Macroheterocera: overview of the macro-moths

SWRS Lepidoptera Course, Aug. 2011
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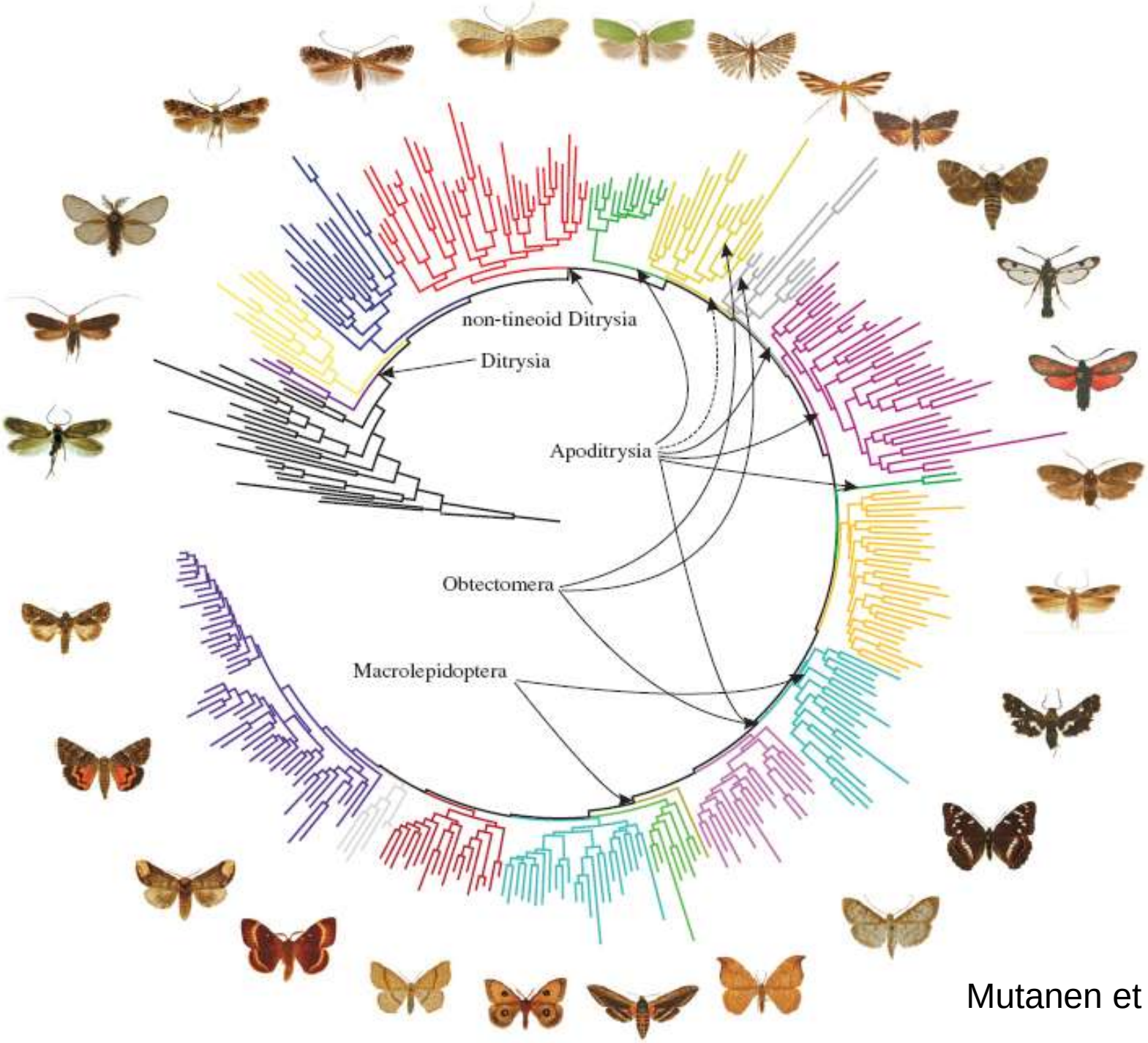
Canadian National Collection of Insects, Arachnids and Nematodes

What happened to the “Macrolepidoptera”?

