



A Phylogenetic Investigation of
the Planthopper Superfamily
Fulgoroidae
Hemiptera: Fulgorinae with emphasis on
Fulgoridae

DEFENDED!

Julie Urban

University at Albany &
New York State Museum

**First Phylogeny of Fulgoridae --
molecular data
(Urban & Cryan, accepted MP&E)**



Fulgoridae -- molecular

Taxonomic sampling:

Ingroup: 69 taxa in 46 genera

-- representatives of 8 of 8 subfamilies, 10 of 11 tribes

Outgroups:

Dictyopharidae (7)

Cixiidae (2), Delphacidae (1)

Molecular data -- ~ 5000 bp

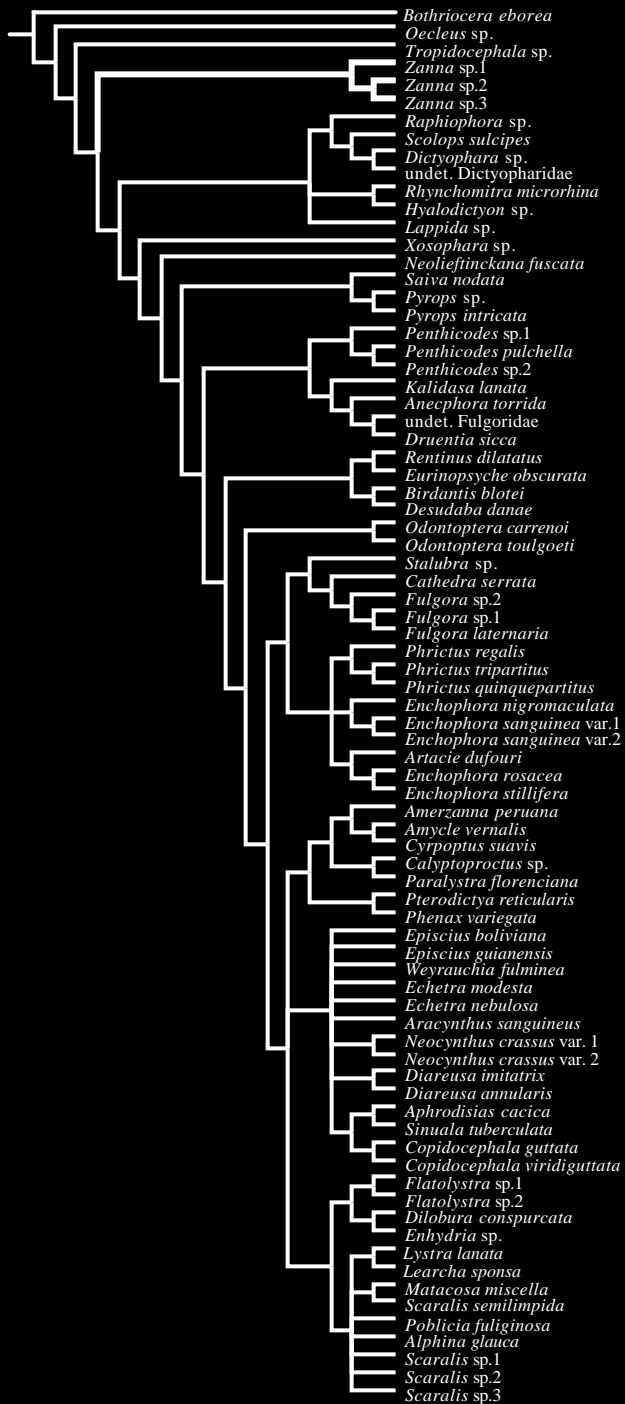
18S rDNA ~1,900 bp

28S rDNA ~2,200 bp

Histone 3 ~ 350 bp

Wingless ~ 350 bp

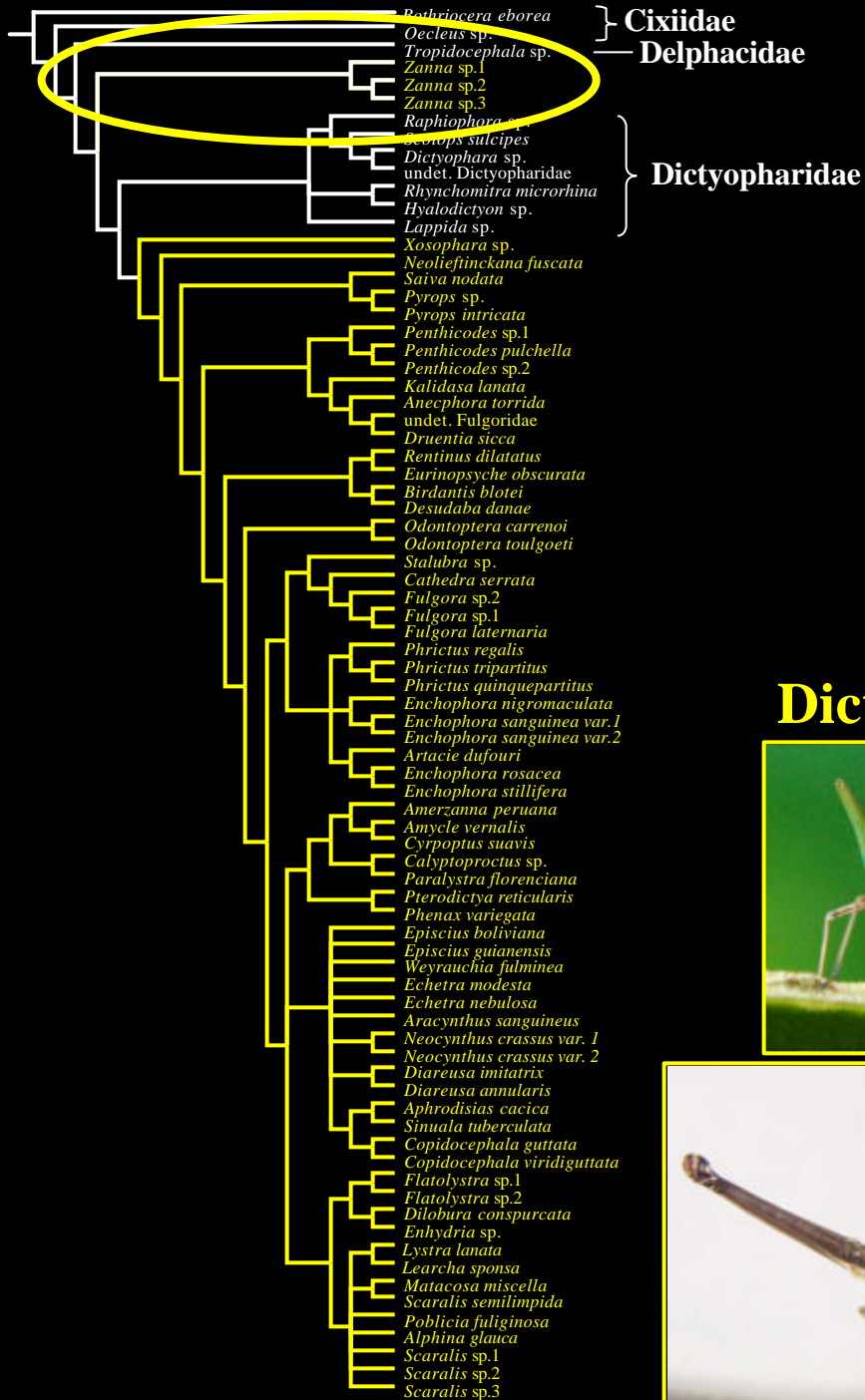
COI ~ 500 bp



MP analysis

-- 19 equally parsimonious topologies

-- robust to different weightings



MP analysis

-- 19 equally parsimonious topologies

