Auchenor-rhyncha:

simply a way of life?

by K.G.A. Hamilton

Auchenorrhyncha are called "short-horned" bugs because their antennae are usually small and inconspicuous; when long, they appear slender and filamentous or 2-segmented.

Fulgoroidea (planthoppers)
began to be divided into families in 1839

Membracoidea:
leafhoppers (Cicadellidae, *left*) and treehoppers (Membracidae) were shown to belong to the same lineage in 1890, but leafhoppers were not placed in Membracoidea until 1983.

Cicadoidea (cicadas):

Tettigarctidae (*left*) were not differentiated as a sister taxon of Cicadidae until 1929

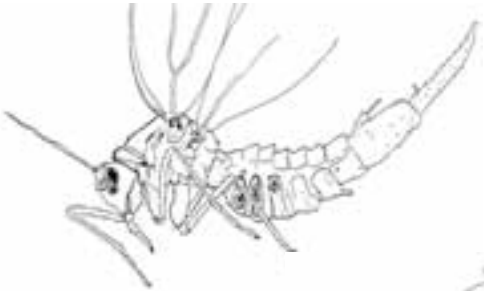
Cercopoidea (froghoppers):

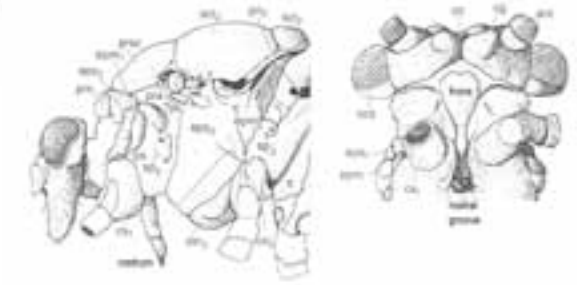
Clastopteridae (*left*) were not differentiated as a sister taxon of Cercopidae until 2001

Sternorrhyncha:

Psyllidae (*top left*), Aphidoidea, Aleyrodidae (*right*), and Coccoidea (*drawing of male*) are plant parasites

Auchenorrhyncha (“neck beaks”) are distinguished from Sternorrhyncha (“breast beaks”) by the position of the rostrum.





HOMOPTERA are sometimes treated as an order, equivalent to HEMIPTERA, with Sternorrhyncha and Auchenorrhyncha as suborders.

- HOMOPTERA
  - STERNORRHYNCHA
    - Coccoidea
    - Aphidoidea
    - Psylloidea
    - Aleyrodoidea
  - AUCHENORRHYNCHA
    - Fulgoroidea
    - Cercopoidea
    - Cicadoidea
    - Membracoidea
- HEMIPTERA

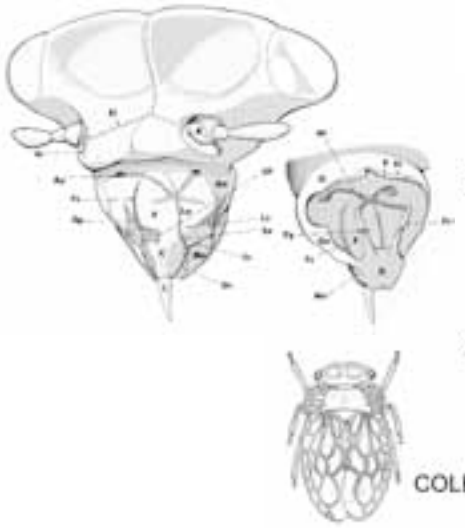
Hemiptera in its original sense included all the insects with piercing-sucking mouthparts, except for the sucking lice (included groups were named later).

- HEMIPTERA Linnaeus 1758
  - THYSANOPTERA
  - HOMOPTERA
    - STERNORRHYNCHA
      - Coccoidea
      - Aphidoidea
      - Psylloidea
      - Aleyrodoidea
    - AUCHENORRHYNCHA
      - Fulgoroidea
      - Cercopoidea
      - Cicadoidea
      - Membracoidea
  - HETEROPTERA

Later authors used the name “Hemiptera” in more restricted senses, to exclude Thysanoptera.

