

How do species get their name? from discovery to disclosure

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How do species get their name?

taxonomy: the science of naming and classifying organisms

Greek:

taxis arrangement

nomos law

taxonomists identify, describe and name the diversity of life

the ultimate product of their activities is identification literature, such as field guides

taxonomists discover new species!



species discovery: take a cruise...



fly helicopters...



ride a motorcycle...



climb mountains...



sample the local cuisine...



... and catch those specimens!





“I attached some pictures of (I think) an *Urothemis* but I don't find the species!”

Nicolas Mézière, 12.x.2009
S.E.Gabon (1500 km west)

new species found by Nico Mézière in SE Gabon



Africocypha

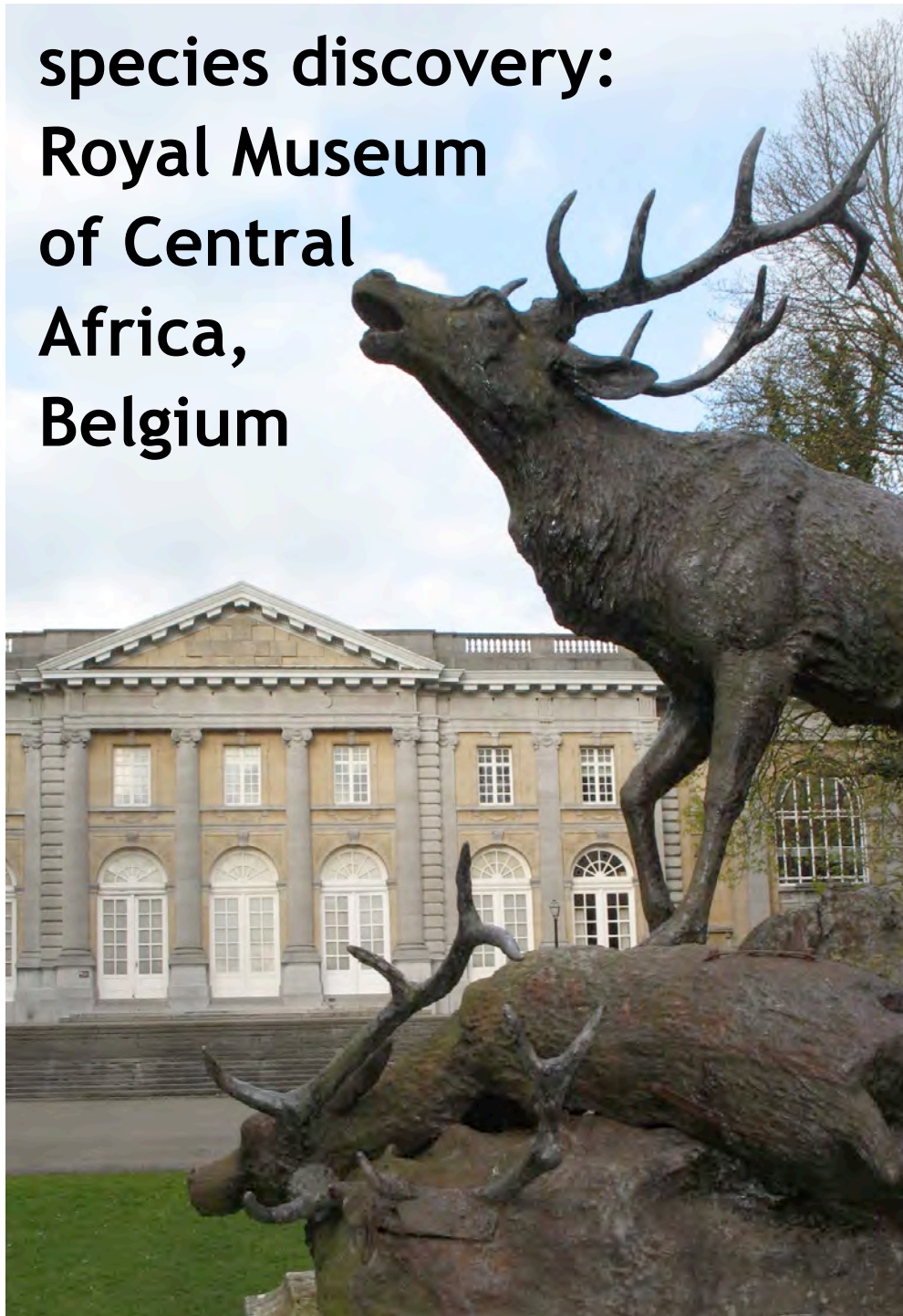


Elattoneura



Urothemis

species discovery:
Royal Museum
of Central
Africa,
Belgium







Natural History Museum of Zimbabwe
work place Elliot Pinhey 1950-1982





S. gracilis



S. venator

2 species of
Syncordulia

both are
VULNERABLE
Cape endemics





S. gracilis



S. venator

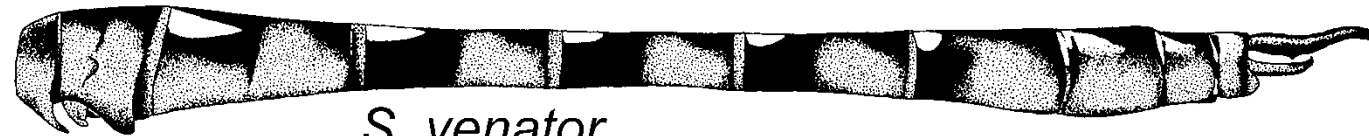
2 species of
Syncordulia

... or 3?

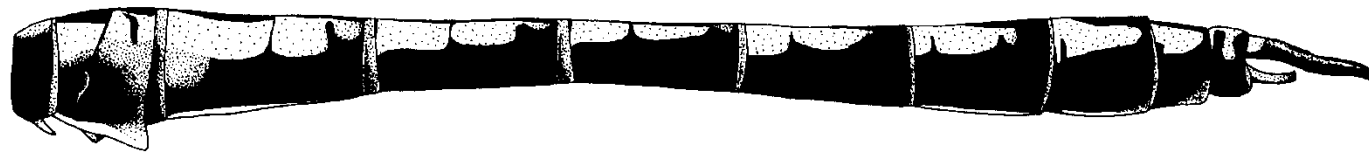




S. gracilis



S. venator



3 species of
Syncordulia

... or 4?



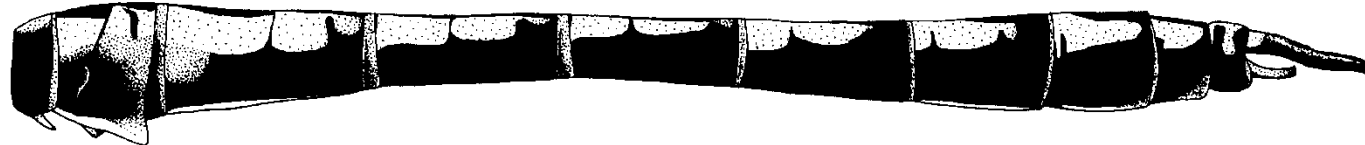
4 species of
Syncordulia!



