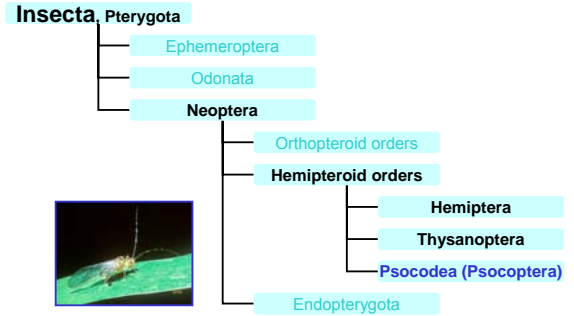


True Bugs!

Hemiptera 1

Class: Insecta
Order: Hemiptera

ToLWeb*: Arthropoda, Hexapoda ...



*The Tree of Life Web Project (ToL) <http://tolweb.org/Insecta>

“Typical” Hemipteran adults



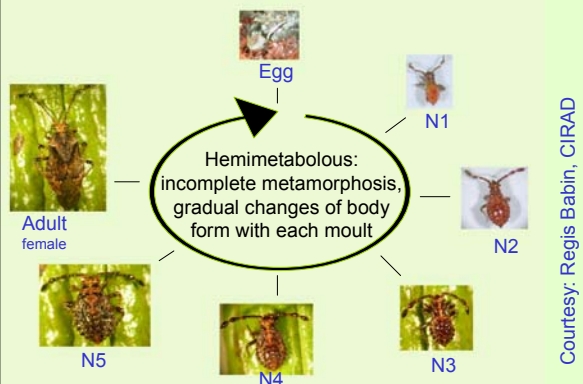
Heteroptera Auchenorrhyncha Sternorrhyncha
(Homoptera) (Homoptera):

Some authorities divide the Hemiptera into two suborders, Heteroptera & Homoptera. Others consider the Heteroptera (=Hemiptera) and Homoptera as separate orders.

Some basic facts about bugs:

- Order Hemiptera is the largest exopterygote order with >75,000 species
- The life cycle is hemimetabolous with 2-7 (typically 5) instars.
- Polymorphisms are common and viviparity and parthenogenesis occur in some groups
- Hemiptera include important pests.
 - direct damage to crops through feeding
 - vectors plant diseases
 - public health pests
- Some bugs are beneficial:
 - predacious Heteroptera natural enemies of crop pests.
 - Shellac and cochineal are derived from coccoids

Life cycle (of a cocoa mirid)

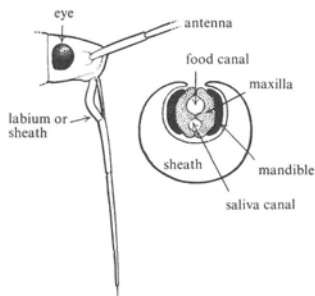


Courtesy: Regis Babin, CIRAD

Major morphological features of true bugs

- The order is very varied, both in structure and biology
- All have piercing/sucking mouthparts (maxillary stylets concealed in a grooved labium)
- Two pairs of wings (usually) with the forewings tougher in texture than the hindwings

Mouthparts: the rostrum



Chinery (1972) *Insects of Britain*

Classification of bugs

Suborder	Economically important families
Heteroptera	Reduviidae, Lygaeidae, Pentatomidae, Miridae, Nabidae, Cimicidae, Pyrrhocoridae, Coreidae, Anthracoridae
Coleorrhyncha	None (1 family only: the Peloridiidae)
Auchenorrhyncha	Cicadidae, Cercopidae, Cicadellidae, Delphacidae
Sternorrhyncha	Psyllidae, Aleyrodidae, Aphidae, Adelgidae, Phylloxeridae, Coccidae, Diaspididae, Margarodidae and Pseudococcidae



www.museum.vic.gov.au

Order

Hemiptera

(old orders)

Heteroptera

Homoptera

Sub-order

Heteroptera

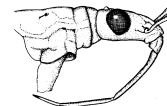
Families

Seed bugs, shield bugs, capsids, bed bugs, water bugs, etc.