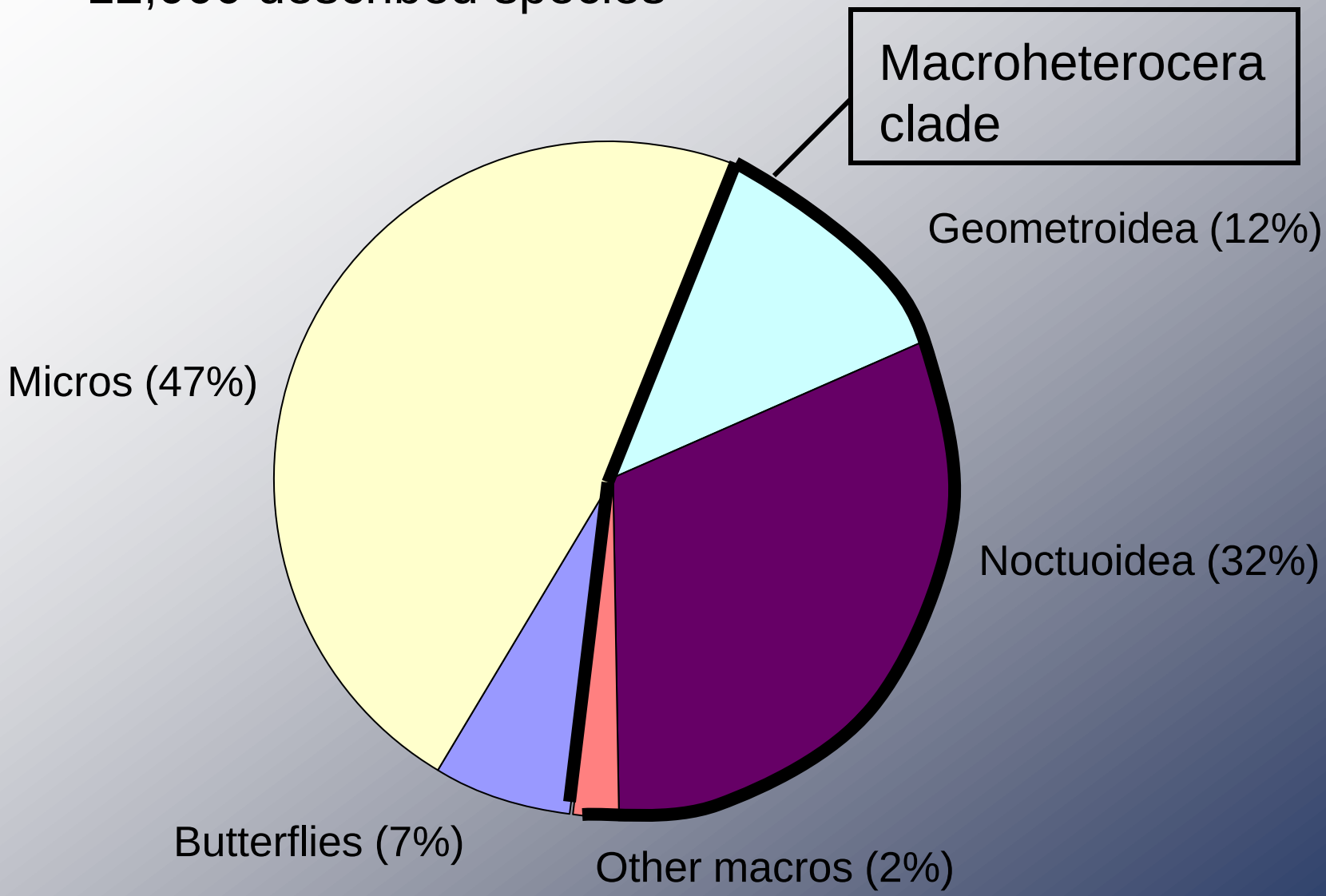
- not a natural group, i.e. butterflies are not macrolepipdoptera



Mutanen et al. 2010

North American Lepidoptera

12,000 described species



North American Lepidoptera

- 12,000 species known, but how many more are out there?