S. gracilis



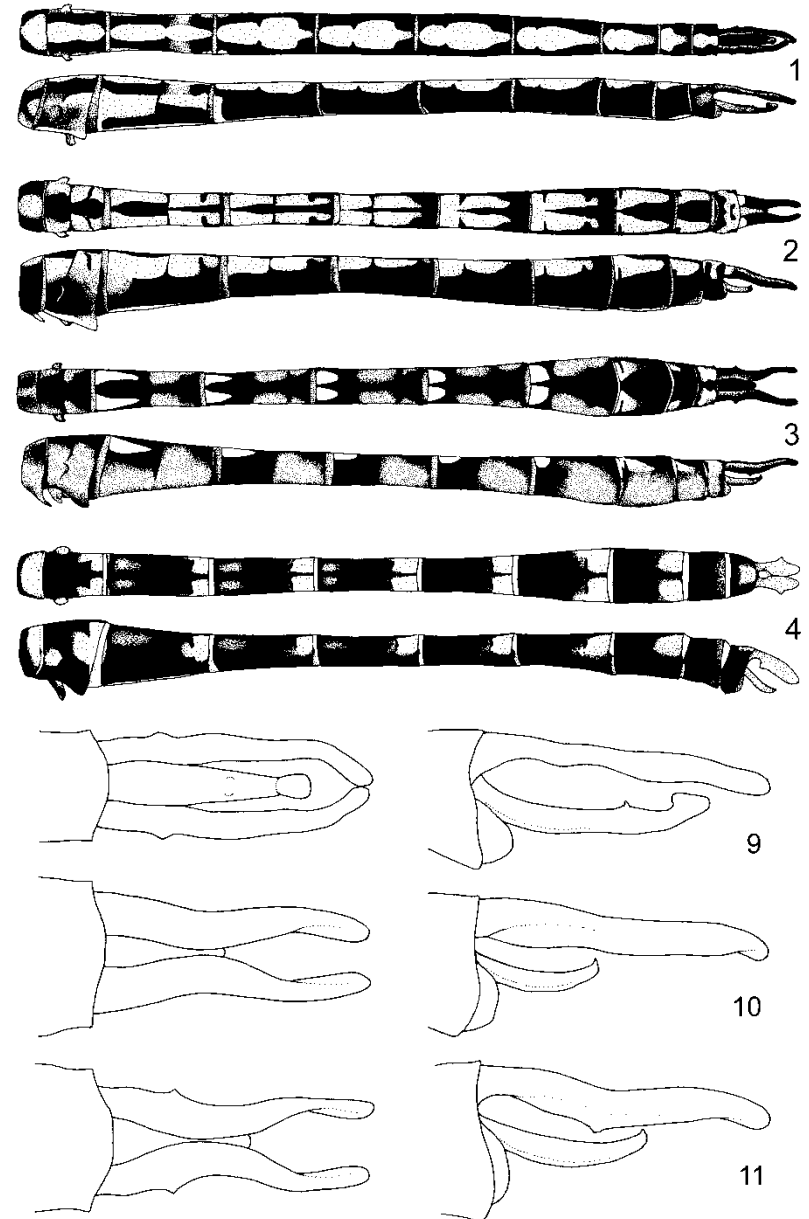
S. venator



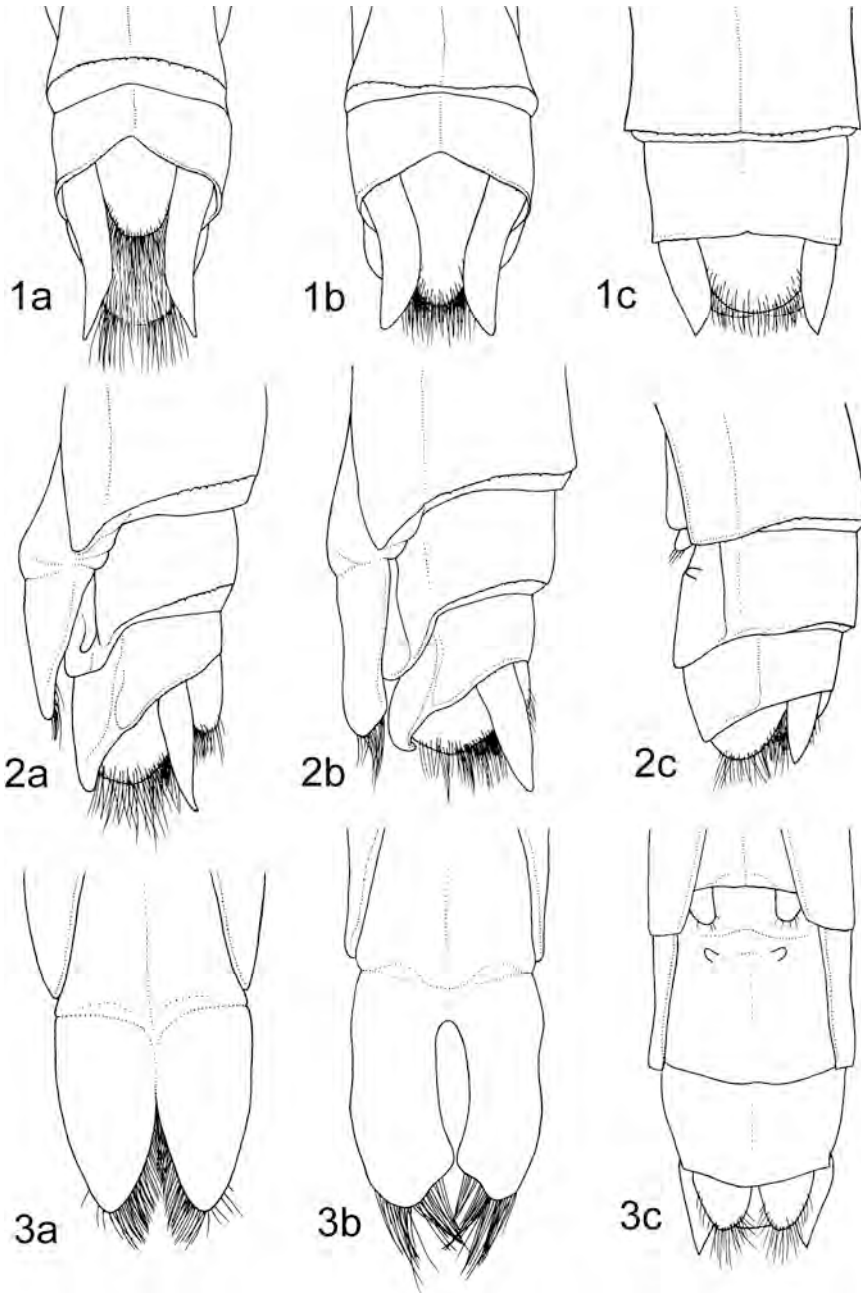
all threatened endemics of Cape Region, South Africa

The taxonomic process: introducing a new species

- discovery in field or collection
- study of specimens
- review of taxonomic literature
- comparison similar species
- confer with fellow specialists
- decide on a name
- publish full description
- your name is eternalised
if you are not too late...



Dijkstra et al (2007): *Syncordulia*



Idomacromia jilliana
Dijkstra & Kisakyé, 2004



only two females from Bwindi Impenetrable Forest, Uganda

But what is a species? And what is a name?

caught between

reality:

biological diversity

interpretation:

species concepts

rules:

nomenclature

practice:

often limited data



What is a species?

- Biological species concept: a group of populations whose members have the potential to interbreed in nature and produce viable offspring
- Phylogenetic species concept: the smallest group of individuals on a phylogenetic tree
- Morphological species concept: defines species by structural feature
- more practical considerations...



What is a species? What is a subspecies?

Principles

1. Distinctness: (sub)species differ genetically and abruptly without extensive clinal variation
2. Distribution: subspecies never breed at same location, species may do so
3. Appropriateness: recognising a distinct species is preferable over a subspecies of an existing species



Appropriateness: subspecies vs species

Problem

Reality

vs

Perception

taxon 1

t. 2

taxon 3

the subspecies category has become devaluated by the naming of mere variations (e.g. of size or paleness)

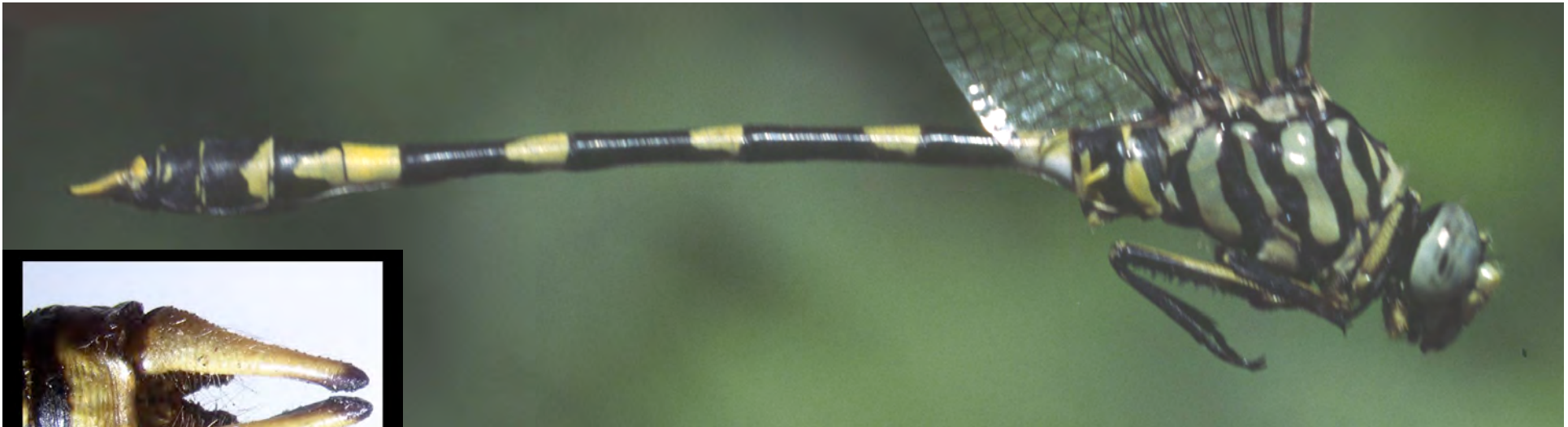
truly distinct taxa have become swamped in the mess

species 1

species 2

Paradox: recognition of less (subspecies) requires more:

1. phenotypic expression is ruled out to explain differences, e.g. size and paleness under environmental influence
2. geographic analysis is performed, e.g. clinal variation ruled out
3. possible status of taxon as full species is considered, e.g. in case of marked differences in morphology and configuration (not mere intensity) of markings
4. consequences are considered, e.g. is the nominotypic subspecies a natural group too?



Variation in melanisation
example: *Gomphidia bredoi*

great variability across vast continent:
morphology nonetheless uniform

15 May 2008



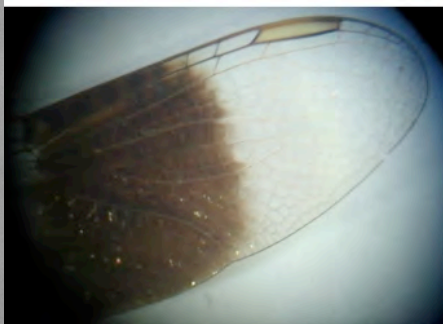
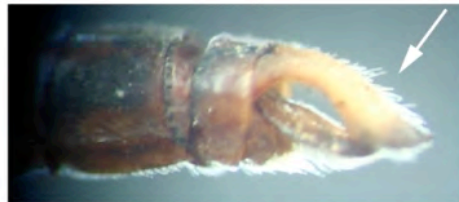
“I have some problems with dragonflies from Senegal. May I ask you for your help with identification?”

