattened, toothed

Delphacinae: Saccharosydni

3 genera, 9 species; all Neotropical
(except *Saccharosydne procerus*)



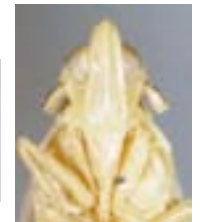
Saccharosydne procerus –
Japan; photo by Keiji
Morishima



Saccharosydne saccharivora - Florida



Saccharosydne brevirostris - Mexico



Calcar tectiform,
toothed



Delphacinae: Tropidocephalini

29 genera, 162 species, Tropics



Tropidocephala brunneipennis (photo by Keiji Morishima)



Tropidocephala tuberipennis - Greece
Many bamboo feeders in Asia (and probably Neotropics)

Calcar thick, without teeth



Undescrbed Neotropical Tropidocephalini

Delphacinae: Delphacini

Very Large Group!
268 genera, 1569 species (75%!); Cosmopolitan; No phylogenetic hypotheses among genera



Delphax crassicornis



Javesella pellucida
(Photo by Johannes Skaffason)



Delphacodes "campestris"



Liburniella ornata



Acanthodelphax analis



Delphacodes "alexanderi"



Pissonotus flabellatus



Eurybregma nigrolineata

Family Achilidae

- Immatures fungus feeders
 - Adults mostly on woody plants
- No known plant pests
- Features
 - Body "flattened", wings overlapping at apex
 - 2nd hind tarsomere with row of teeth
 - Fore wing concave on trailing margin
 - Claval vein reaching apex of clavus (in some?)



Hind tibia
Apex of second segment of hind tarsus

Family Achilidae

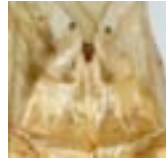
- North American Diversity
 - 1 subfamily (Achilinae), 3 tribes, 8 genera
 - Achilini – genus *Uniptera* only
 - Myconini – Genus *Cixidia* only (was *Epiptera*)
 - Plectoderini – 8 Genera, revised by O'Brien 1971
 - *Catonia* & *Syneccoche* largest genera

Uniptera



Figures 6. Dorsal lateral view of Achilidae: (A) *Catonia*, (B) *Syneccoche*, (C) *Cixidia*, (D) *Epiptera*, (E) *Uniptera*, (F) *Uniptera*.

Family Achilidae



- Generic ID Features
 - Teeth of hind leg
 - Male pygofer lobe
 - Wing venation



Family Kinnaridae

Features

- Similar to (some) cixiids in many features
 - Small (l.t. 3 mm)
 - Ovipositor reduced (vs cixiids)
- 2nd hind tarsomere with row of spines
- Abdominal terga “chevron” shaped
 - Often “sunken”
- Wings membranous
- Median ocellus often present



Family Kinnaridae

- Diversity
 - 1 genus, 6 species
 - Plus 1 undescribed (new genus)
 - All southwestern
 - Known hosts: Asteraceae



Tropical Kinnaridae



Family Derbidae



- Nymphs all(?) fungus feeders, adults on plants
 - Adult host varied
 - Several species suggested as plant pests, none substantiated
- Features
 - Many forms long, fragile wings, short body
 - Terminal beak segment short
 - 2nd hind tarsomere with row of spines (Row on some!)
 - Frons often narrow with median carina obscure or absent



Family Derbidae

- Diversity

- 3 Subfamilies, 6 Tribes, 14 genera, 67 species
- Higher taxonomy not entirely stable
- Largest genus 32 species *Cedusa*, ~300 in Americas, (~100 not described)



Family Derbidae

Subfamilies

- **Derbinae**

Two Tribes

- **Derbini**

- 2 genera, 2 species, NA, both Southeastern
- Moth-like

- **Cenchreini**

- 3 genera, 7 species
- *Neocenchrea* (1 species) & *Omolicna* (4 species) mostly Southeastern
- *Persis* (2 species), southeastern (rare)
 - Tropical species on same genus



Paramysidia mississippiensis



Omolicna sp.