  fauna ~75% known, i.e. **4,000 undescribed species**

- most are microlepidoptera, but many macros too:
  - ~500 Noctuoidea, ~300 Geometroidea

Macro-moth superfamilies

Bombycoidea: (silk moths and kin)

Saturniidae, Sphingidae, Apatelodidae

Lasiocampoidea: Lasiocampidae (tent caterpillars and kin)

Geometroidea:

Geometridae (inchworms)

Sterrhinae, Larentiinae, Archiearinae, Ennominae

Uraniidae

Sematuridae

Drepanoidea: (hook-tips and kin)

Drepanidae, Doidae

Noctuoidea (owlet moths and kin)

Lasiocampidae: tent caterpillars, lappets

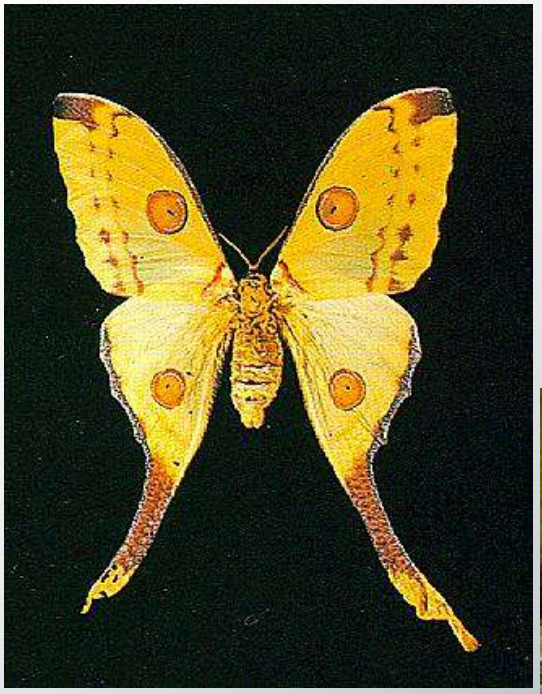
- simple wing pattern: no prominent spots, dull colors
- plumose antennae, shaggy vestiture
- tree and shrub feeding larvae: some irruptive (*Malacosoma*)
- ~30 N. Am. species

Lasiocampidae: tent caterpillars, lappets

- included with Bombycoidea in past

- 6 subfamilies, 3 in North America (Malacosomatinae, Pinarinae (was Gastropachinae) Lasiocampinae)

Bombycoidea: Saturniidae



Saturniidae

- large, often colorful; discal spots and often eye spots present; plumose antennae

- don’t feed as adults

- most have arboreal larvae; some w. urticating hairs (Hemileucinae)

- ~70 N. Am. species, best-studied group of macro-moths

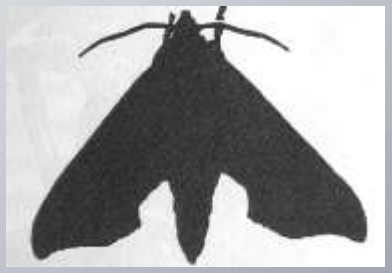
Urticating hairs in *Hemileuca nevadensis*

Bombycoidea: Apatelodidae

- previously as subfamily of Bombycidae, but not closely related

(Zwick, A. 2008. *Syst. Ent.* **33:**190–209

Sphingidae -
hawkmoths



- distinctively massive bodies, narrow wings (“jet fighter”)

- larvae have caudal horn
- host plants v. diverse, but mostly shrubs, herbaceous dicots (relatively few on trees and monocots)