Cheers, Nataly Matushkina”

sp. N6



sp. N7

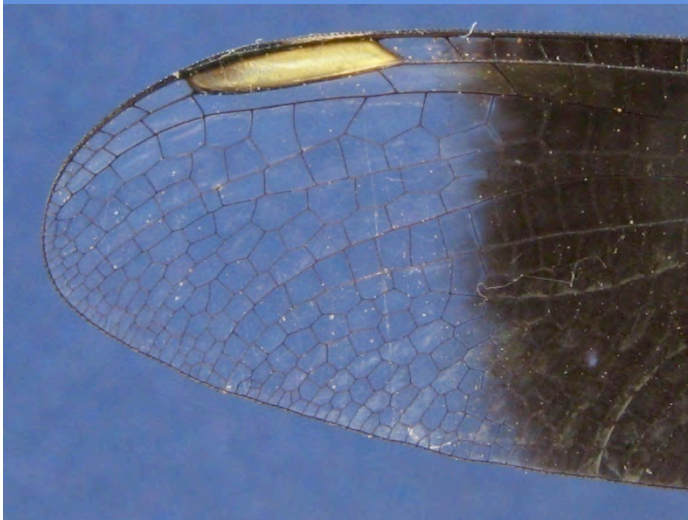
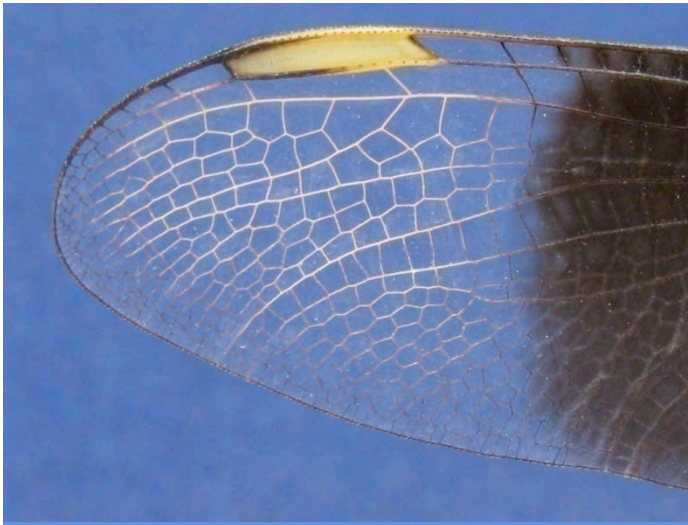


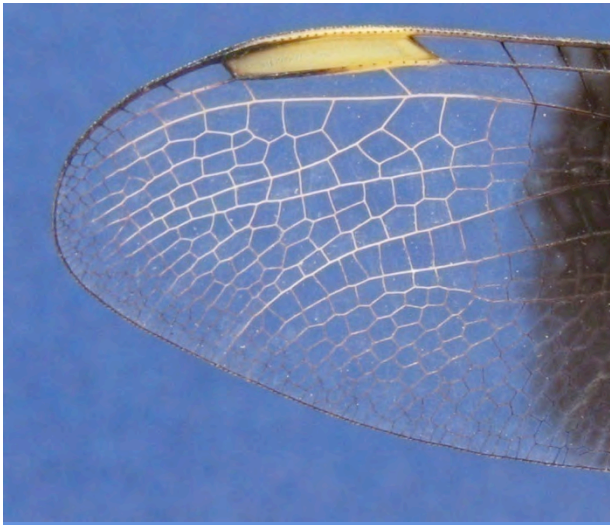
16 May 2008



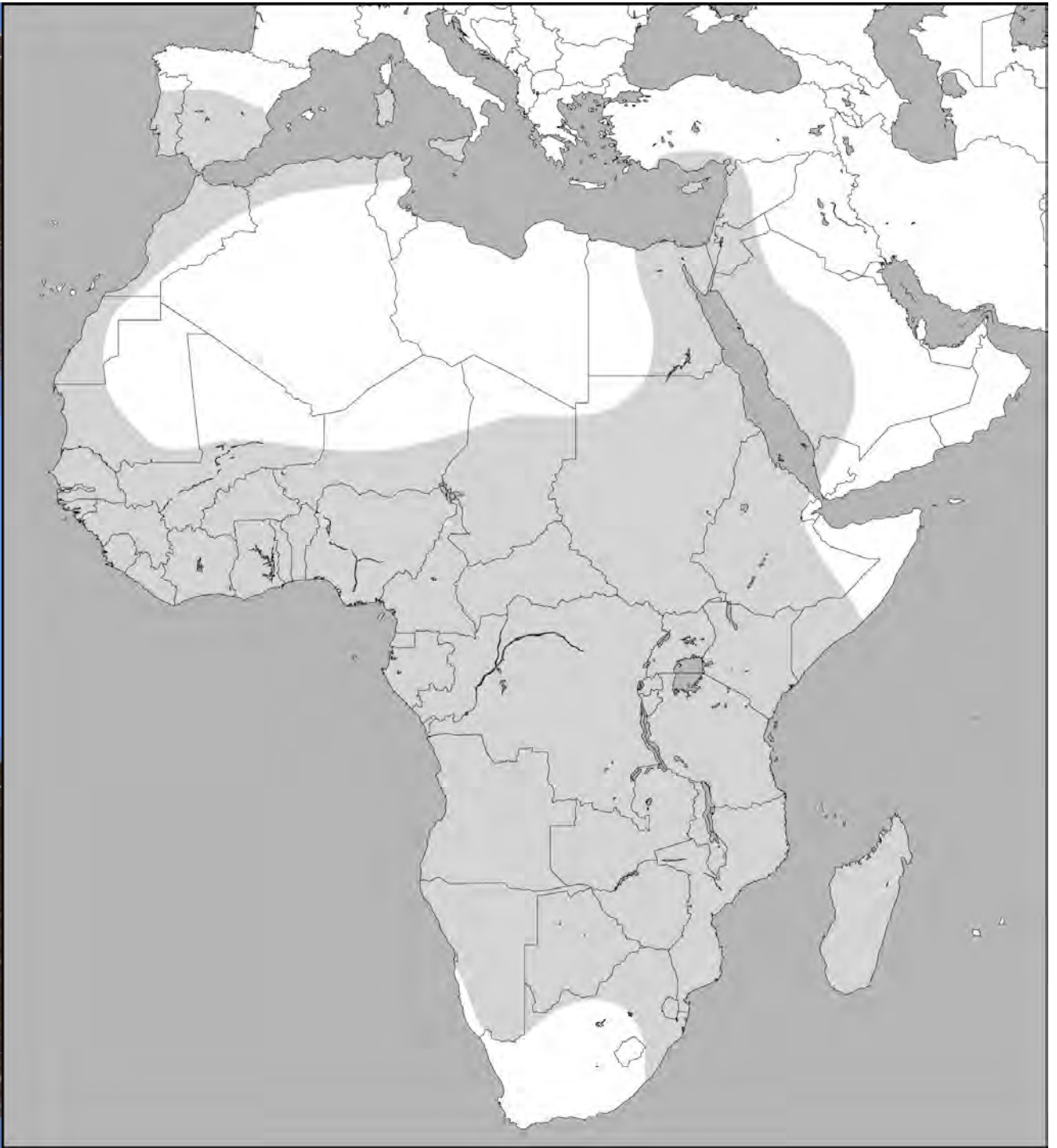
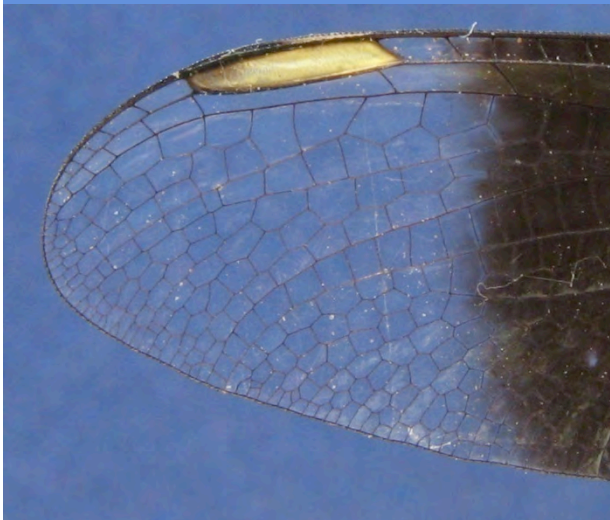
“Are you sure that N6 and N7 are the same species? They have quite different shape of appendages and of lateral margins of tergite 8.”

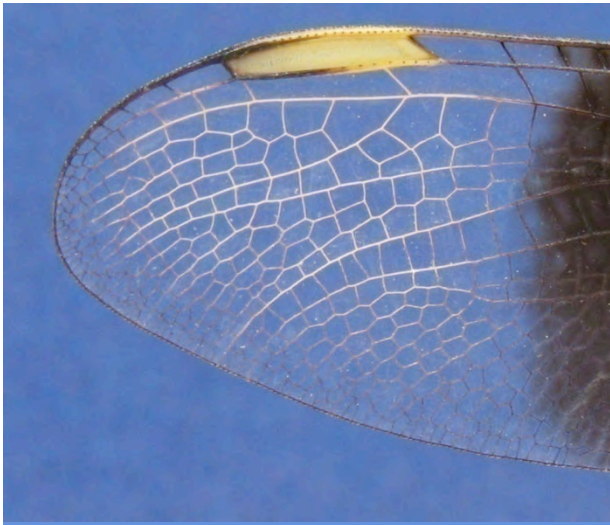
Africa's 'easiest'
and most familiar
dragonfly



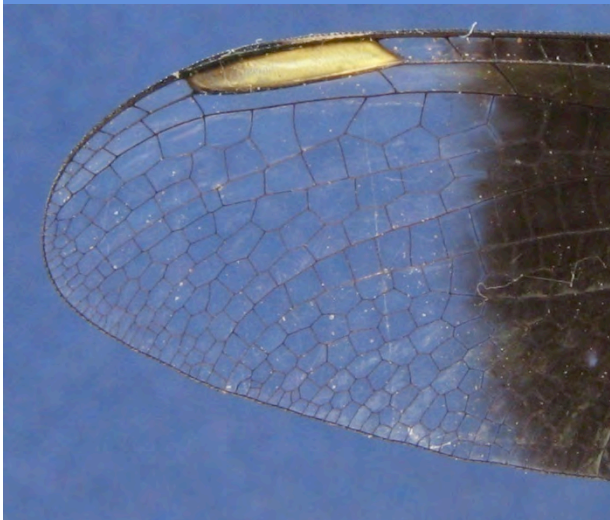


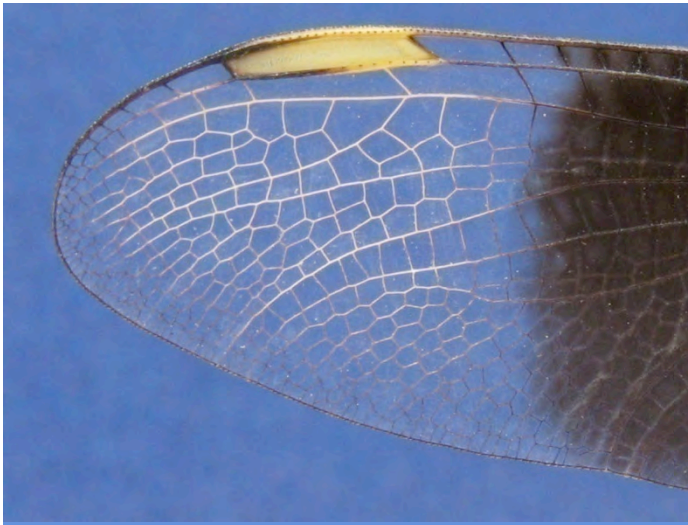
what was
a full map...