Family Derbidae

Subfamilies

- **Cedusinae**

- 1 Genus (*Cedusa*), 32 NA species; ~200 WW species
- All very similar externally!
- Common, sometimes abundant
- Revised Flynn & Kramer, 1983, Kramer 1986



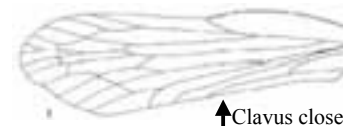
Cedusa sp.

Family Derbidae

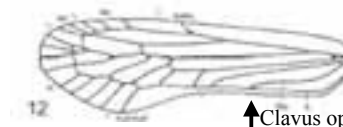
Subfamilies

- **Otiocerinae**

- 3 tribes, 8 genera, 27 species NA
- Fragile
- Long wings, short body
- Clavus open
- Generally uncommon



↑Clavus closed



↑Clavus open



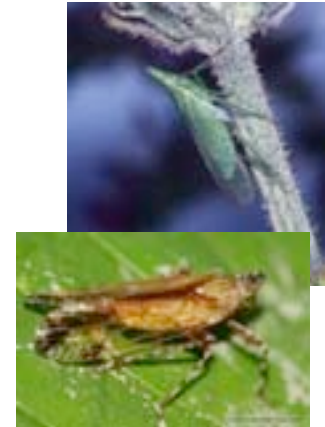
Family Dictyopharidae

- Features
 - Apex of 2nd hind tarsomere with row of spines
 - Head with projection or three median carinae
 - Many Fulgoridae with projection
 - Usually forewings membranous
- Hind wings not reticulate
- Hosts varied
 - Mostly woody, semi-woody plants



Family Dictyopharidae

- Diversity NA
 - 2 Subfamilies, 2 Tribes, 15 genera, 74 species
 - Largest genus *Scolops* (32 species)
 - Keys to North American genera limited



Family Dictyopharidae

Diversity NA:

- Subfamily Orgeriinae
 - All Southwestern (as currently defined)
 - Limited distribution WW (arid regions)
 - Very specialized
 - Brachypterous
 - Lacking tegulae



Family Dictyopharidae

Diversity NA:

- Subfamily Dictyopharinae
 - 5 Genera
 - 3 genera, 6 species “green”, macropterous Dictyopharini
 - Mostly southeastern (many tropical)
 - *Taosa inexacta*
 - *Scolops* – 32 species
 - Breakey 1928 to species
 - *Phylloscelis* – 4 species
 - McPherson & Wilson. 1995 to species
 - “Cranberry toad bug”



Mitrops (top row), *Nersia*, and *Rhynchomitra*



Scolops (top row) and *Phylloscelis*

Family Fulgoridae

- North American diversity
 - 9 genera, 18 species
 - *Alphina* & “*Calyptoproctus*” *marmorata* under revision
 - No published generic keys
 - Most taxa rare
 - *Cyrpoptus* revised by Kramer (1978)
 - Most diverse NA genus (6 species)



Family Fulgoridae

- Features
 - Large Planthoppers
 - Apex of 2nd hind tarsomere with row of spines
 - Hind wing with anal area reticulate
 - Front wing often opaque & reticulate
 - Head process may be present
- Hosts – mostly woody plants
 - Few on bunch grasses



A. *Alphina glauca*, B. *Amycle tumacacoriae*, C. *Cyrpoptus belfragei*, D. *C. vanduzeei*, E. *Poblicia fuliginosa*, F. *Rhabdocephala brunnea*

Family Flatidae

- Features
 - Apex of 2nd hind tarsomere with pair of spines
 - Claval region with wax-bearing pustules
 - Waxy!
 - Submarginal vein setting off row of marginal cells
- Hosts mostly woody plants



Family Flatidae

- Diversity NA:
 - 2 subfamilies, 3 tribes
 - 15 genera, 35 species
 - Most taxa western
 - No published generic keys



A. *Anormenis chloris*, B. *Antillormenis martinicensis*, C. *Cyarta melichari*, D. *Flatoides* sp., E. *Flatoidinus acutus*, F. *Melormenis leucophaca*

Family Flatidae

- Subfamily Flatoidinae
 - 3 genera, 10 species
 - Body “flattened”, wings held tent-like
 - Uncommon!!