- ~130 N. Am. species; also very well-known and studied group

Sphingidae:
hawkmoths


Manduca dilucida
84-SRNP-1012


Manduca florestan
81-SRNP-369


Manduca hannibal
93-SRNP-2187


Manduca lanuginosa
84-SRNP-730


Manduca lefeburii
81-SRNP-224


Manduca muscosa
80-SRNP-192


Manduca occulta
81-SRNP-151


Manduca ochus
99-SRNP-1147


Manduca pellenia
97-SRNP-1568


Manduca rustica
81-SRNP-347


Manduca sexta
78-SRNP-24


Neococytius cluentius
81-SRNP-695


Nyceryx coffaeae
80-SRNP-181


Nyceryx magna
98-SRNP-6789


Nyceryx riscus
85-SRNP-308


Pachygonidia drucei
81-SRNP-664


Pachygonidia ribbei
99-SRNP-769

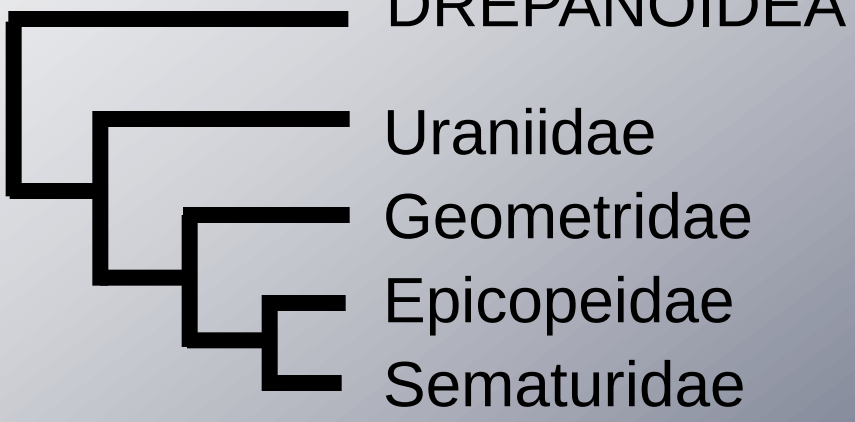

Pachygonidia subhamata
95-SRNP-659


Pachylia darceta
98-SRNP-3241


Pachylia ficus
80-SRNP-74

Geometroidea

- no good structural apomorphies and phylogeny not fully resolved.



Sihvonen et al. 2011

Mutanen et al. 2010

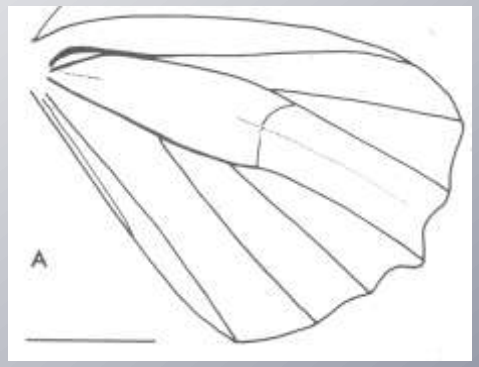
Geometridae

”earth-measurer:” inchworms

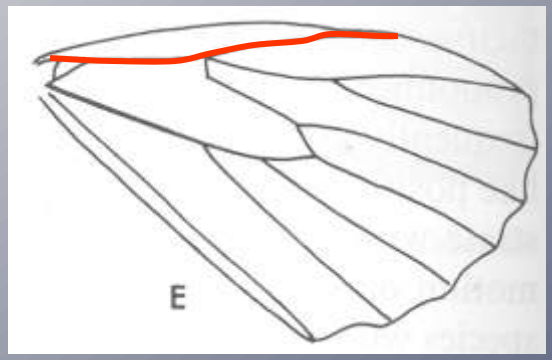
- tympanum on abdomen base: unique
- wings usually marked with wavy lines, fore- and hindwing pattern similar – many rest w. wings flat or vertically over body (rarely tent-like or rolled)
- larvae unique: no prolegs on segments 3-6.
- most diverse in wooded and shrubby habitats: arboreal larvae
- female wingless in some species

Geometridae: Larentiinae

- HW vein Sc+R fused w. Rs >= half of disc length
- FW bands juxtaposed lines



Ennominae



Larentiinae (Kristensen 1998)