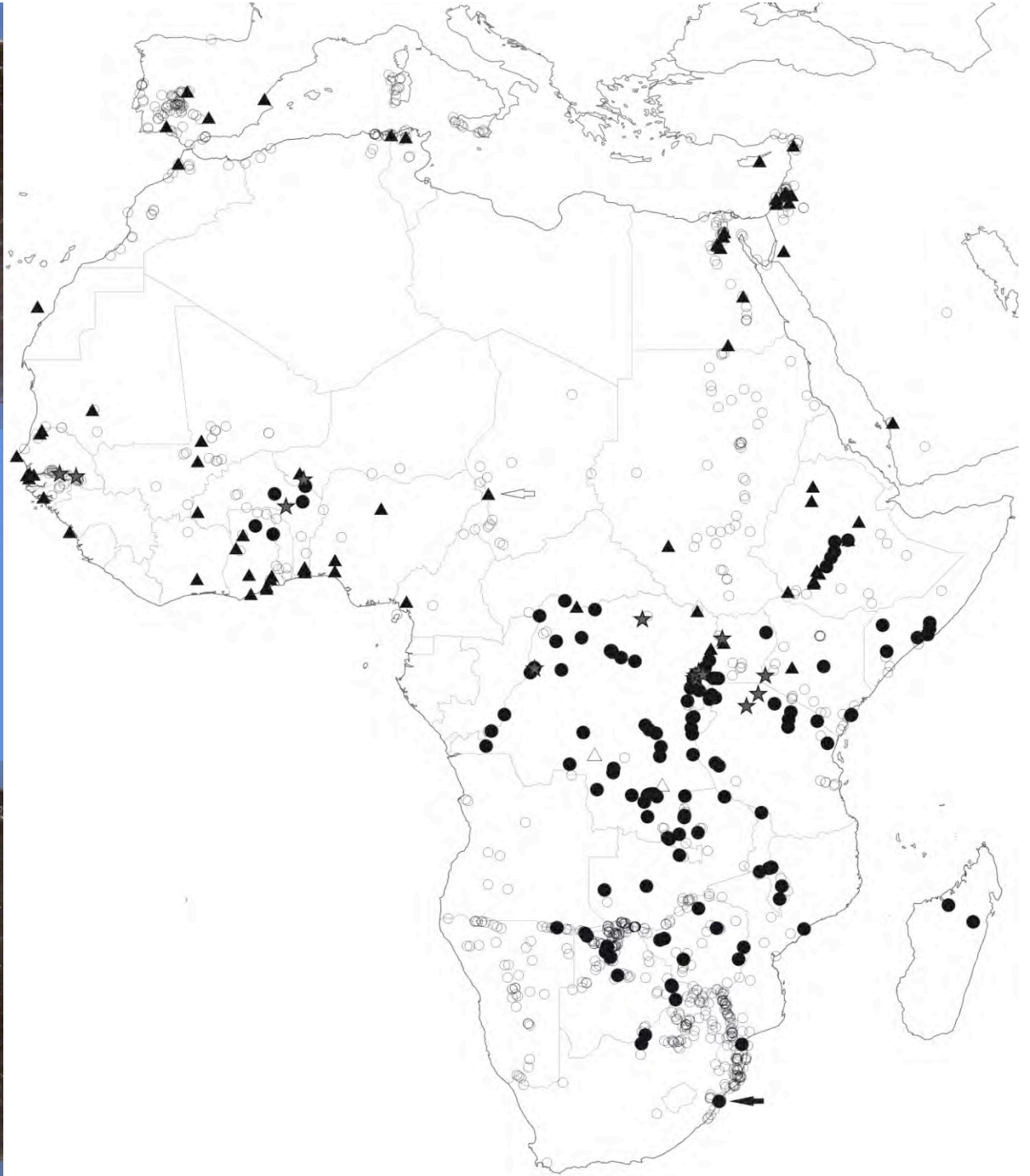
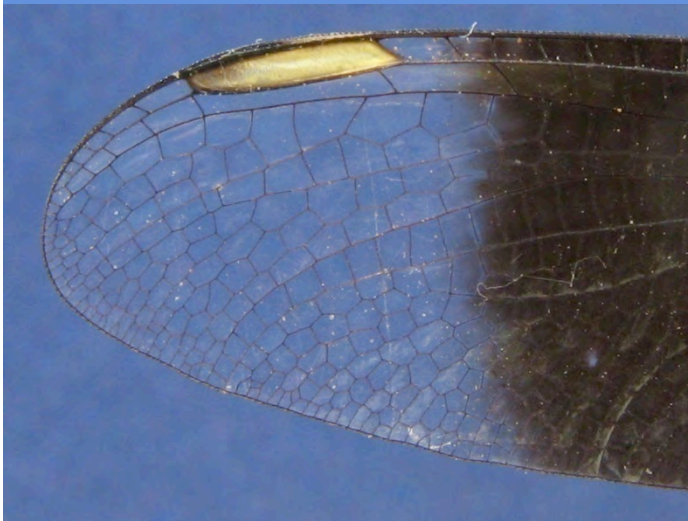