Family Flatidae

- Subfamily Flatinae
 - 3 Tribes
 - Flatini – 2 genera, 2 species
 - *Siphanta acuta* introduced (HI, CA)
 - *Hesperophantia* rare
 - Selizini – 2 genera, 11 species
 - “Pointed tail”
 - *Cyarda* is being revised; mostly Southeastern
 - *Mistharnophantia* all Southwestern



Siphanta acuta (“torpedo bug”)



Cyarda sp.



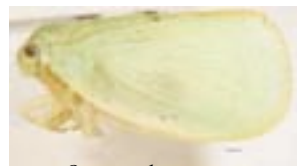
Mistharnophantia

Family Flatidae

- Subfamily Flatinae
 - **Nephesini**
 - 8 Genera, 13 species
 - All common flatids this tribe



Metcalfa pruinosa



Ormenoides venusta



Anormenis chloris

Family Acanaloniidae

Features

- Wings broad, held parallel to body
- Ours usu. Green
- Venation +/- reticulate
 - marginal vein of flatids absent
- 2nd hind tarsomere w/ 2 apical spines
- Hind tibiae w/o subapical spines (vs issid/nogos)
- Mostly on woody & semi-woody plants



Family Acanaloniidae

- North American Diversity
 - 2 Genera
 - 19 species *Acanalonia* (top)
 - 1 introduced, FL
 - *Acanalonia conica* introduced to Europe
 - 1 species in *Euthiscia*
 - *Acanalonia* species ID by Doering 1932



Family Caliscelidae

- Features
 - Apex of 2nd hind tarsomere with pair of spines
 - Wings brachypterous, not reticulate, much shorter than abdomen
 - May have expanded front legs or “snout-like” head
- Mostly grass feeders
- All “Issid” planthoppers reviewed by Doering (1932-1941)



Family Caliscelidae

- Removed from Issidae by Emeljanov 1999
- North American Diversity
 - 1 subfamily 2 tribes, 6 genera (2 introduced), 48 species
 - Largest genera: *Bruchomorpha* & *Aphelonema*
 - Species keys Doering 1940, 1941
 - 2 genera/species introduced

Family Issidae

- Diversity NA
 - 3 tribes, 9 genera, 24 species
 - Intro texts treat Issidae as including Caliscelidae & all NA Nogodinidae
 - Acanaloniidae sunk (Fennah, 1950's), then separated from Issidae
 - Most taxa western
 - Keys to species by Doering (see also O'Brien, 1988, Gnezdilov 2003, 2006a&b)



Family Issidae

- Wings broad, held parallel to somewhat tent-like
 - Often with “bulla”
- Venation +/- reticulate
 - marginal vein of flatids absent
- 2nd hind tarsomere with 2 apical spines
- Hind tibiae with subapical spines (vs. acanaloniids)
- Mostly on woody plants



Figure 76. Dorsal habitus of Issidae adults in ventral view. A. *Microgasteronotus*, B. *Aburtonia*, C. *Phidippus*, D. *Phidippus*, E. *Phidippus*, F. *Phidippus*, G. *Phidippus*, H. *Phidippus*.

Family Nogodinidae

- Diversity
 - 10 Genera, 58 species
 - All southwestern
 - All formerly included in Issidae
 - Keys to species by Doering (see also O’Brien, 1988)



A. *Danepteryx lurida*, B. *Dictyonissus griphus*, C. *Dictyssa monroviana*, D. *Dyctidea* sp., E. *Misodema reticulata*, F. *Neaethus sinehamatus*, G. *Osbornia cornuta*

Family Nogodinidae

- Features
 - Similar to Issidae, except wing venation reticulate & with “clear” patches



Figure 77. Dorsal habitus of Nogodinidae adults in ventral view. A. *Danepteryx*, B. *Dictyonissus*, C. *Dictyssa*, D. *Dyctidea*, E. *Misodema*, F. *Neaethus*, G. *Osbornia*, H. *Phidippus*.