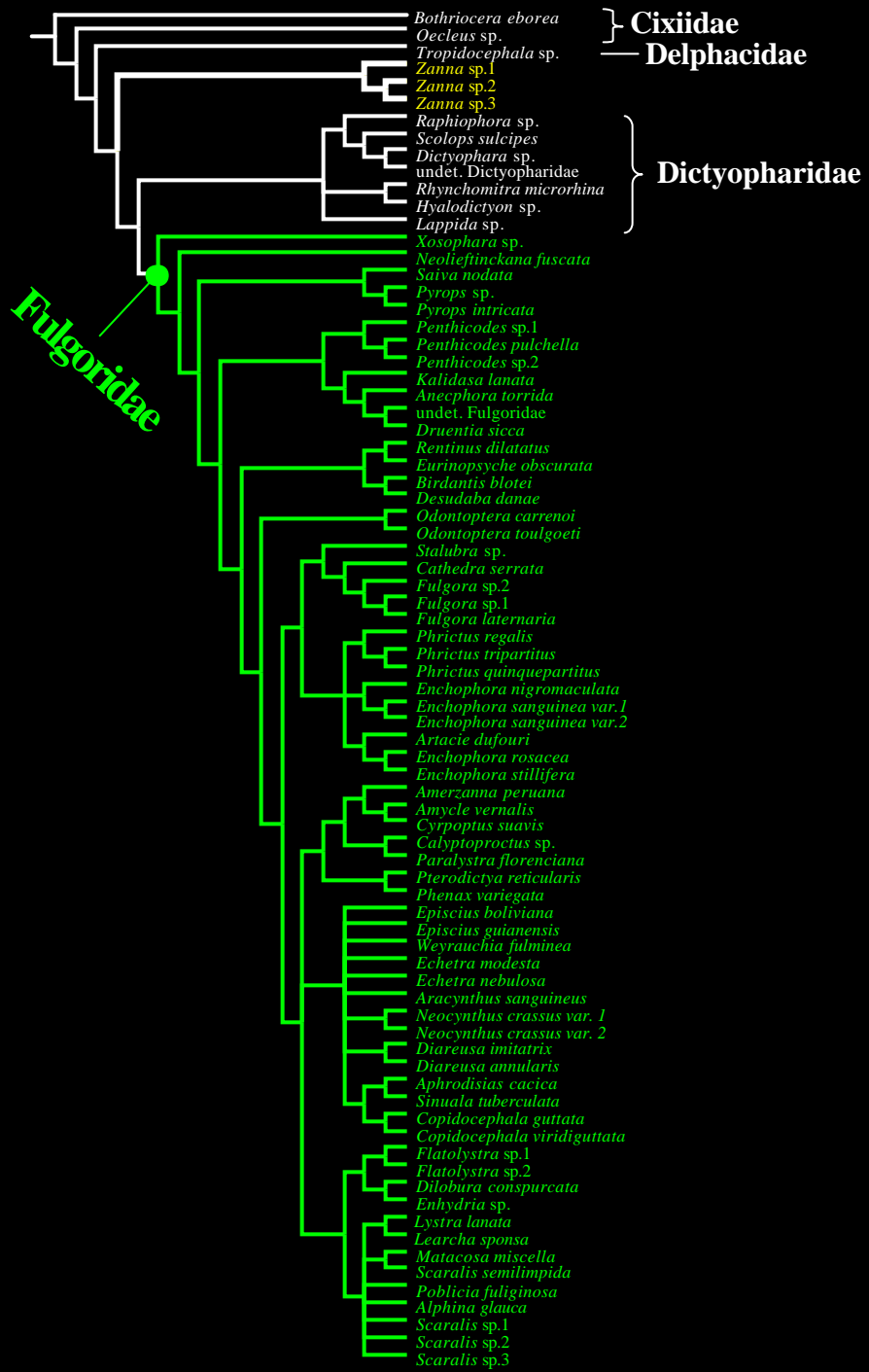
-- robust to different weightings

Fulgoridae not monophyletic with respect to Dictyopharidae

Dictyopharids



Zanna



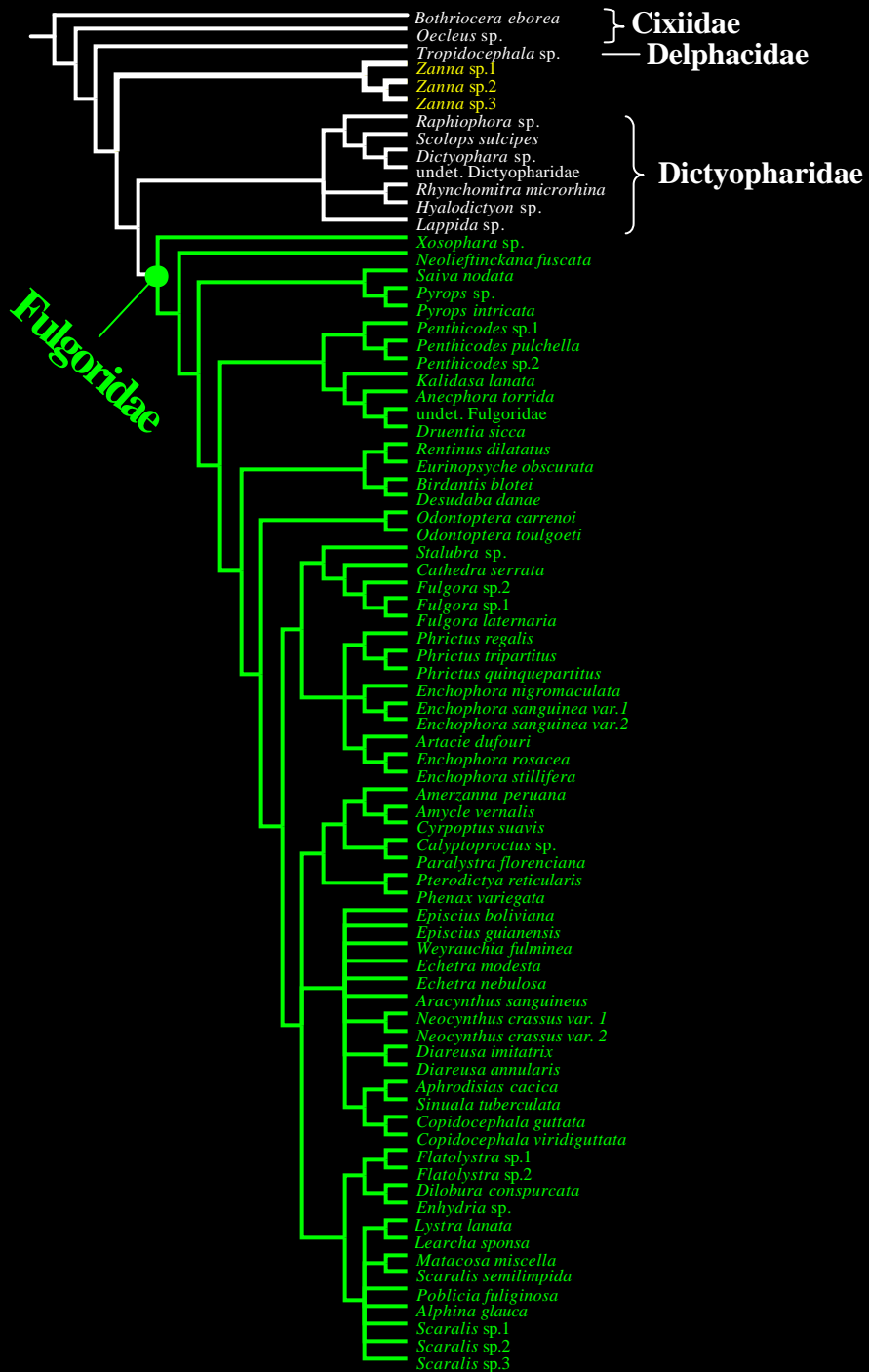
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topologies

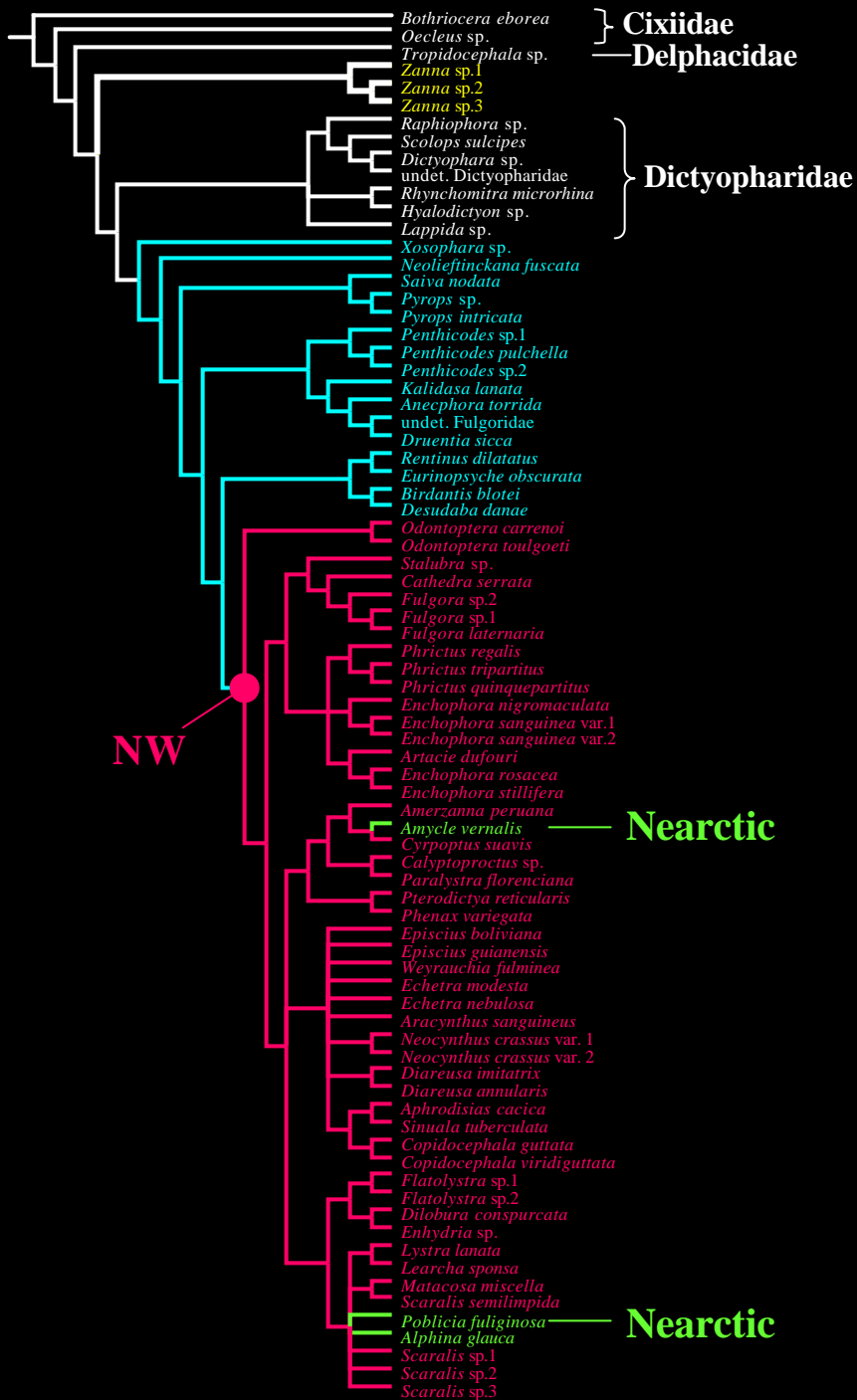
-- robust to different weightings

Fulgoridae not monophyletic with respect to Dictyopharidae



Tests of classification:

- Reject monophyly of family
- Reject monophyly of 5 of 7 tested subfamilies
- Reject monophyly of 5 of 6 tested tribes



Biogeography:

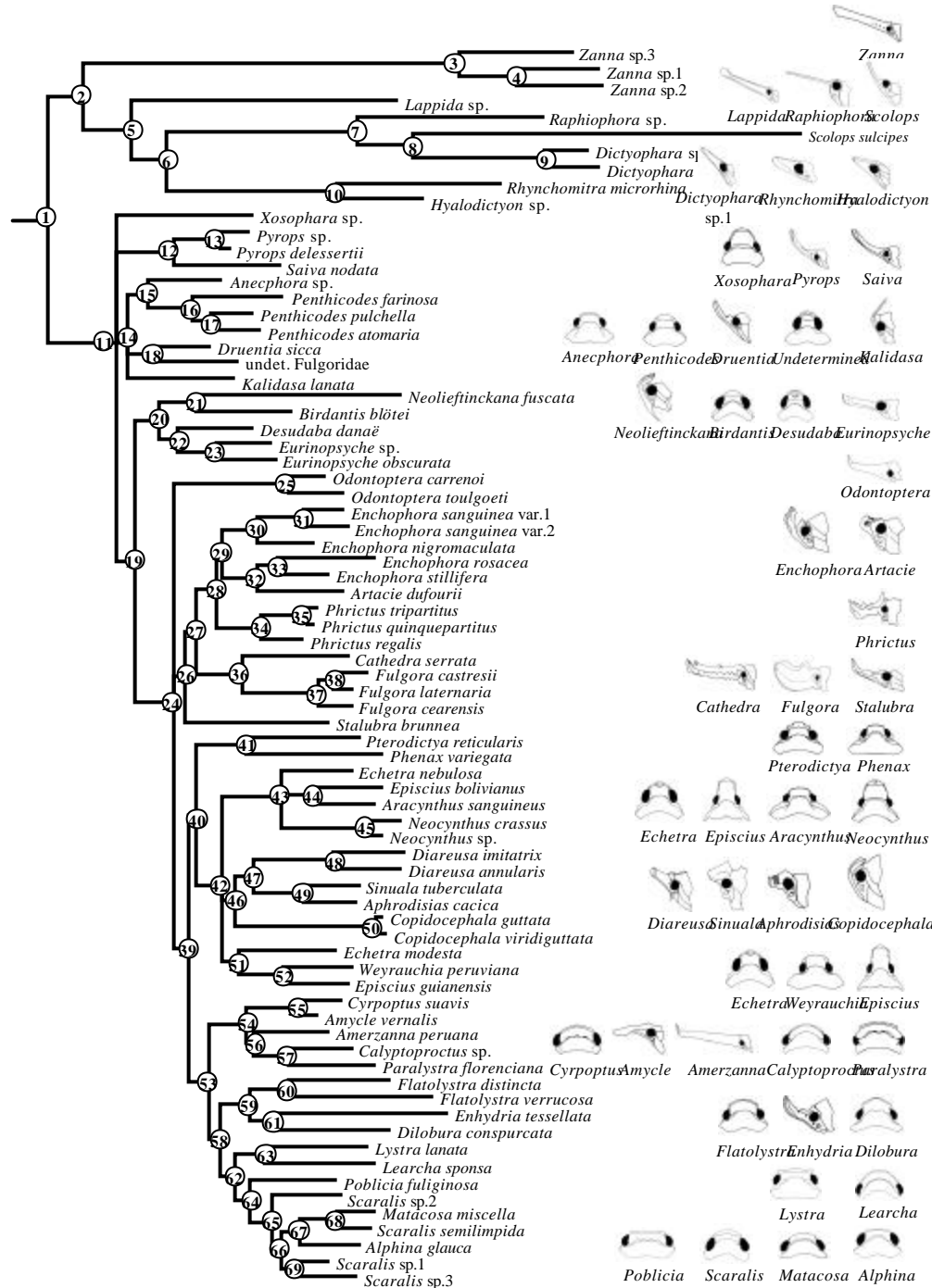
-- Old World origin

-- Monophyletic New World
(colonization of Neotropics)

-- Multiple dispersal events
into Nearctic

Mapping Head Process:

-- 4-7 losses of head process
across fulgorid evolution



Fulgoridae -- molecules + morphology

Taxonomic sampling

69 ingroup taxa + 10 outgroups

Morphological data -- 110 characters

Characters and states developed from literature on Fulgoridae and other planthopper families