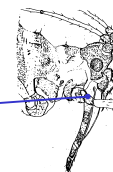
The rostrum position is diagnostic for the 3 major divisions

- **Heteroptera** arises from anterior part of head (prognathous)
- **Sternorrhyncha** displaced between anterior coxae
- **Auchenorrhyncha** arises from rear of head

Heteroptera:
Nabidae



Sternorrhyncha:
Aphidae



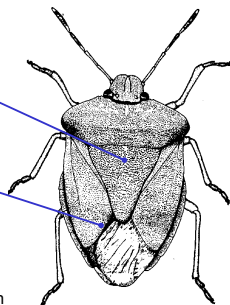
Auchenorrhyncha:
Cicadidae



Common diagnostic features for the sub-orders

Heteroptera

- Commonly prominent triangular scutellum
- Forewings have a leathery basal portion and a membranous apical region forming the hemelytra
- Wings held flat over the abdomen at rest
- On head:
 - Rostrum arises from front of head (prognathous)
 - Large, sclerotized gular region

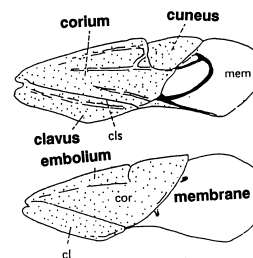


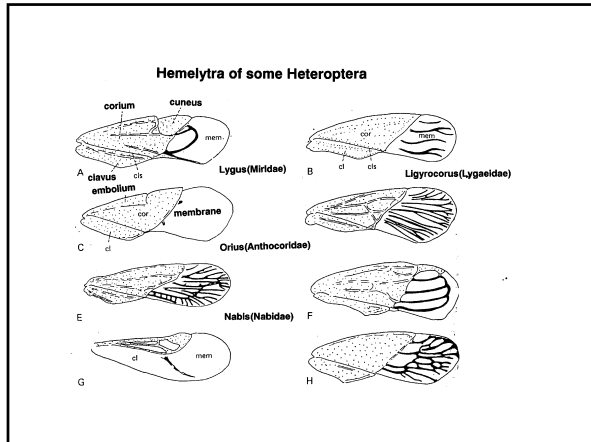
Pentatomidae

The Heteroptera

When the forewings are fully developed they are horny/leathery at the base and membranous at the tip, hence the name.

Generalised hemelytra





Heteroptera: major divisions (Infra-orders)

- **Amphibicorisae** - water surface dwellers (= Gerromorpha)
- **Hydrocorisae** - true water bugs (= Nepomorpha)
- **Geocorisae** - terrestrial bugs
 - Cimicomorpha (predaceous)
 - Pentatomorpha (phytophagous)

Amphibicorisae - water surface dwellers
(= Gerromorpha)

- All predaceous
- Special adaptations include water repellent hairs
- Pondskaters (Gerridae) and water measurers (Hydrometridae) have acoustic communication
- *Microvelia* (Veliidae) is a rice planthopper n.e.

Hydrometra

Hydrocorisae - true water bugs
(= Nepomorpha)

- Mostly predaceous & live under water
- Antennae concealed in grooves, breathe via air bubble, siphon or plastron
- Water scorpion (Nepidae), backswimmer (Notonectidae), water boatmen (Corixidae), toe-biters (Belostomatidae)

Heteroptera: Geocorisae
A - predaceous terrestrial bugs

(= Cimicomorpha)

Predaceous families include:

- assassin bugs (Reduviidae),
- bed bugs (Cimicidae),
- damsel bugs (Nabidae)
- flower bugs (Anthorcoridae)

Reduviidae - the assassin bugs

- Most predate other insects and many have evolved to mimic their prey
- (apparently) **3** segmented rostrum

Some suck the blood of birds and mammals ...

Disease vectors

- *Rhodnius prolixus* & *Triatoma* spp. - “kissing bugs” - transmit Chagas’ disease (*Trypanosoma cruzi*: a flagellate protozoan)



Cimicidae - the bed bugs & flower bugs

- *Cimex* spp. wingless bloodsuckers of birds & mammals
- *Cimex lectularis* is the common bed bug
- Flower bugs are winged and capture their insect prey on flowers



Then



And now ...

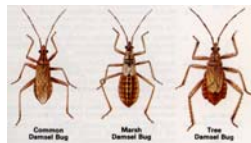


“They’ve had an incredible impact on high-end hotels. If the word ‘bedbug’ gets out, it scares a lot of people away.”

Mike Lawton, Entomologist for *Western Exterminator* on the return of the bedbug. 2003.