Geometridae: Sterrhinae

- sister group to Larentiinae

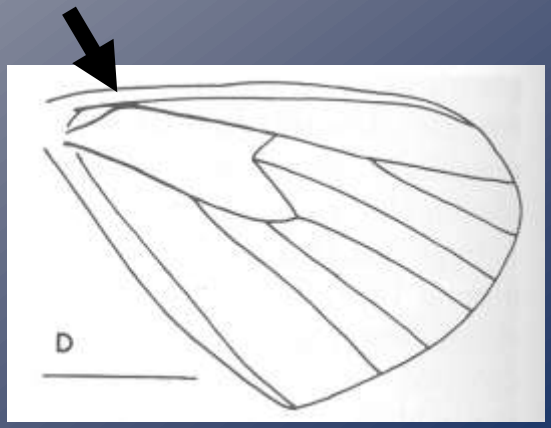
wavy lines don’t form bands

- FW with areole

- anterolateral extensions on male Sternite 2 absent.

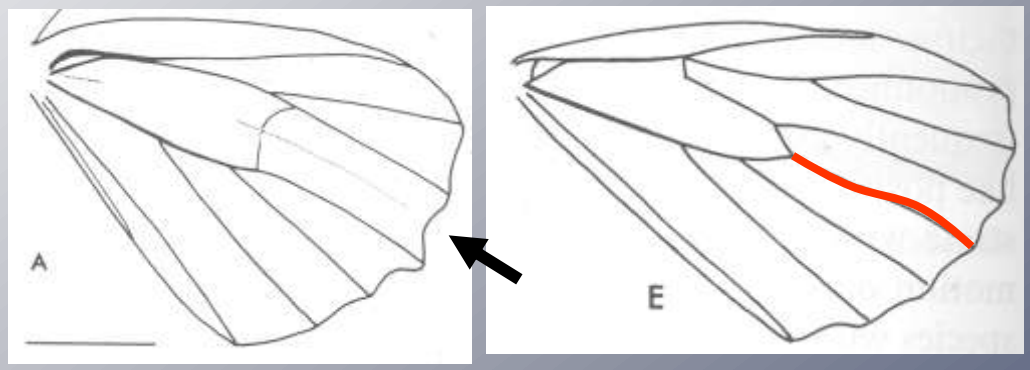
HW Rs fused for short distance

- see Sihvonen & Kaila 2004



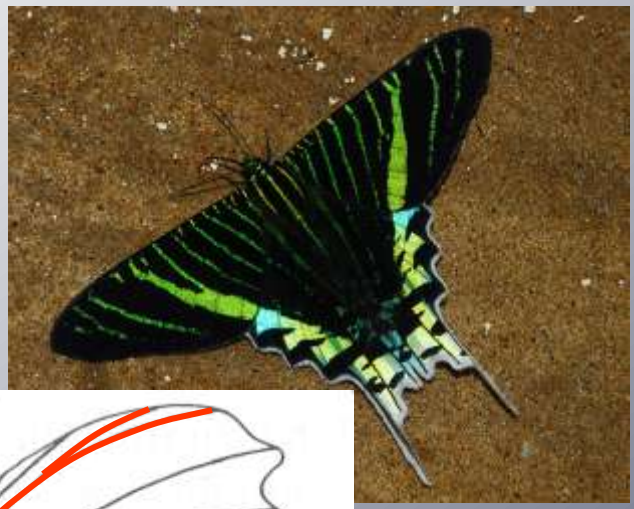
Geometridae: Ennominae

- nearly ½ of all Geo's
- vein M2 of HW lost (loss of characters can be problematic)