Molecular data -- ~ 5000 bp

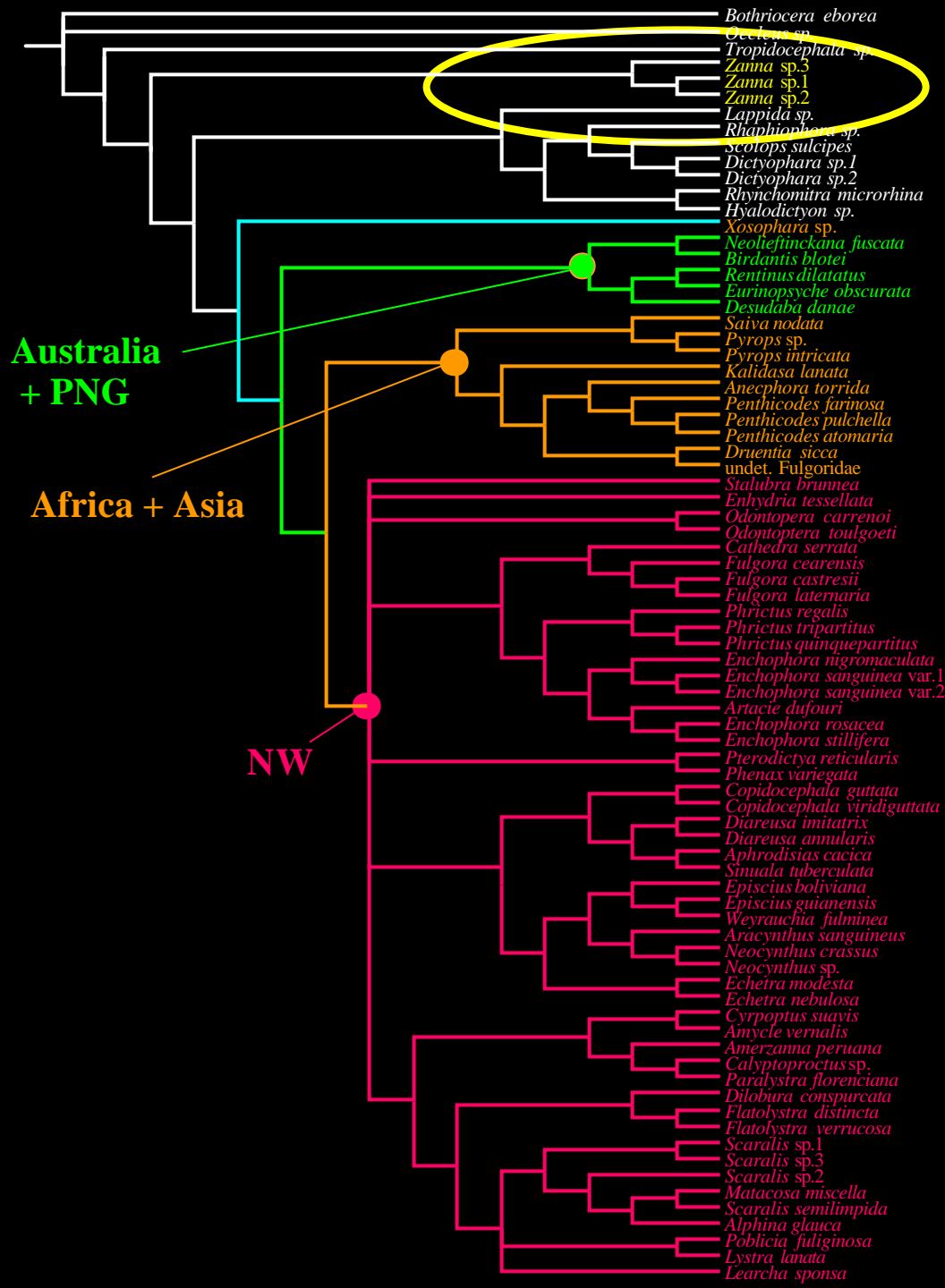
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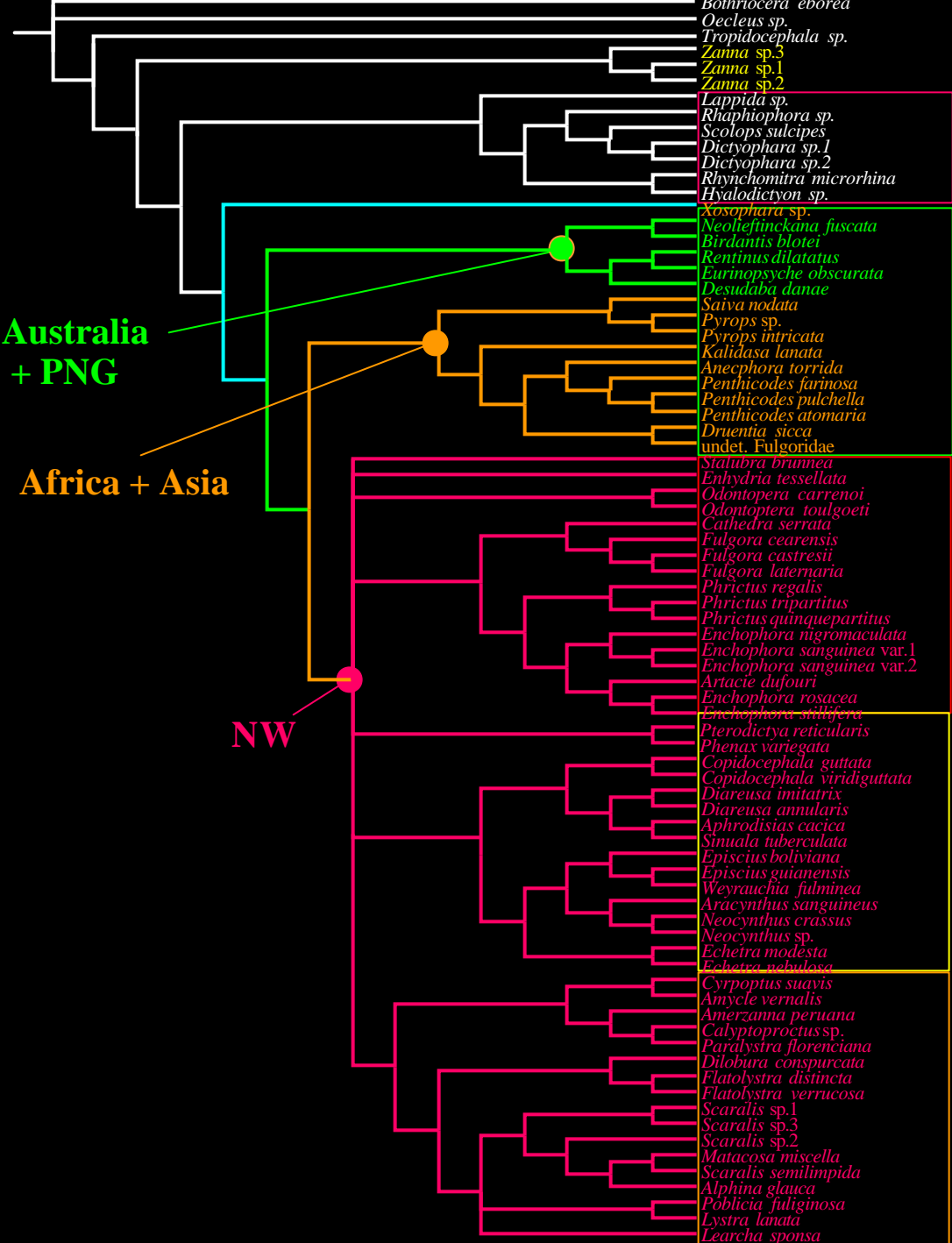


Bayesian analysis

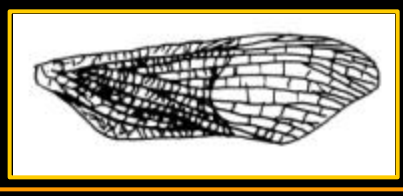
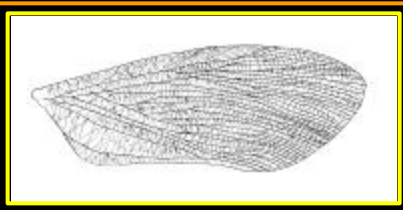
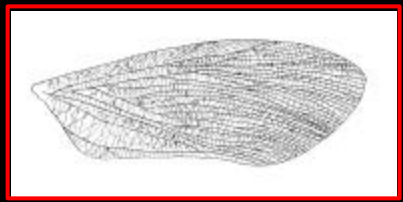
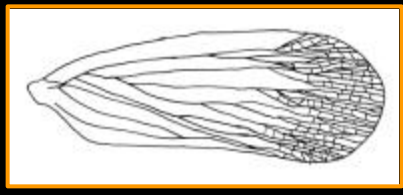
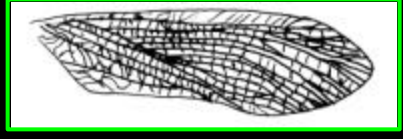
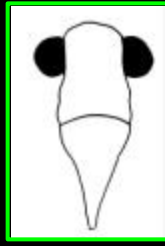
Zanna placed outside of Fulgoridae