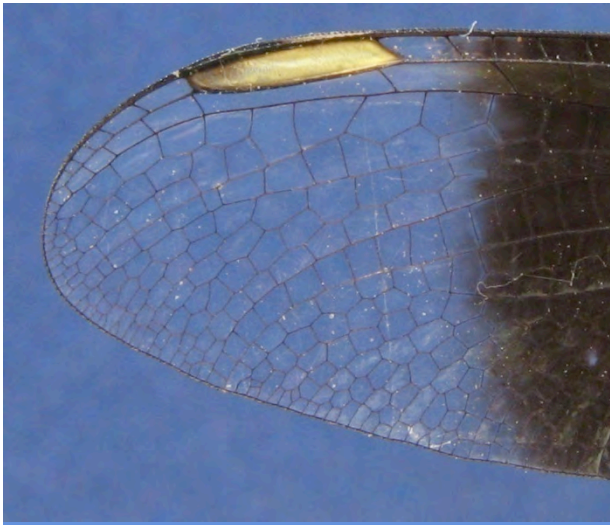
... is instantly
a blank map





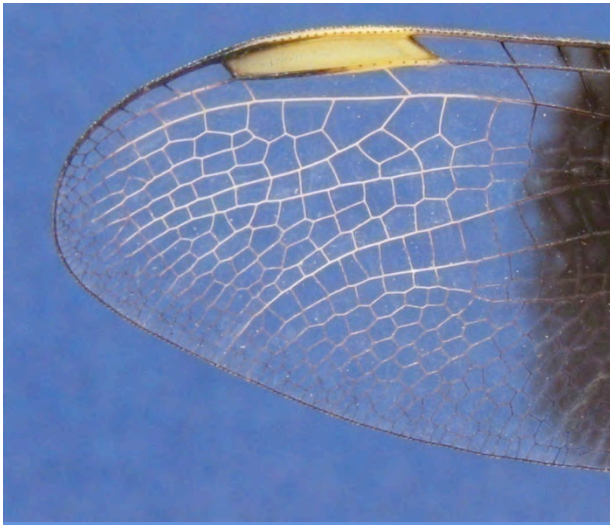
1154 males,
970 females



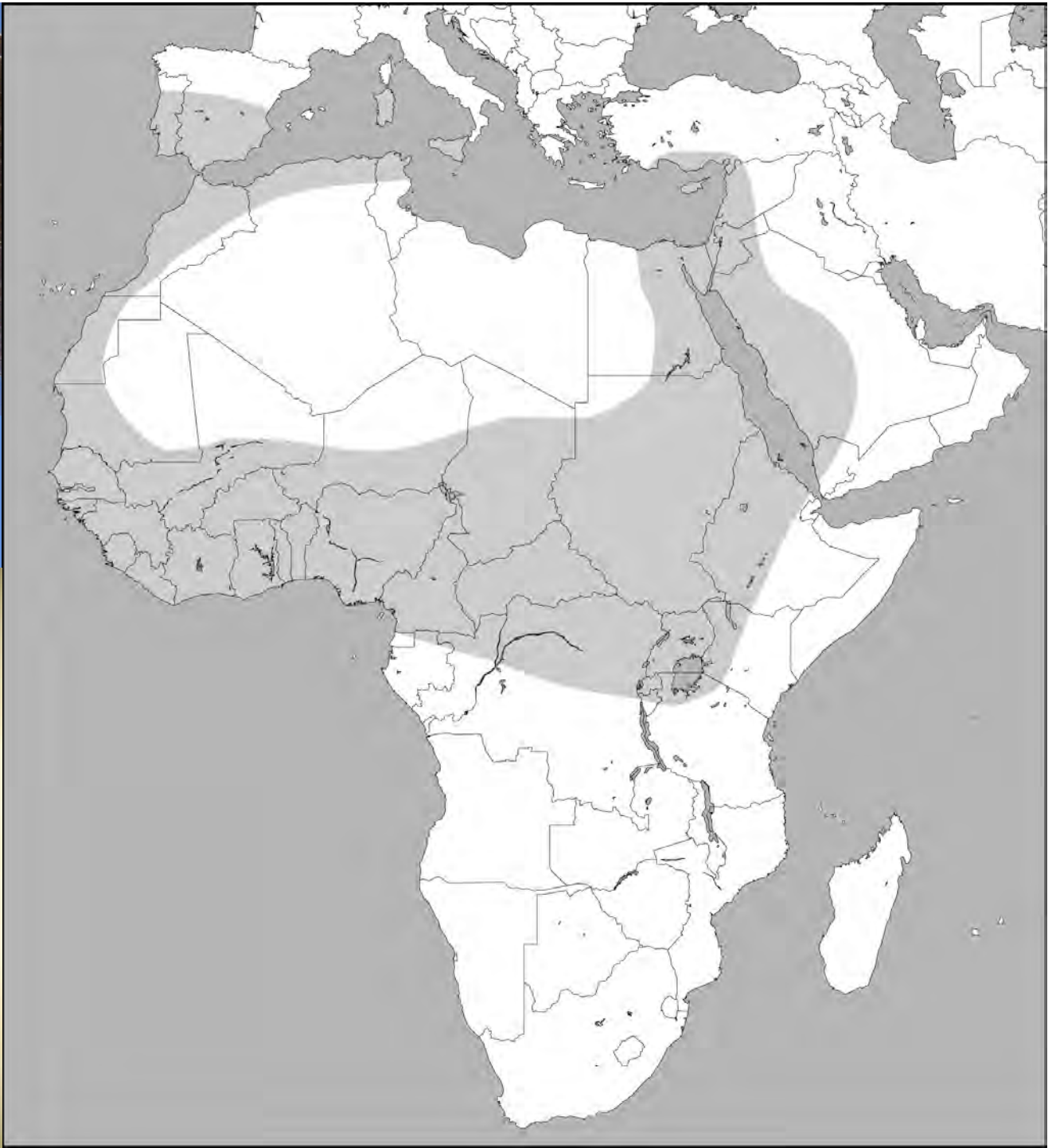


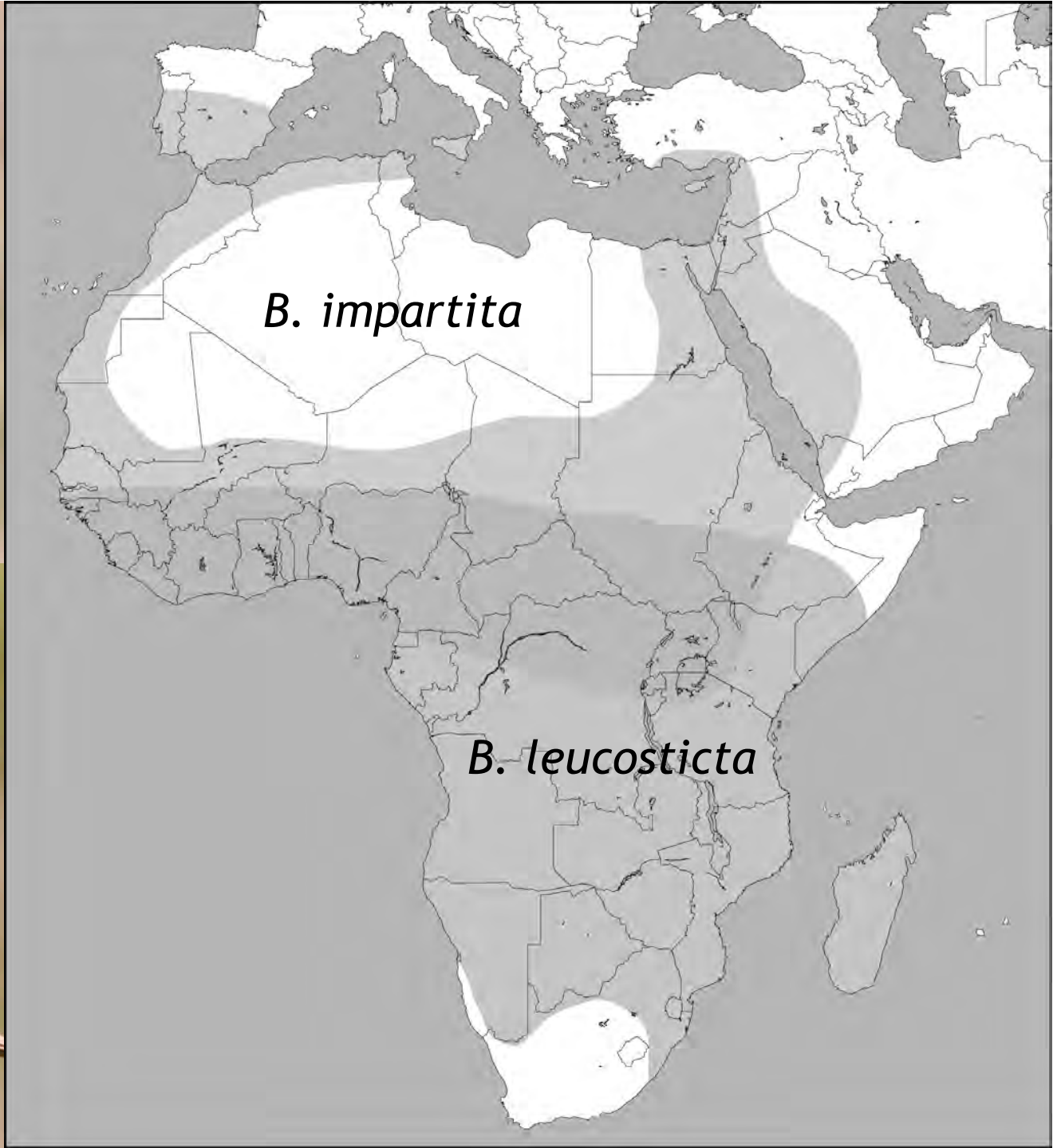
*Brachythemis
leucosticta*





*Brachythemis
impartita*

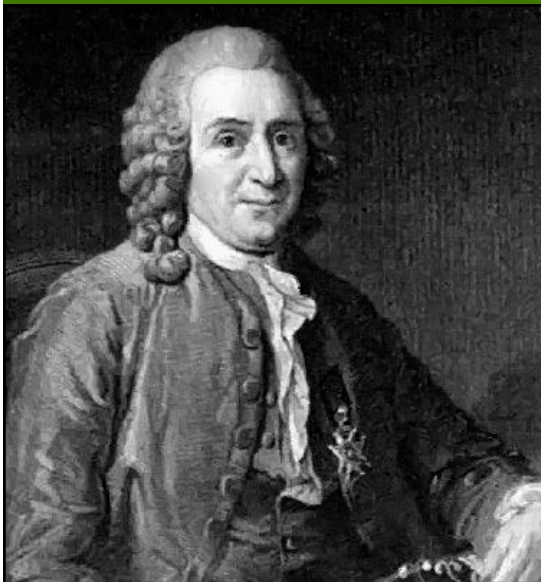




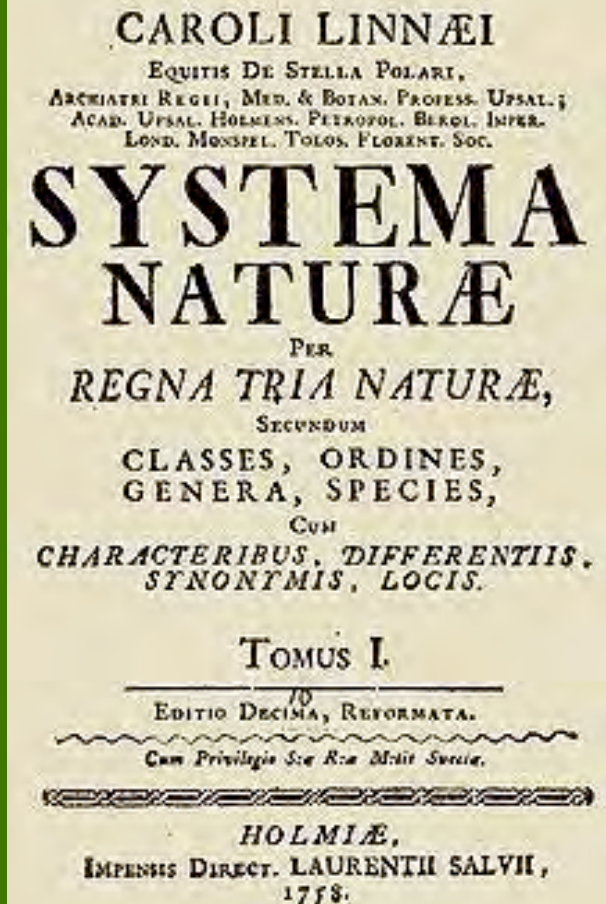
What is a name?

Carolus Linnaeus devised the first binominal method of nomenclature consistently applied to animals and plants, which is still in use today

- first part: genus
- second part: specific epithet
- together form “species name”



Homo sapiens Linnaeus, 1758



International Code of Zoological Nomenclature

rules (mandatory!) and recommendations that determine the structure and formation of names of organisms

Ruling principles

Typification: the identity of a name relies only on its type, not on its description

Synonymy: each taxon only has one valid name

Homonymy: one name can apply to only one taxon

Priority: the earliest description is the “right” one

What is a type?

Holotype: the single specimen upon which a new species-group taxon is based in the original publication

Paratypes: remaining specimens of the original type series (including allotype)

Syntypes: specimens of a type series that collectively constitute the name-bearing type

Lectotype: a syntype designated as the single-name bearing type specimen (+ paralectotypes)

Neotype: the single specimen designated as the name-bearing type when none is believed to exist (anymore)

What is *Platycnemis congolensis* Martin, 1908 ?