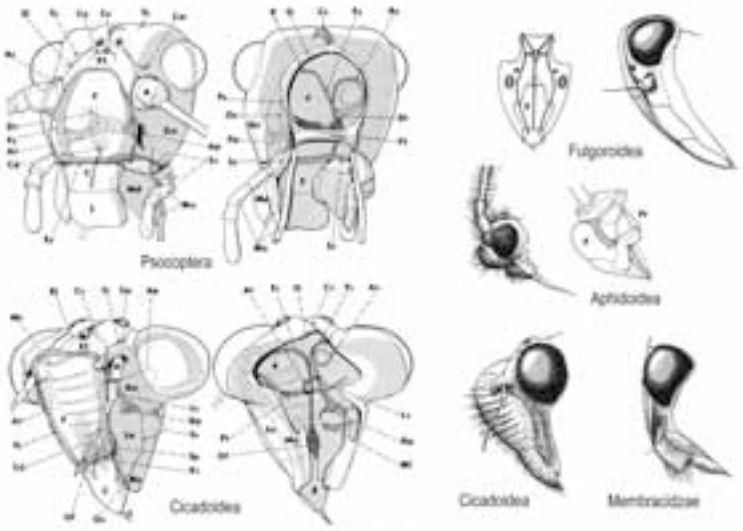
- THYSANOPTERA
- HEMIPTERA Leach 1815
  - HOMOPTERA
    - STERNORRHYNCHA
      - Coccoidea
      - Aphidoidea
      - Psylloidea
      - Aleyrodoidea
    - AUCHENORRHYNCHA
      - Fulgoroidea
      - Cercopoidea
      - Cicadoidea
      - Membracoidea
  - HETEROPTERA = HEMIPTERA Macleay 1819

Discovery of the southern-hemisphere Peloridiidae in 1897 resulted in a 3-suborder classification of Homoptera



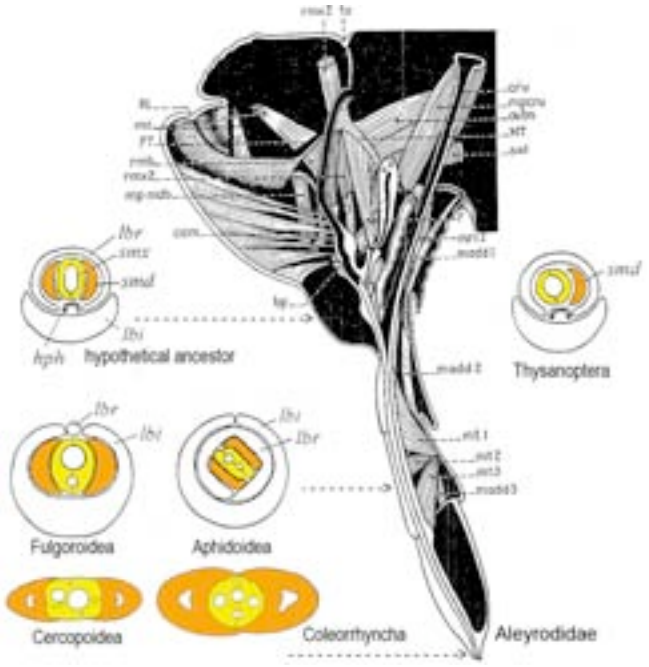
- STERNORRHYNCHA
  - Coccoidea
  - Aphidoidea
  - Psylloidea
  - Aleyrodoidea
- AUCHENORRHYNCHA
  - Fulgoroidea
  - Cercopoidea
  - Cicadoidea
  - Membracoidea
- COLEORRHYNCHA — Peloridiidae

Most hemipteroid heads are characterized by an enlarged frons bearing cibarial dilator muscles, but those of Fulgoroidea, Membracidae and some Heteroptera are flat.

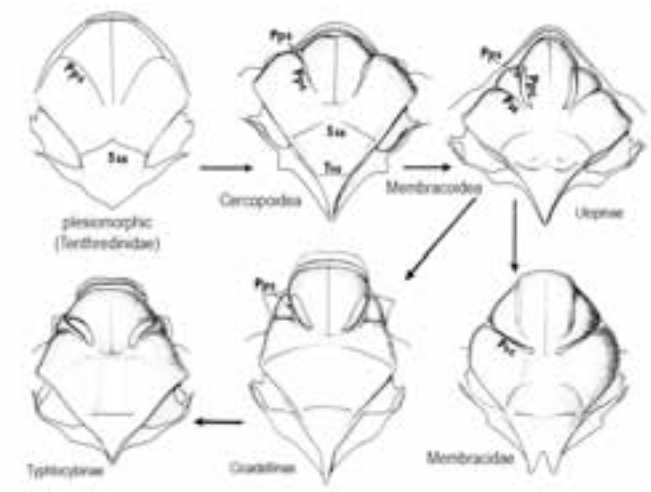


The Hemipteran rostrum is a complex apparatus showing numerous synapomorphies

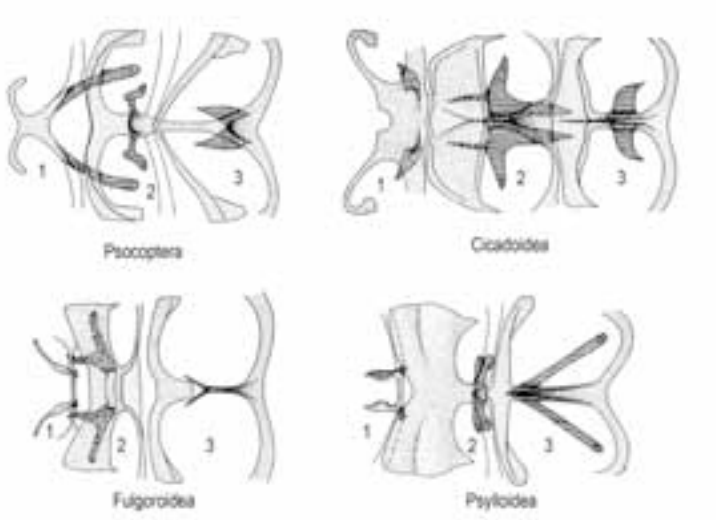
(***smx, smd***, shown in yellow and orange, are stylets of the maxillae and mandibles)