Monophyletic New World lineage

2 Old World lineages?



- Bothriocera eborea*
- Oecleus* sp.
- Tripidocephala* sp.
- Zanna* sp.3
- Zanna* sp.1
- Zanna* sp.2
- Lappida* sp.
- Rhaphiophora* sp.
- Scolops sulcipes*
- Dictyophara* sp.1
- Dictyophara* sp.2
- Rhynchomitra microrrhina*
- Hyalodictyon* sp.
- Xosophara* sp.
- Neohetfinckana fuscata*
- Birdantis blotei*
- Rentinus dilatatus*
- Eurinopsyche obscurata*
- Desudaba danae*
- Saiva nodata*
- Pyrops* sp.
- Pyrops intricata*
- Kalidasa lanata*
- Anechphora torrida*
- Penthicodes farinosa*
- Penthicodes pulchella*
- Penthicodes atomaria*
- Druentia sicca*
- undet. **Fulgoridae**
- Statubra brunnea*
- Enhydria tessellata*
- Odontoptera carrenoi*
- Odontoptera toulgoeti*
- Cathedra serrata*
- Fulgora cearensis*
- Fulgora castresii*
- Fulgora laternaria*
- Phrictus regalis*
- Phrictus tripartitus*
- Phrictus quinquepartitus*
- Enchophora nigromaculata*
- Enchophora sanguinea* var.1
- Enchophora sanguinea* var.2
- Artacie dufouri*
- Enchophora rosacea*
- Enchophora sinifera*
- Pterodictya reticularis*
- Phenax variegata*
- Copidocephala guttata*
- Copidocephala viridiguttata*
- Diareusa imitatrix*
- Diareusa annularis*
- Aphrodisias cacica*
- Sinuata tuberculata*
- Episcius boliviana*
- Episcius guianensis*
- Weyrauchia fulminea*
- Aracynthus sanguineus*
- Neocynthus crassus*
- Neocynthus* sp.
- Echetra modesta*
- Echetra nebulosa*
- Cyrpoptus suavis*
- Amycle vernalis*
- Amerzanna peruana*
- Calyptoproctus* sp.
- Paralystra florenciana*
- Dilobura conspurcata*
- Flatolystra distincta*
- Flatolystra verrucosa*
- Scaralis* sp.1
- Scaralis* sp.3
- Scaralis* sp.2
- Matacosa miscella*
- Scaralis semilimpida*
- Alphina glauca*
- Pöblicia fuliginosa*
- Lystra lanata*
- Learcha sponsa*



Fulgoridae II (*Urban & Cryan, in progress*)