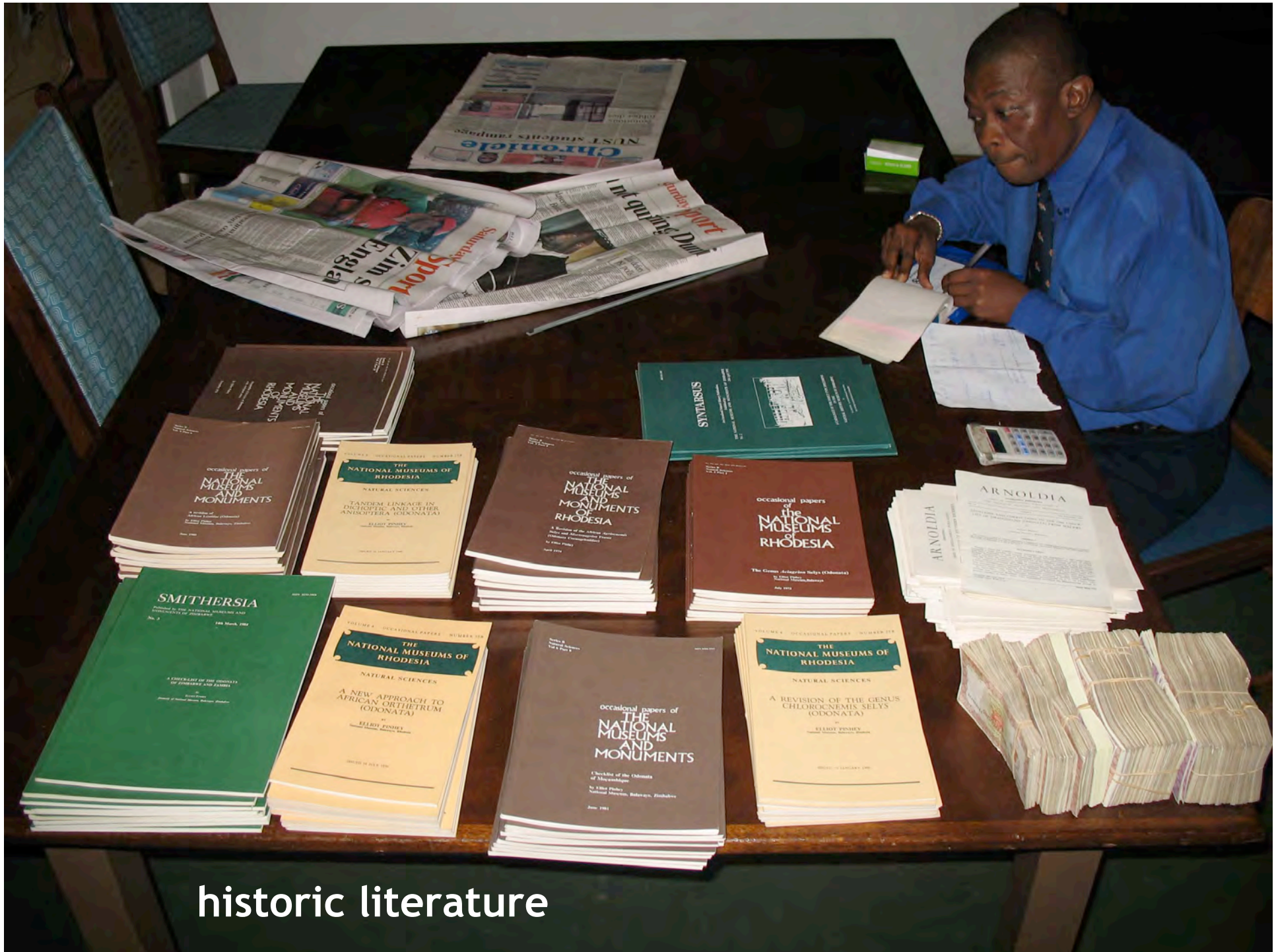
Details of 'Congolese' *Platycnemis* labelled by René Martin in Paris and Genua:

| | | | | | |
|--------------------|-------------------|---------|--------|-----------------------|-------------------------|
| "Congo" | "P. congolensis " | "Type " | = | <i>P. congolensis</i> | |
| "Congo" | "P. congolensis " | | = | <i>P. congolensis</i> | |
| "Congo" | "P. congolensis " | female | = | ? | |
| "Congo" | | damage | = | <i>P. nyansana</i> ? | |
| "Côte d'Ivoire " | "P. congolensis " | "Type " | damage | = | <i>P. guttifera</i> ? |
| "Sikasso " (Mali) | "P. congolensis " | "Type " | | = | <i>P. sikassoensis</i> |
| "F. Vaz" (Gabon) | "P. congolensis " | | | = | <i>P. congolensis</i> |
| "Guinée française" | "P. congolensis " | female | | = | <i>P. congolensis</i> ? |

Platycnemis "congolensis"

= *P. nyansana*





historic literature



“Dear colleague,

... It will be known to you that in the last 10-15 years the Odonata of tropical Africa have been worked on intensively. The results are still being disclosed in a continuous flow of publications. It has become evident that the specialists engaged in this work are proceeding very hurriedly...

M.A. Lieftinck, 7 February 1964



“... I have written you previously that this fact is hampering the study of the fauna more and more, making it so unattractive that accurately working specialists will need years to create order in the existing chaos.”

M.A. Lieftinck, 7 February 1964



n = 385

n = 130

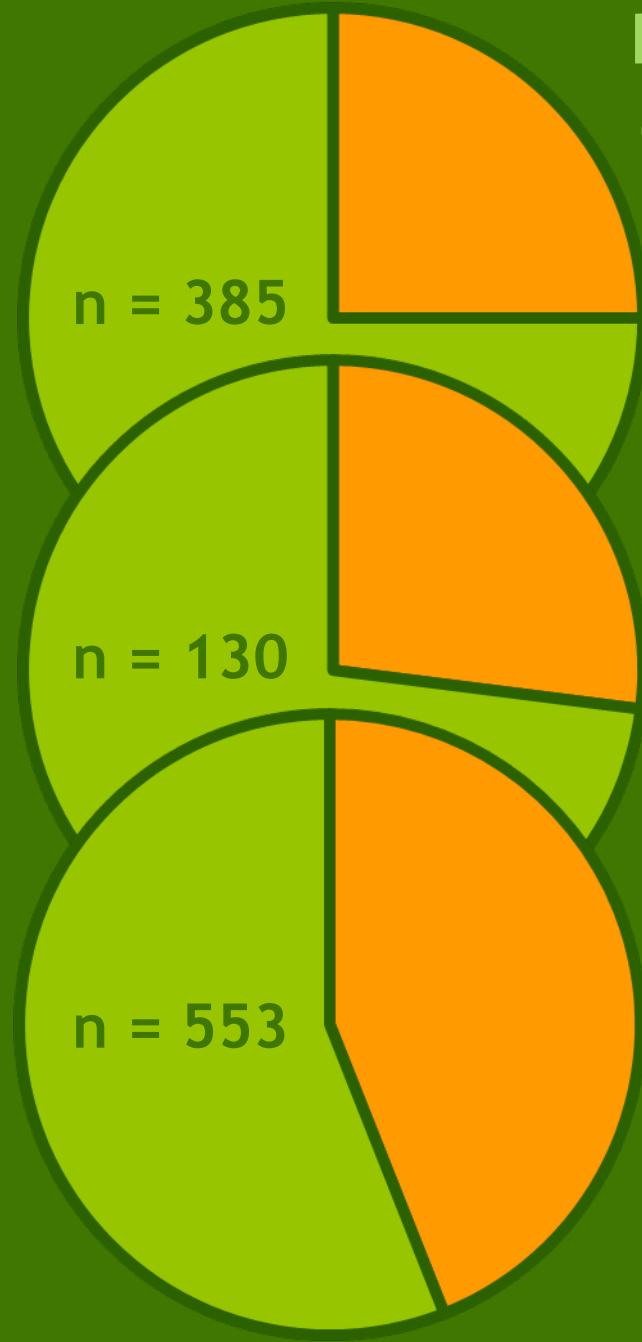
n = 553

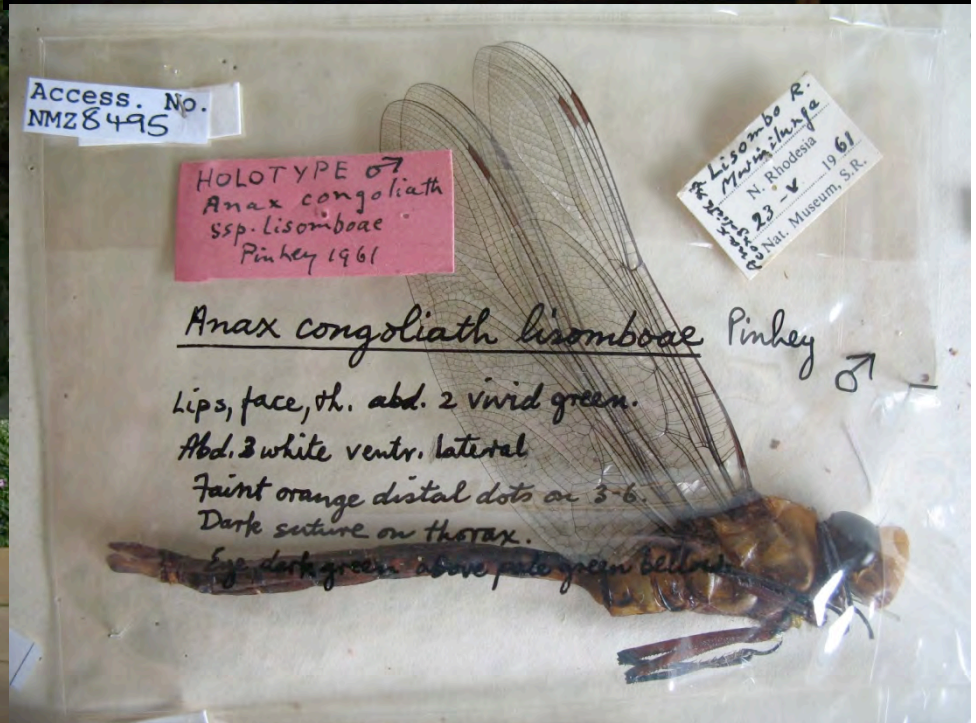
Royal Museum
Central Africa
misidentified