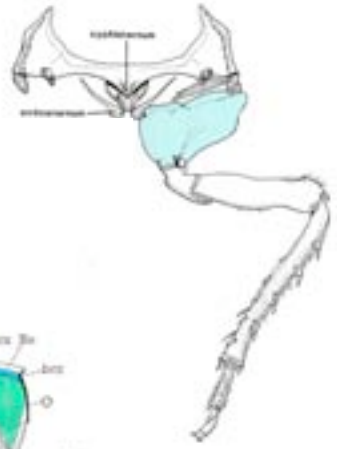
Hemipteroid mesonota have oblique sutures also found in Endopterygota.

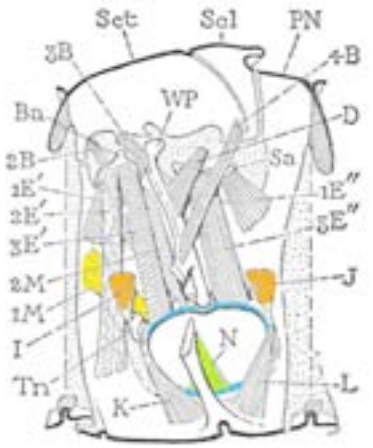


Hemipteroid thoracic sterna, like those of Endopterygota, all have well-developed furcasterna
(coxal cavities numbered)

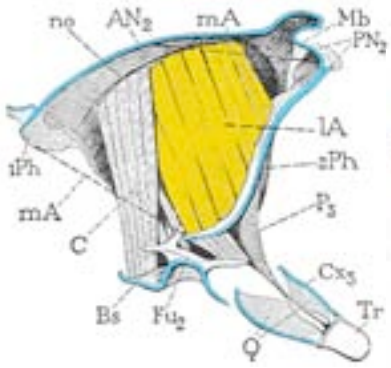


Jumping Homoptera utilize different muscles – for example, the enlarged hind coxa (blue) of Membracoidea contains an enlarged internal muscle (deep green) whereas other Homoptera jump by muscles within the thorax.