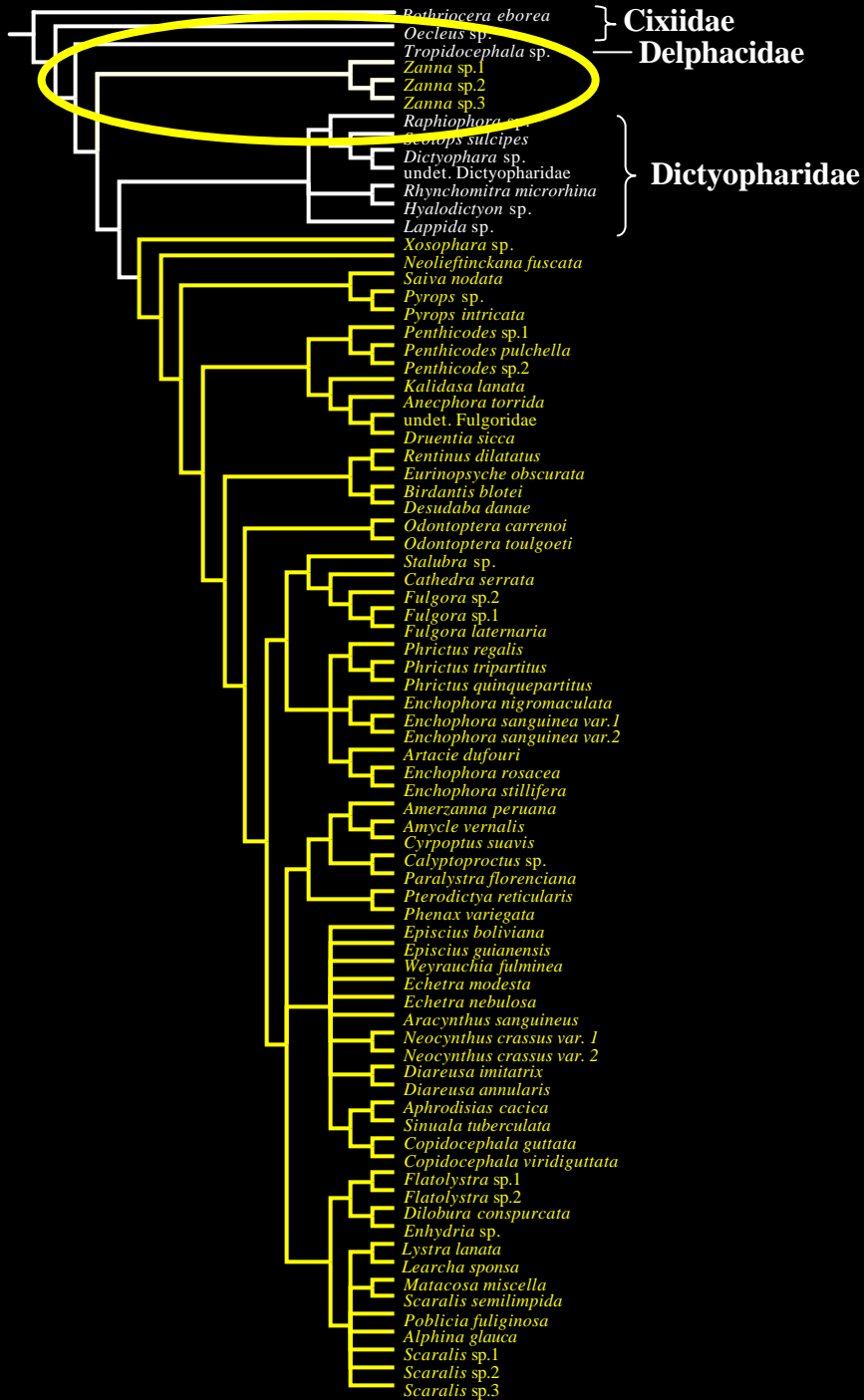
Increasing taxonomic sampling

13 genera new to data set

40 species new to data set

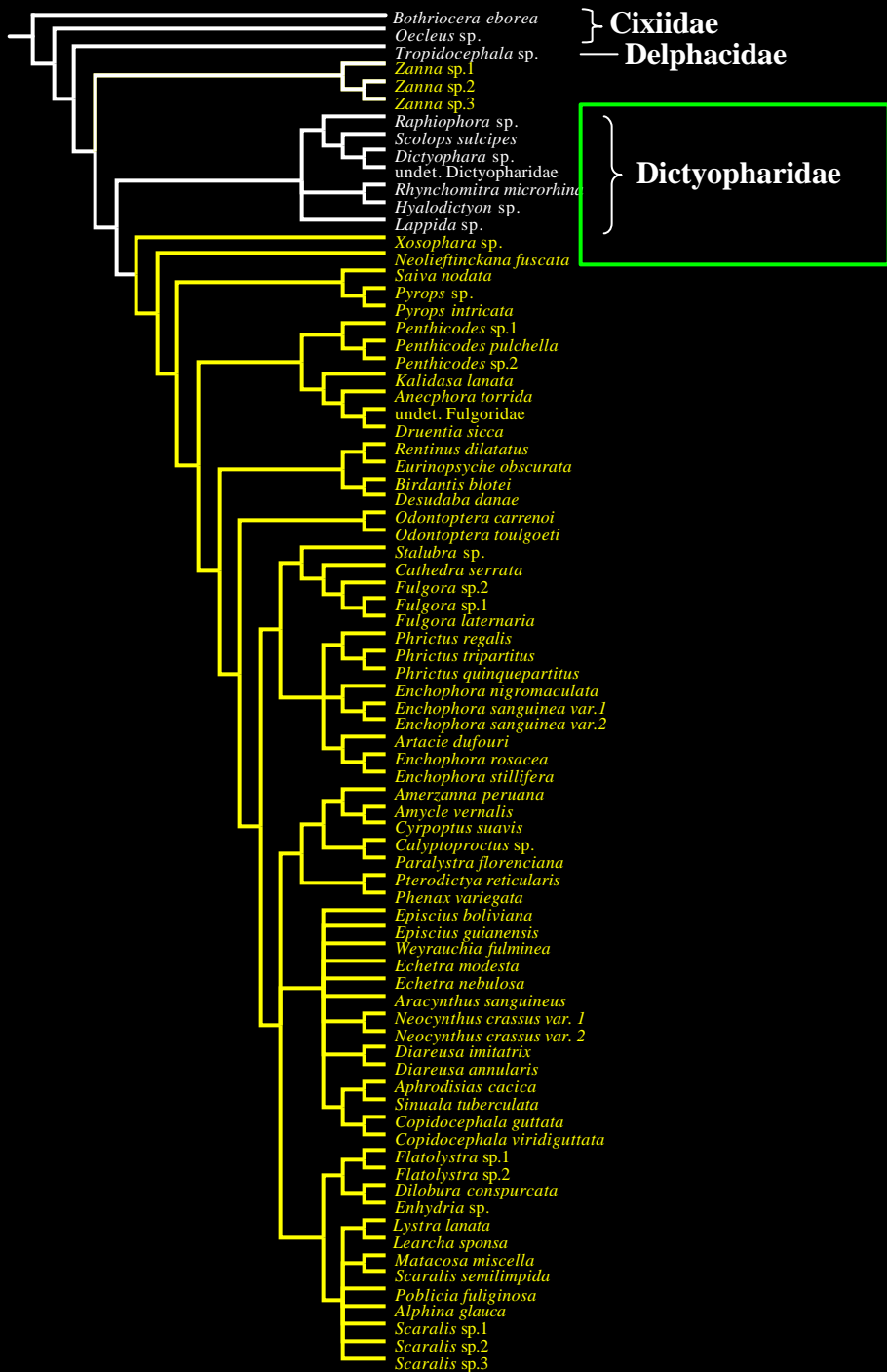
Reworking some morphological characters

Objective: Basis for revised classification



Increased sampling of *Zanna*





Increased sampling of *Zanna*

Increased sampling within Dictyopharidae

Increased Old World sampling (3 genera)