Trithemis

Gynacantha

Orthetrum





GEORGE ARNOLD ENTOMOLOGICAL LABORATORY

Raphael Chahwanda
employed since 1958

KEEPER
OF
ENTOMOLOGY

... and his (?) *Aeshna
rileyi raphaeli*







Eastern Africa

five years of revision:

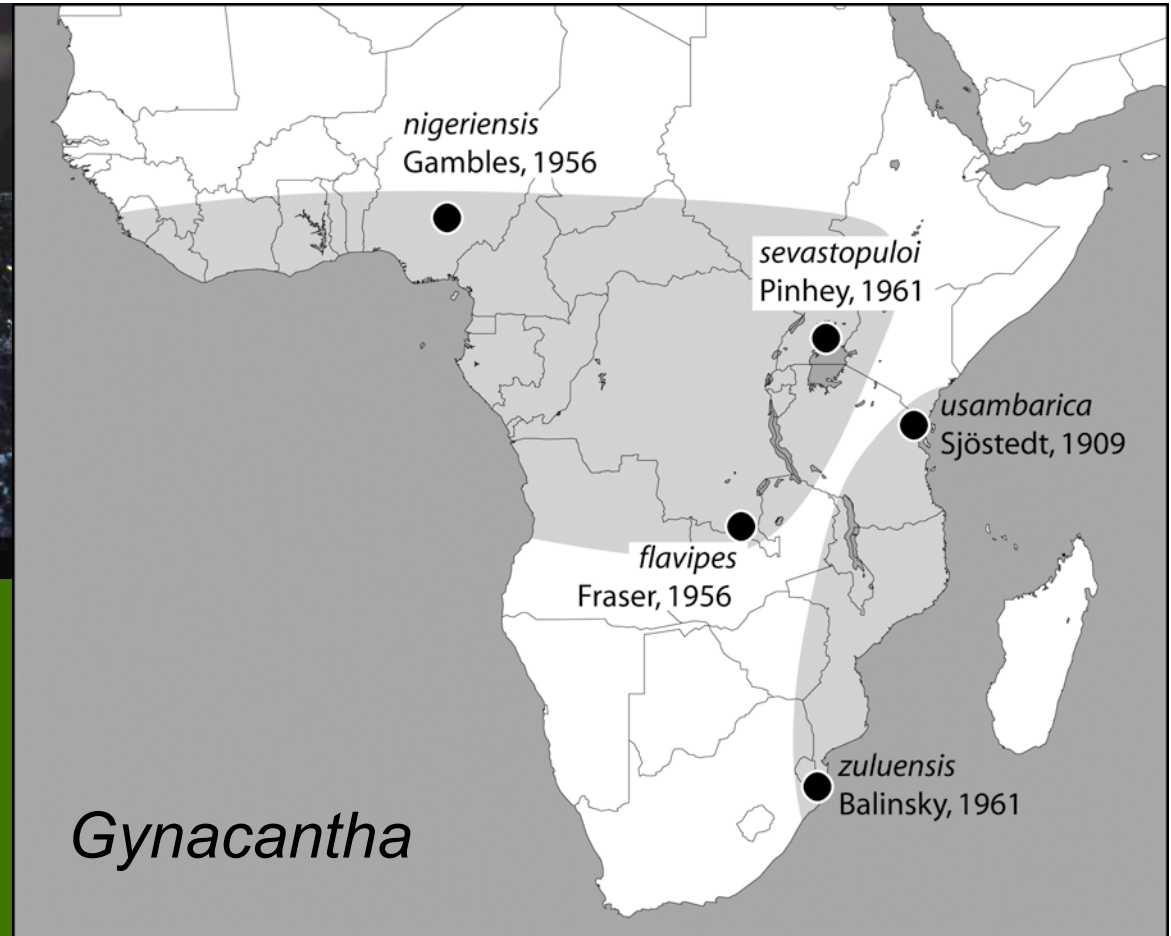
463+ valid species

7+ species new to science

11-15% of names are synonyms

23 species change their familiar name (1 in 20!)

12-14% of country records is unreliable



But then to what genus does a species belong?

Large but indecisive fraction of users prefer alternative combinations of genus and species names

Zoological Records (1980 - 2004)

| European species | n | alternative | use |
|--------------------------------|----|---------------------|-----|
| <i>Aeshna isoceles</i> | 31 | <i>Anaciaeschna</i> | 35% |
| <i>Lestes viridis</i> | 47 | <i>Chalcolestes</i> | 23% |
| <i>Gomphus flavipes</i> | 52 | <i>Stylurus</i> | 8% |
| <i>Cordulegaster bidentata</i> | 55 | <i>Thecagaster</i> | 2% |

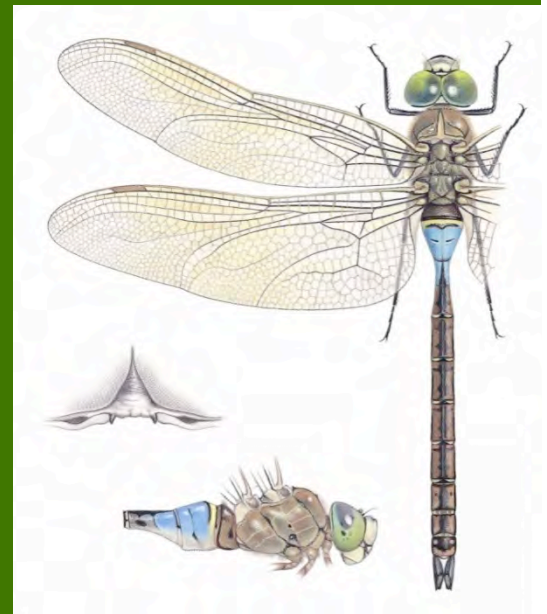
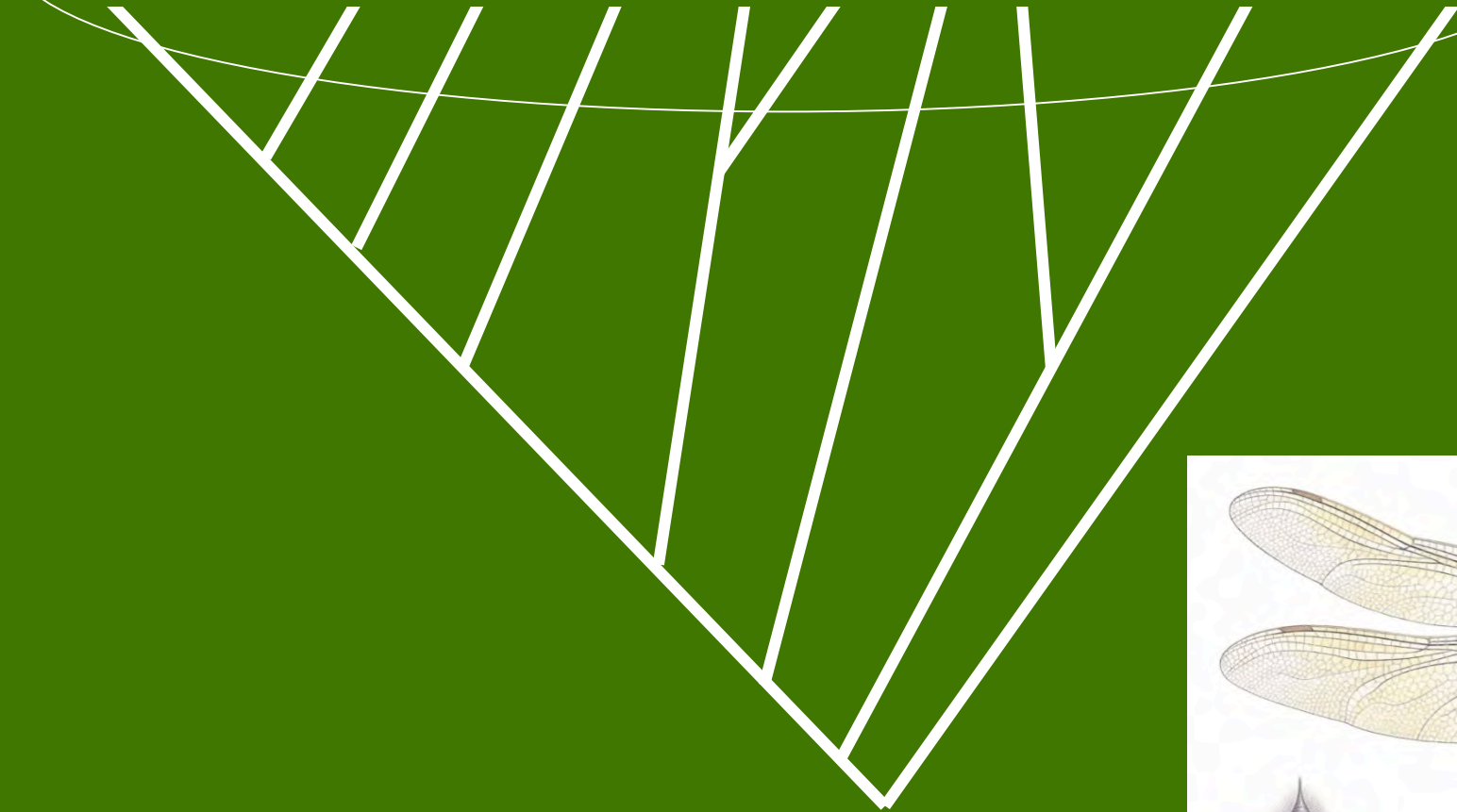
What is a genus?