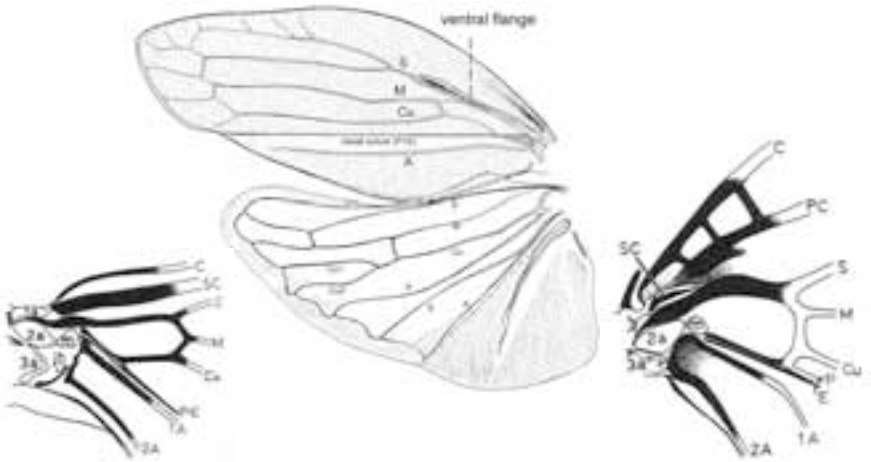




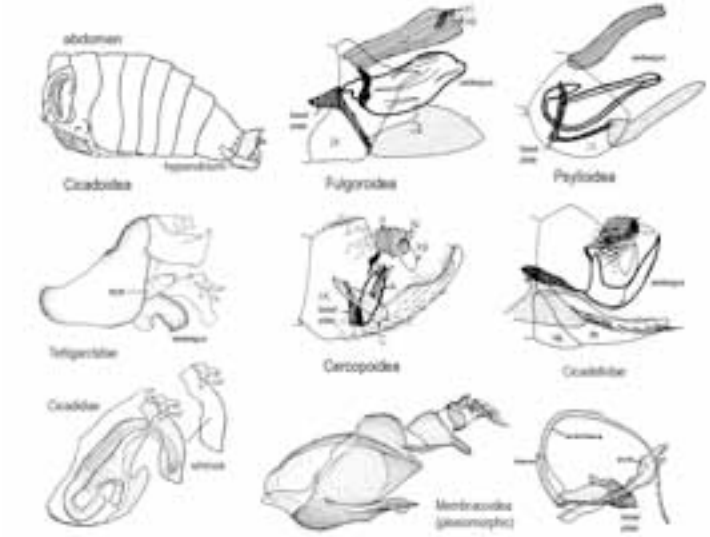
Cicadoidea have an unusually highly arched thorax with very large muscles (yellow), attached to a greatly enlarged mesonotal phragma, that gives the wings a powerful upstroke. The “nodal line,” unique to Cicadoidea, may be an adaptation to this powerful upstroke. It crosses the middle of the wings and is a zone that permits downwards flexion.



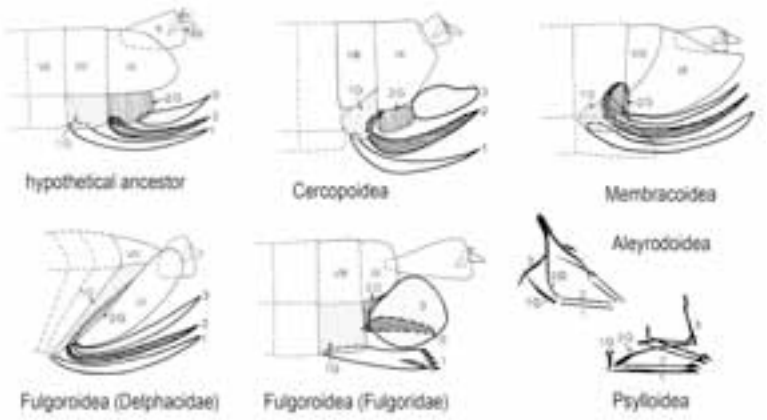
The wings of Auchenorrhyncha are characterized by a “claval suture”. Cicadomorpha have a characteristic submarginal vein creating a membranous “appendix” around the wing edge. Cercopoidea are further distinguished by a ventral flange which has been confused with SC, which is reduced or absent in all Homoptera except cicadas.



Male Homoptera belong to two groups: those with external articulations (Fulgoroidea, Sternorrhyncha), and those with internally articulated genital claspers (Cicadoidea, Coleorrhyncha).



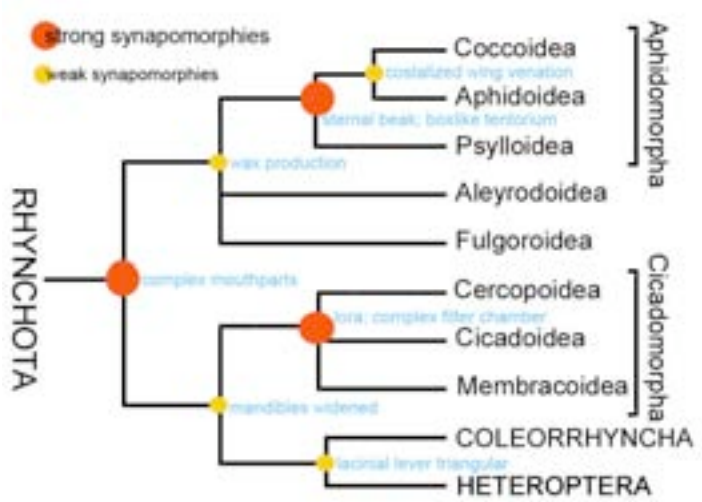
Female (ovipositor) characters show different lines of descent in Fulgoroidea from those of Cicadoidea and Sternorrhyncha.



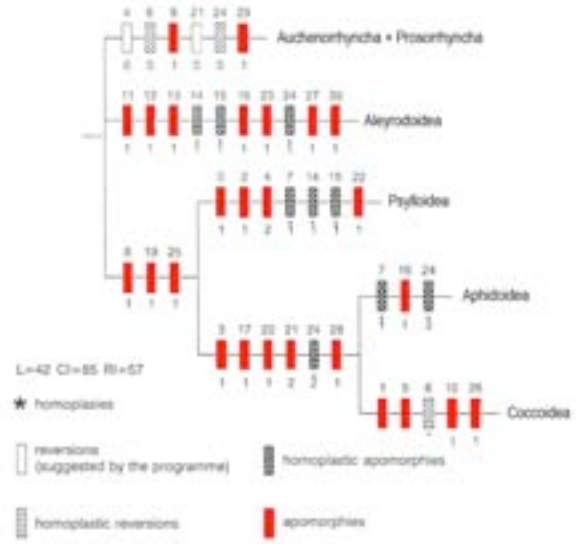
Wax production

is a feature in common to primitive Coccoidea (*upper left*), Psyllidae, Fulgoroidea and Aleyrodidae (*lower right*) as well as some Aphidoidea.