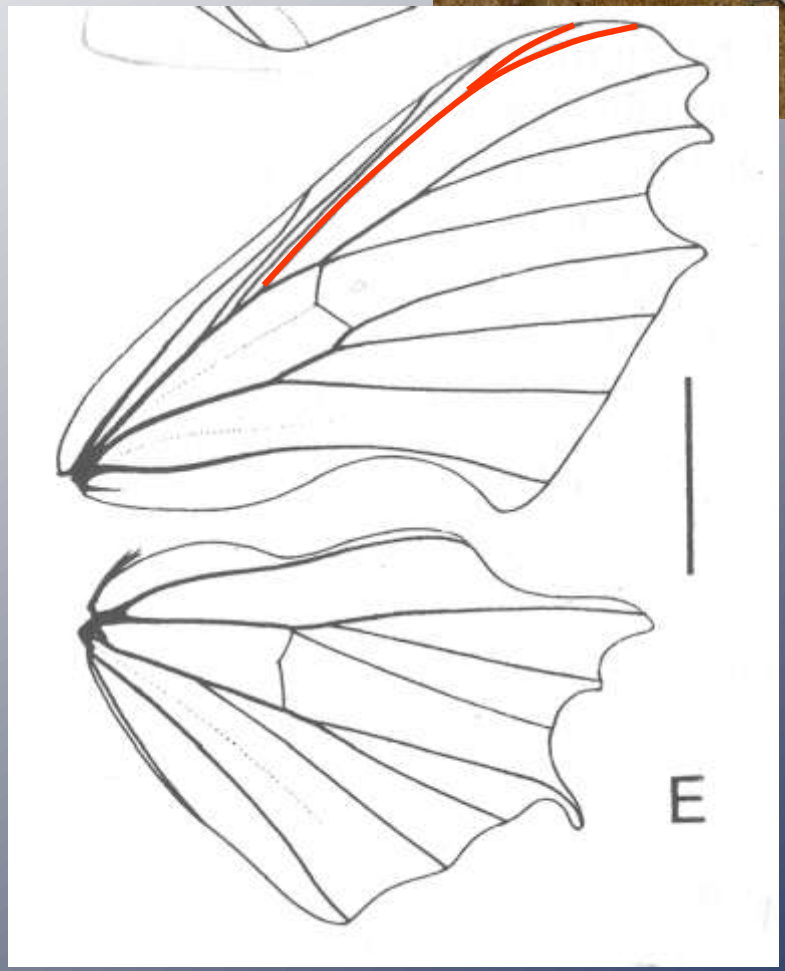


Ennominae Larentiinae (Kristensen 1998)

Uraniidae



- tympanal structure autapomorphic
- m/f tympanum differs!
- FW vein Rs4 stalked w. M1, but separate from other Rs



Uraniidae

Sematuridae

- unique thickened antennae
- never have tympanum, unlike remaining Geometroidea

Drepanoidea: Drepanidae

- defined by unique tympanum: positioned internally

- larva: presence of secondary seta on A1-A8 near spiracle

Doidae – Drepanoidea?

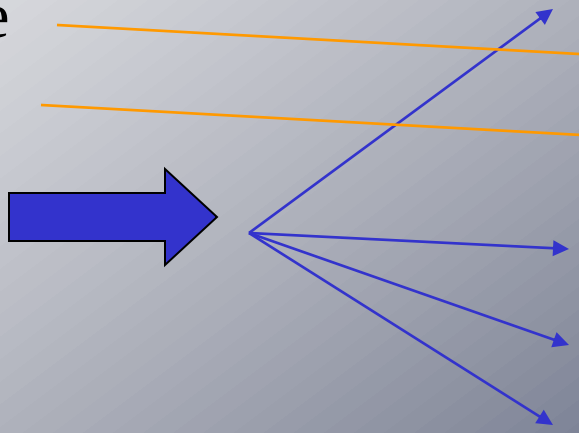
- only recently (1987) recognized as separate family
- small family, New World only; phylogenetic placement not stable
- no unique characters, but tympanal struc. similar to Notodontidae and Noctuidae, previously Noctuoidea!
- larvae with swollen thoracic segments – similarities to Thyatirinae

Doidae

Superfamily Noctuoidea

Old:

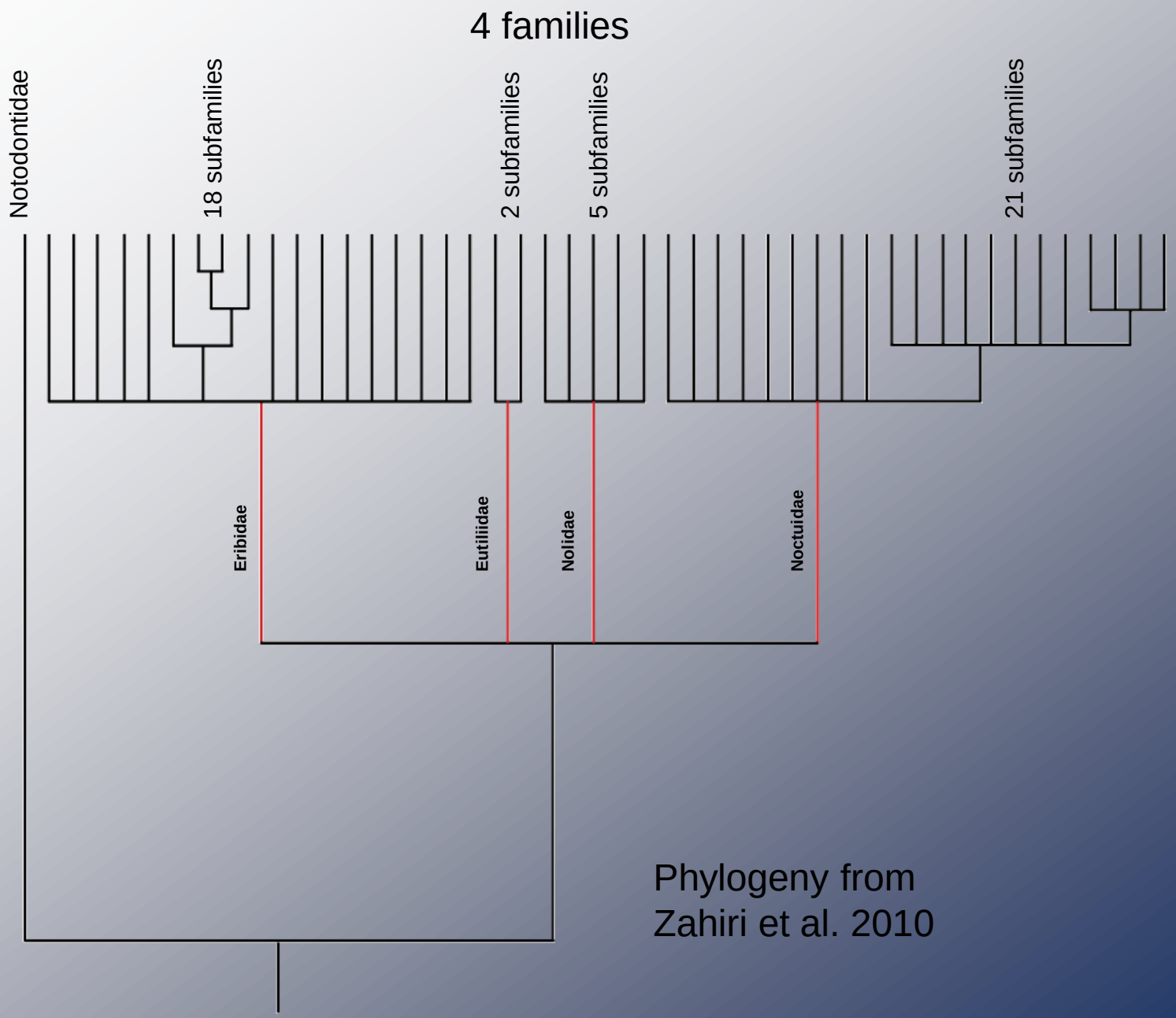
- Doidae
- Notodontidae
- Lymantriidae
- Arctiidae
- Noctuidae



New:

- [Doidae: Drepanoidea!]
- Notodontidae
- Erebidae
  - Lymantriinae
  - Arctiinae
- Nolidae
- Euteliidae
- Noctuidae

Families from Franclemont & Todd 1983 on phylogeny from Zahiri et al. 2010


4 families
Notodontidae
18 subfamilies
2 subfamilies
5 subfamilies
21 subfamilies
Eribidae
Eutiliidae
Nolidae
Noctuidae
Phylogeny from
Zahiri et al. 2010

Some important structures to look at in lab:

- forewing and hindwing venation
- tympanum (Geo's, Noctuoidea, Pyralidae)
- bare frons (Erebinae)
- tymbal (Arctiinae)