Family Tropiduchidae

- Features
 - Apex of 2nd hind tarsomere with pair of spines
 - Front wings with row of crossveins setting off a reticulate apical area
 - Some (many?) superficially similar to Dictyopharidae (Dictyopharini)



Rhinodictya quaesitrix Kirkaldy from Australia

Family Tropiduchudae

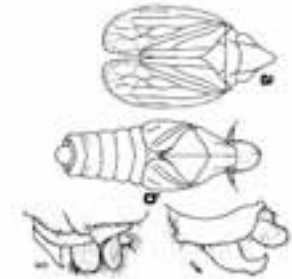
- Diversity
 - North America: 4 species reported, 2 confirmed
 - all southeastern



Figure 3. Habitus of Tropiduchidae. A. *Kallitachia* sp. (Hawaii), B. *Neosticta rivula* (Caribbean), C. *Peltographa rotulata* (SE USA).

Families Gengidae and Hypochthonellidae

- **Features**
- Both without spines on 2nd tarsomere
- **Gengidae** with 2 genera, known from 2 collection events, Natal and Cape of Good Hope,
 - with carinate veins, compound eyes not reduced
- **Hypochthonelliidae** with one genus, from 1 event, Southern Rhodesia
 - Subterranean, reduced compound eyes



a. Gengidae, *Gengis*;
b. Hypochthonelliidae, *Hypochthonella*

Family Achilixiidae

Features

- Apex of 2nd hind tarsomere with row of apical spines
- Abdomen with 1 or 2 lateral projections between segments 3 & 5
- Ovipositor reduced, not sword-shaped
- Length ~ 3-8 mm
- S.American and Oriental

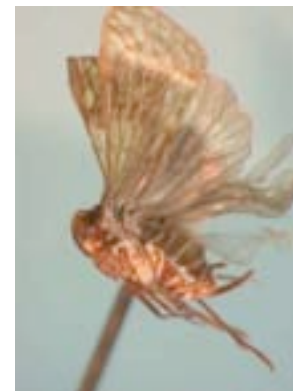


Achilixiidae & Cixiidae

Achilixiidae



Cixiidae-Bennini



Cixiidae-Bennarellini



Family Meenoplidae

Features

- Apex of 2nd hind tarsomere with row of apical spines
- One or both claval veins tuberculate
- Apical segment of rostrum longer than broad
- Small, 2-6mm.
- Old World distribution
- Sister group of Kinnaridae (See Bourgoin 1997)

- Meenopliinae – tegmen with second claval vein covered with sensory pits
- Kermisiinae - tegmen with second claval vein not covered with sensory pits



Lophopidae

• Features

- Second hind tarsomere without spines
- Vertex with width less than 3 x length
- Frons usually longer than wide & with 1-3 longitudinal carinae
- Length~ 7-22 mm
- See Soulier-Perkins for world key to genera, phylogeny, biogeography
- Worldwide except N. America



Ricaniidae

• Features

- Second hind tarsomere without spines
- Forewing usually triangular (apical margin longer than anal)
- Female genitalia without wax
- Length ~ 7-13 mm
- Worldwide except N. America



Eurybrachidae

• Features

- Apex of 2nd hind tarsomere without spines
- Vertex width 3 x length at midline
- Frons wider than long, median carina absent or obscure
- Length ~ 2-28 mm
- Clypeus without lateral carina
- Some have tails on forewings
- Worldwide except Americas



Eurybrachys dilatata

Family Eurybrachidae

- Diversity
- Eurybrachinae –mostly Oriental
- Platybrachinae- Ethiopian,mostly Australian
- Loxocephalinae-Oriental, Ethiopian

Family Tettigometridae

Features

- 4–10 mm
- 2nd hind tarsomere with single spine on each side
- Compound eyes and lateral ocelli not separated from frons by strong lateral carinae
- Wings coriaceous (finely pitted, with opaque cells)
- Palearctic, Oriental, Ethiopian
- Many ant-tended (no jumping apparatus, no wax plates, long anal tube)



Hilda patruelis