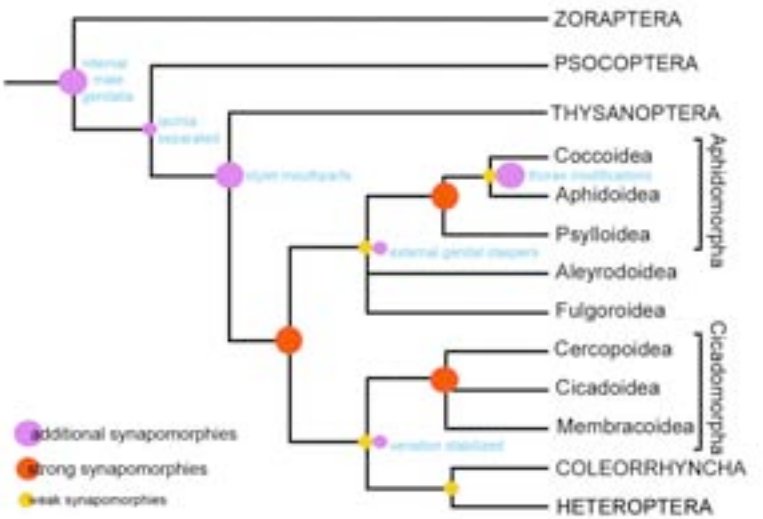
Lines of descent are becoming clearer with the addition of strong synapomorphies, principally from the Homopteran head and enteron.



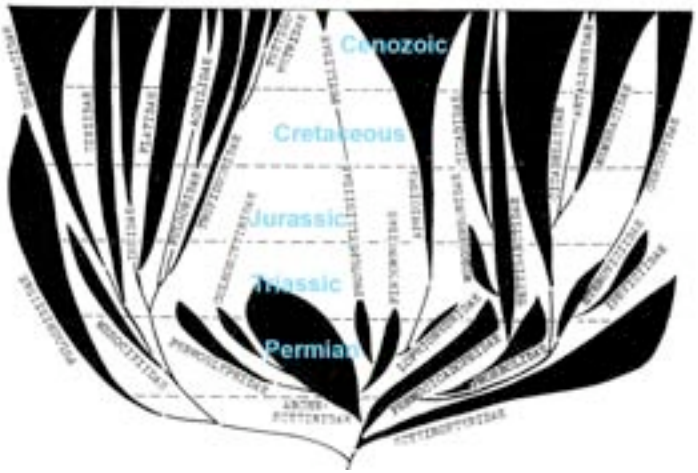
Thoracic characters also group Hemipterous taxa in much the same way as head characters.



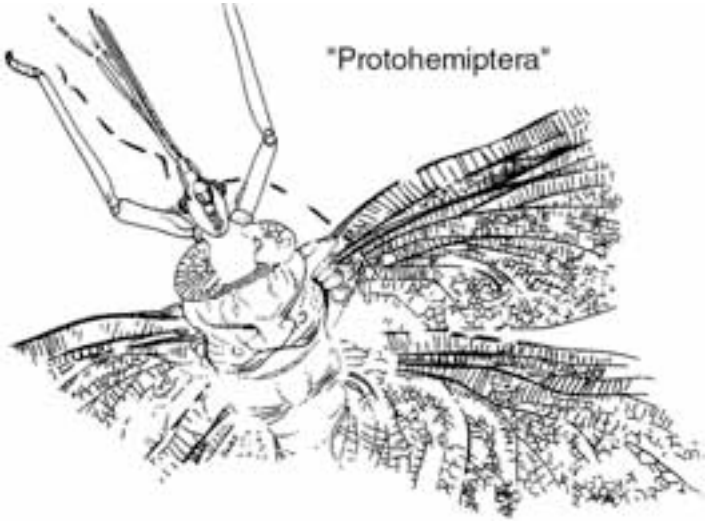
Incorporating data from all Hemipteroid orders results in stronger phylogenetic evidence of relationships.



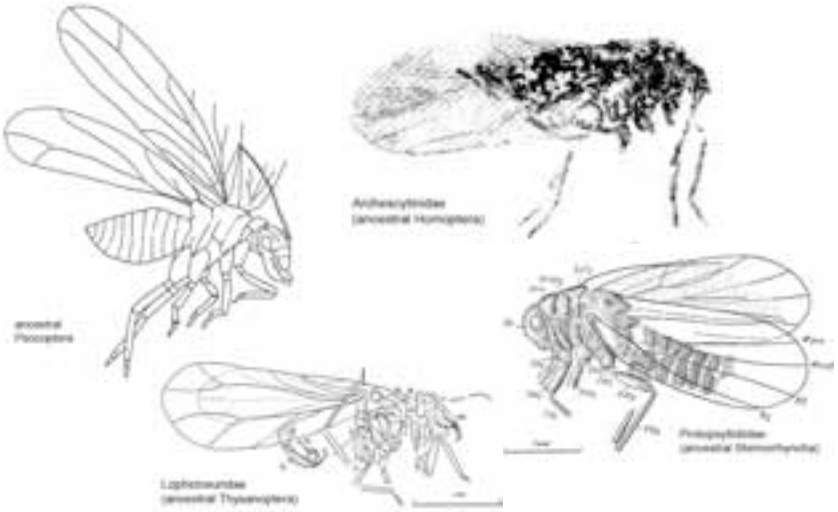
Our ideas of the evolution of Homoptera have altered radically in the last 35 years, thanks largely to the discovery of very well preserved fossils.