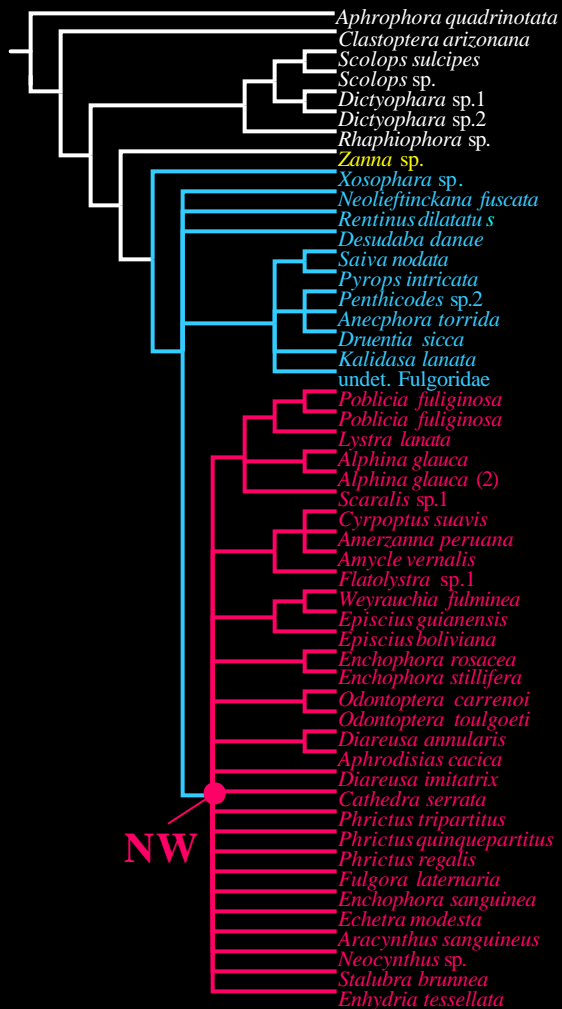
Increased sampling within genera

Endosymbionts

Within Fulgoridae and Dictyopharidae

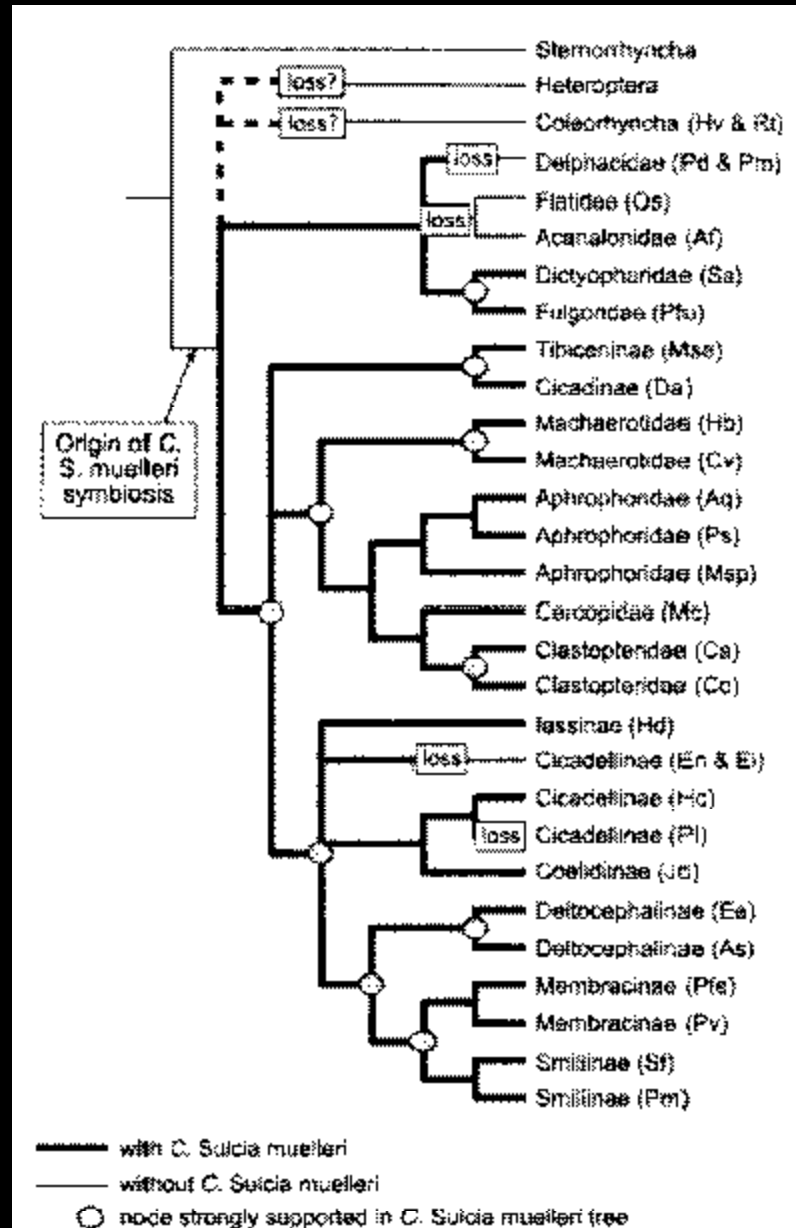
Sulcia muelleri

? -proteobacteria



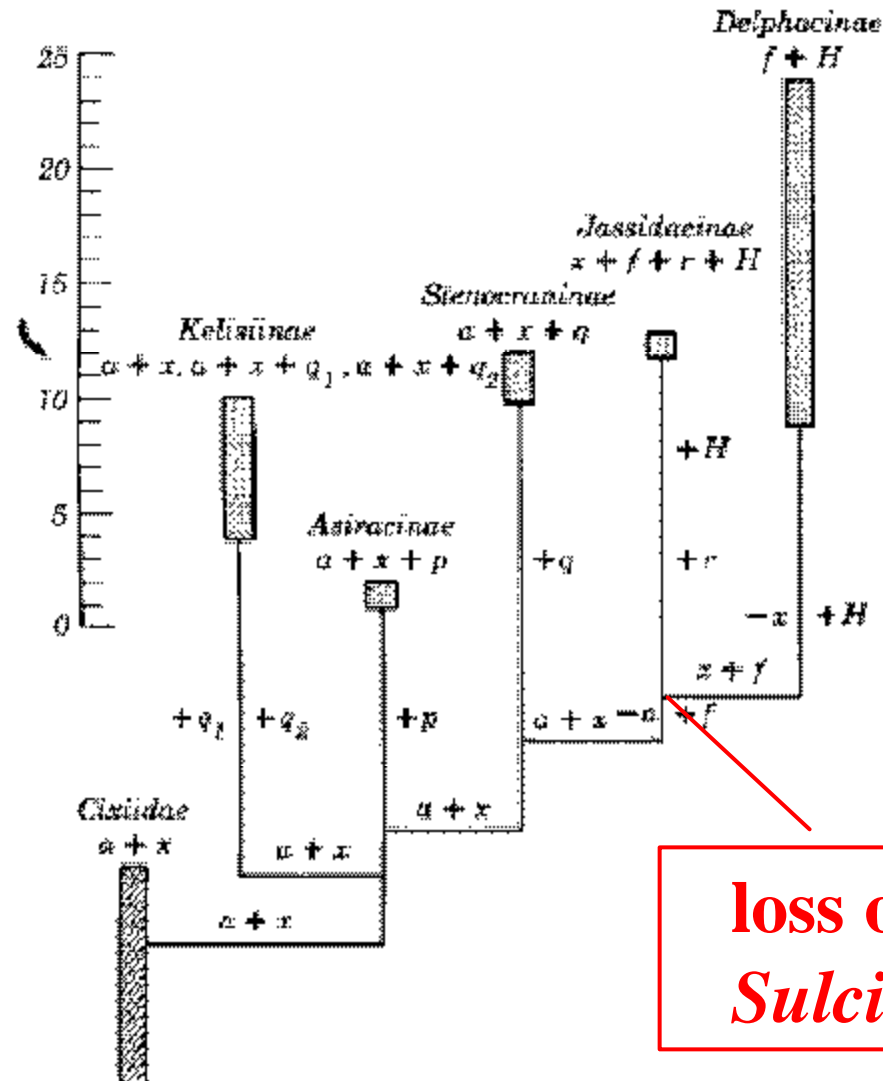
Other Lineages?

(Moran *et al.*, 2005)



Sulcia in Delphacidae?

(Buchner, 1965)



New *Rentinus* species

Collected by Simon lab -- Australia