Nabidae - the damsel bugs

- Predaceous on various insects including aphids and caterpillars
- 4 segmented rostrum
- Large species can pierce human skin



Anthocoreidae (also sometimes called flower bugs)

<http://creatures.iras.ufl.edu>



- beneficial insects: most species are predaceous on various other insects, including significant crop pests

Includes *Orius* spp... “pirate bugs” - here predating *Bemisia* whitefly nymphs

Heteroptera: Geocorisae
B - Phytophagous terrestrial bugs

(= Pentatomorpha)

Phytophagous families include:

- seed bugs (Lygaeidae),
- shield bugs (Pentatomidae),
- capsid bugs (Miridae)
- cotton stainers (Pyrrhocoridae)

Pentatomidae - shield or stink bugs

- > 3000 species in family
- Called "shield bugs" for their shape
- Called "stink bugs" for their noxious alarm pheromones



Pentatomid pests species include:

- *Eurigaster* spp. "sunn pests" - cereals in the Middle East
- *Nezara* spp. on vegetables (ubiquitous)
- *Scotinophara* spp. - rice black bug
- *Antestiopsis* spp. - African coffee
- *Bathycoelia thalassina*
- Various fruit piercing bugs



Lygaeidae - seed or ground bugs

- Mainly seed-eating although some are partly predatory
- Ground dwelling
- Hibernate as adults
- Pests include
 - chinch bug, *Blissus leucopterus*, on cereals (USA)
 - milkweed bug, *Oncopeltus fasciatus*



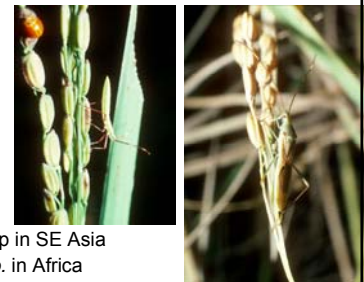
Coreidae - leaf footed bugs

- Nearly all species are fruit feeders
- Most are dull brown & v. similar
- Hibernate as adults



Important pests of several crops ...

- Rice bugs:
 - *Leptocorisa* spp in SE Asia
 - *Stenocoris* spp. in Africa
- *Anasa tristis* (squash bug) on cucurbits
- *Pseudotheraptus wayi* on coconuts (E Africa)



Miridae - capsid bugs

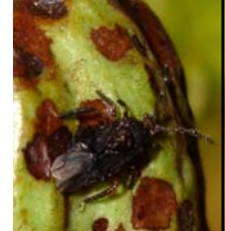
- Largest heteropteran family, > 6,000 species
- Well developed cuneus on forewing: separates from other families
- Mainly fruit and seed feeders - several pest species, but...
- *Cyrtorhinus lividipennis* is an important predator of rice planthoppers & leafhoppers



<http://www.kper.or.kr>

Mirid pests include:

- *Lygocoris pabulinus*, the common green capsid - blemishes fruit
- *Lygus* spp. on potatoes
- Cocoa mirids: *Sahlbergella singularis* & *Distantiella theobroma* in W. Africa (other spp. in SE Asia & Pacific)
- *Helopeltis* spp. - tea, cocoa, etc...



Miridae: *Helopeltis* spp.

- Crop hosts include tea, cocoa, cashew & guava
- Mirids cause damage to shoots, branches, fruit
- *Afropeltis* spp. in Africa



Photo: Nam H.D. Phuong

H. theivora

Also in SE Asia:

H. anthonii

H. sulawesi

H. sumatranus ... etc.

Pyrrhocoridae - cotton stainers

- e.g. *Dysdercus* spp. - becoming more important with GM cotton?
- Cause stains within maturing cotton bolls dramatically reducing value of crop



Summary

- Hemiptera are hemimetabolous insects with piercing & sucking mouthparts
- **Hemi-elytron characteristic of Heteroptera**
- Aquatic and terrestrial families
- Geocorisae (terrestrial) include:
 - Predaceous families - NEs and public health pests
 - Phytophagous terrestrial bugs - many pest spp.
- The rostrum position is diagnostic for the 3 major divisions of Hemiptera; Auchenorrhyncha and Sternorrhyncha to follow ...

Summary:

- Most Hemiptera are terrestrial and phytophagous; but some Heteropteran families are carnivorous & aquatic
- Many phytophagous bugs feed by tapping into phloem, others feed on xylem, parenchyma, seeds or pollen. Predatory species feed on tissues or blood
- Many plant pests, often small insects with short life cycle → prodigious rates of reproduction.