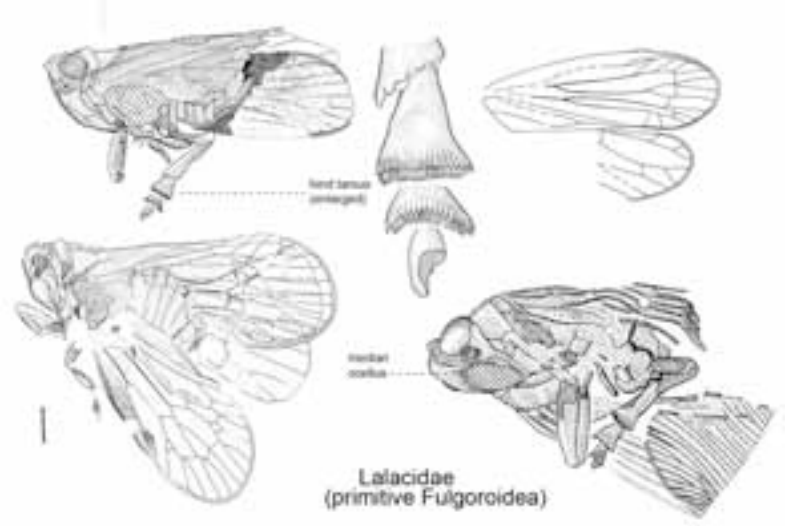
The so-called Protohemiptera are now known to be Paleoptera with a beak and wings quite unlike those of Hemiptera.



The earliest fossil hemipteroid insects were all small adults with simple venation.

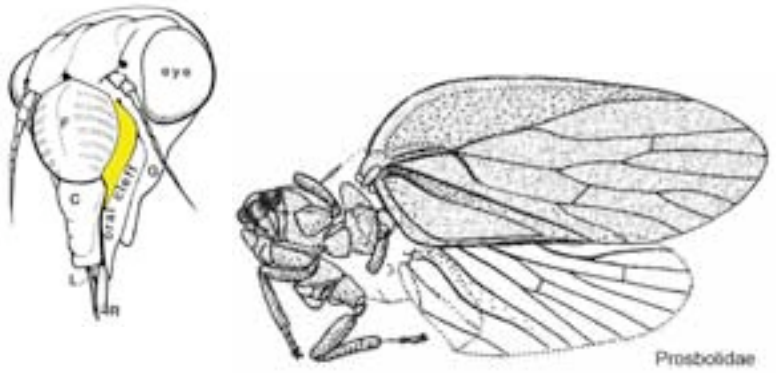


Primitive Fulgoroidea had many wing vein differences, as do modern forms. The large tarsal pectens armed with setae are unique in this extinct family. Note that some had an inflated face.

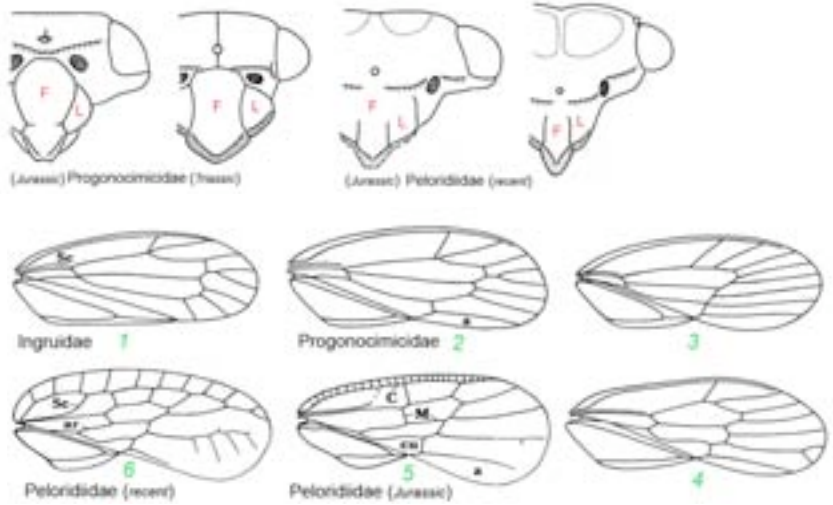


Other primitive Auchenorrhyncha

(such as Permian Prosbolidae) had small, rather flat faces like those of primitive Fulgoroidea, but with a defined lora (yellow) and wings rather like Cercopoidea, but without an appendix.

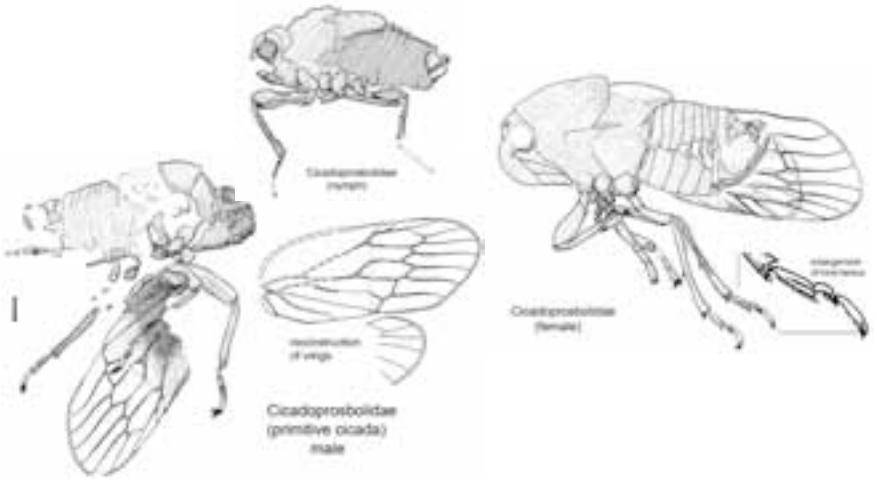


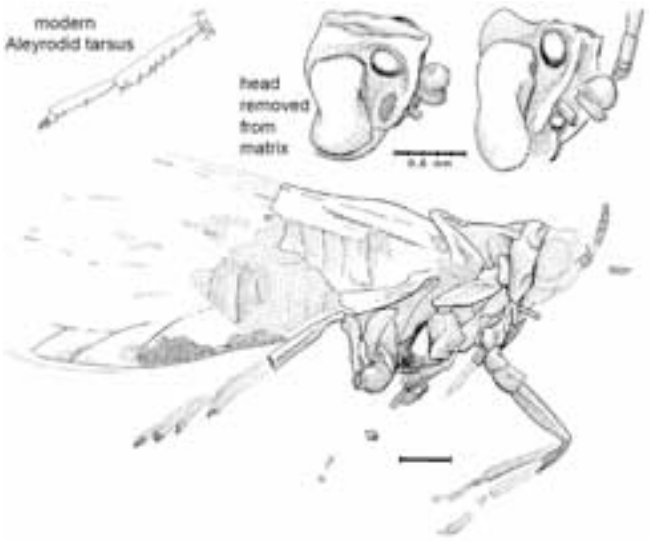
Fossils bridge the morphological gap between ancient Auchenorrhyncha and modern Coleorrhyncha



Primitive Cicadoidea

(Cicadoprosbolidae) had free-living nymphs; adults resembled very small cicadas (14-15 mm) but had jumping hind legs armed with setal rows on the basitarsus, like those of leafhoppers.

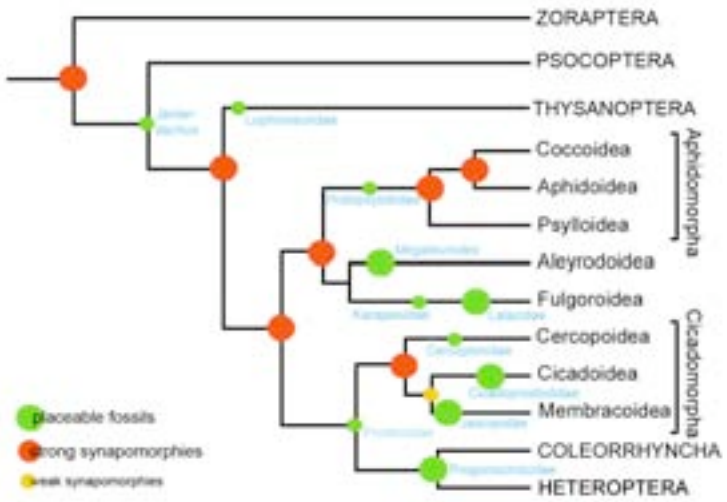




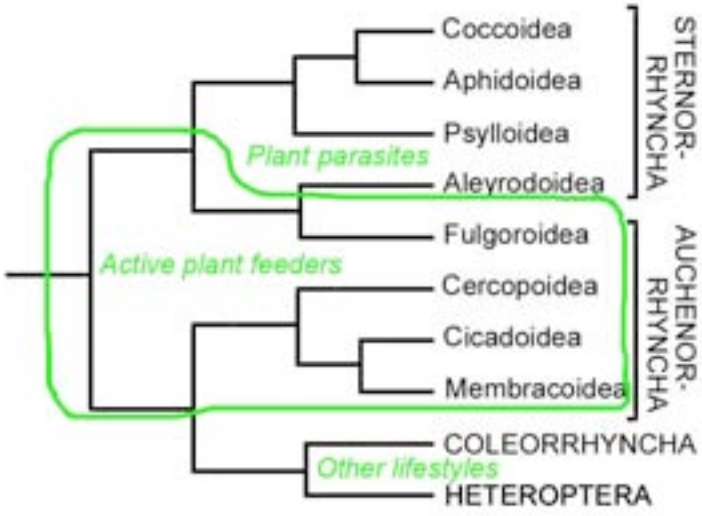
Megaleurodes is a giant (12 mm) whitefly with tegulae, facial carinae and jumping hind legs like Fulgoroidea.

Its head was removed from the limestone to permit examination in various views.

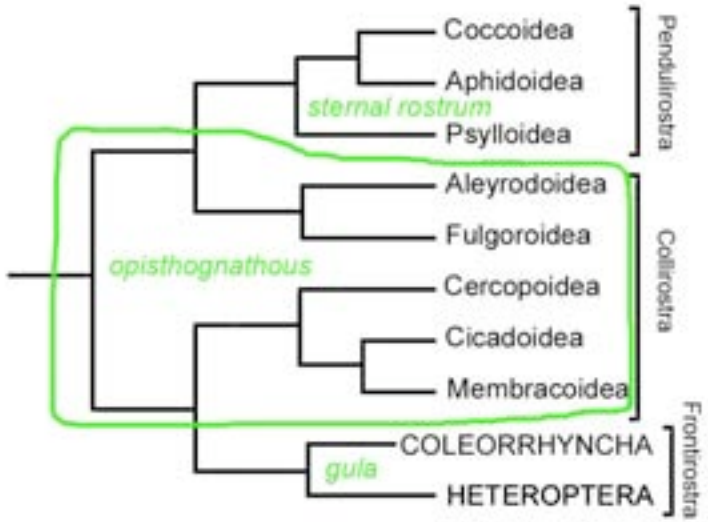
Fossil evidence added to morphological evidence gives a robust phylogenetic picture of the Auchenorrhyncha.



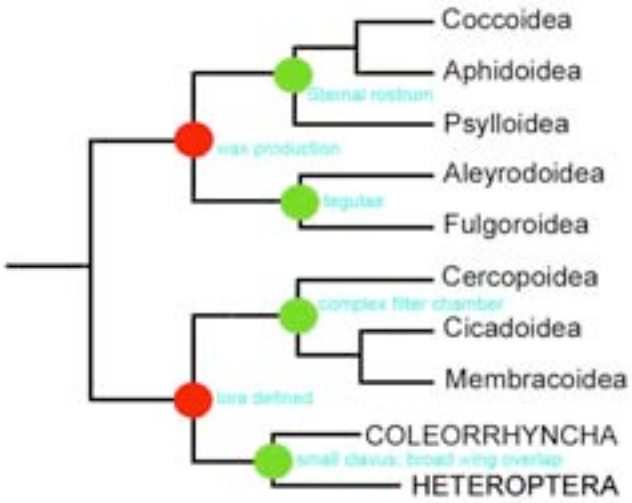
One possible classification of the Homoptera could continue to recognize Auchenorrhyncha as a paraphyletic taxon, based on a plesiomorphic lifestyle.



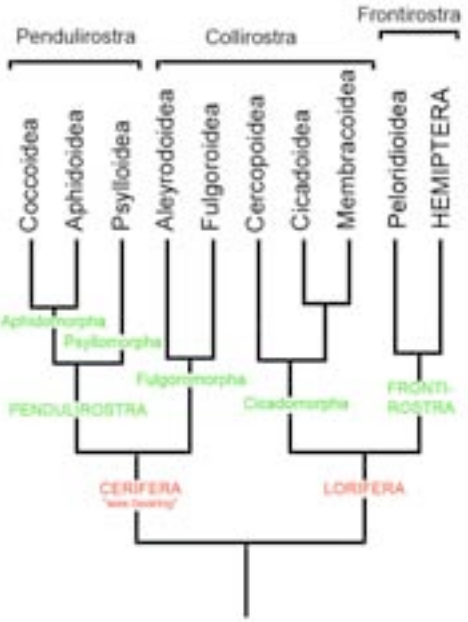
Another possible classification is three equivalent groups, based on the placement of the rostrum.



A strictly cladistic classification would recognize either two to four main taxa, depending on preference. A four-taxa classification could bear existing names, but two of these would need redefinition.



One possible classification could be both cladistic, and conventional, with one paraphyletic taxon (Collirostra) to include the former Auchenorrhyncha plus Aleyrodidae



Dedicated to the memory of “Herb” Ross