Principles

1. Monophyly: a genus is a group of species reflecting their shared and exclusive ancestry
2. Stability: the generic placement of species should change as little as possible



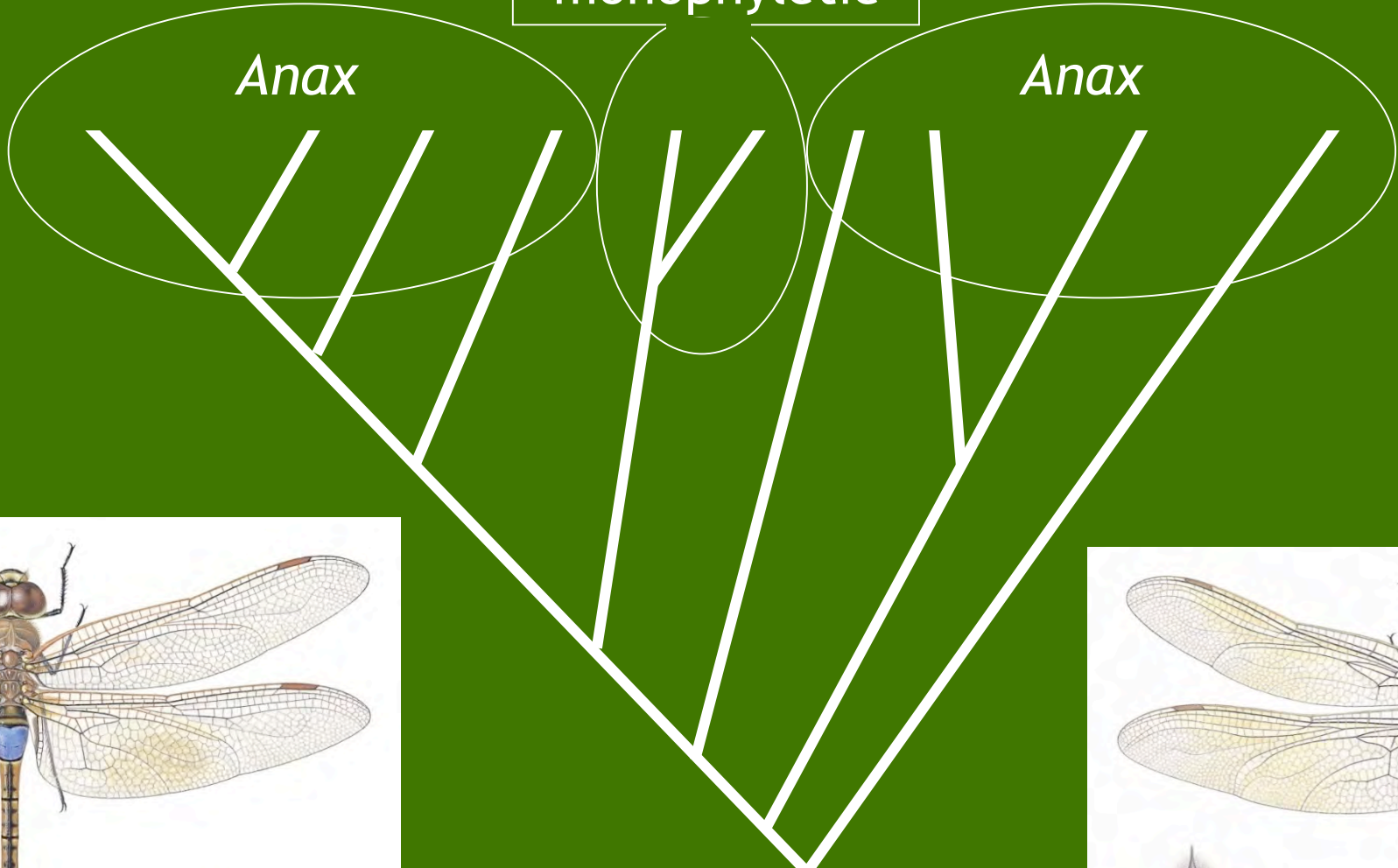
Anax = monophyletic



Hemianax
monophyletic

Anax

Anax



Anax = paraphyletic

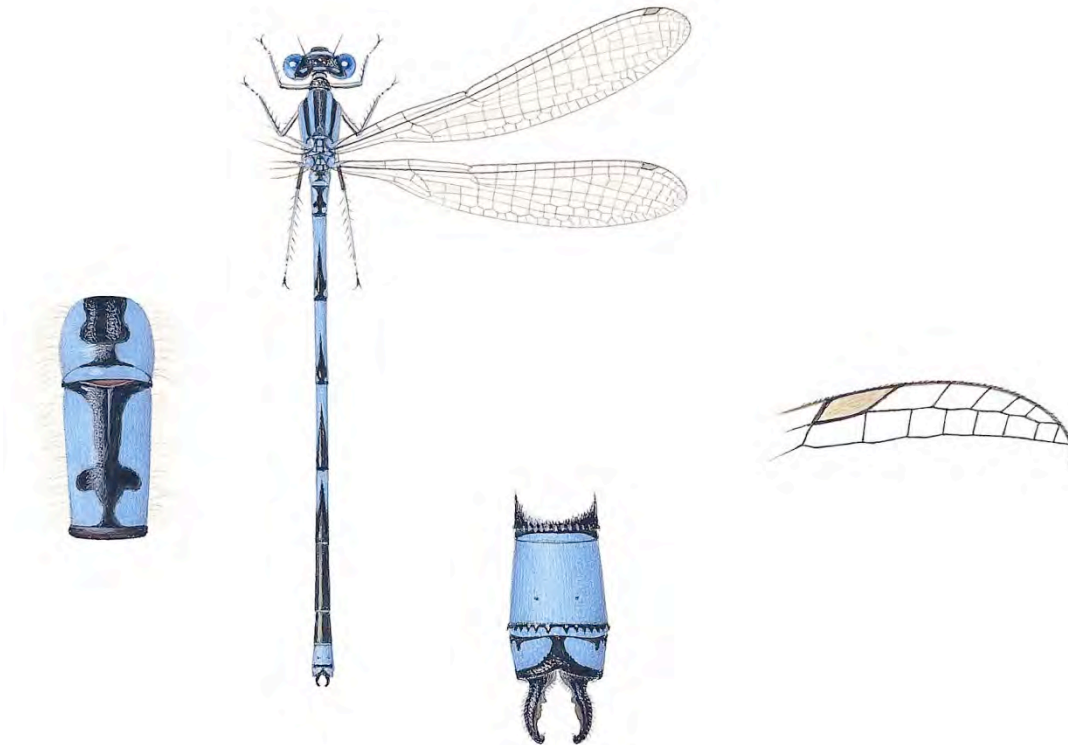
Generic placement

Any taxonomic change should be preceded by:

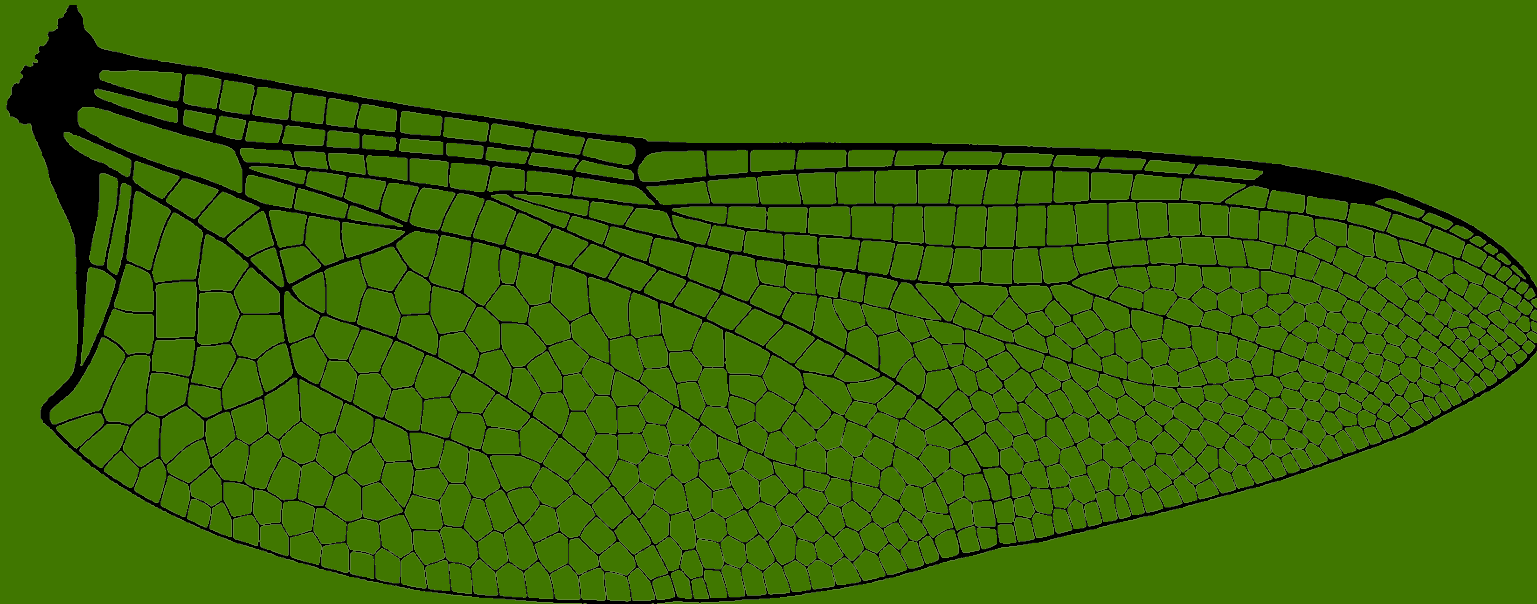
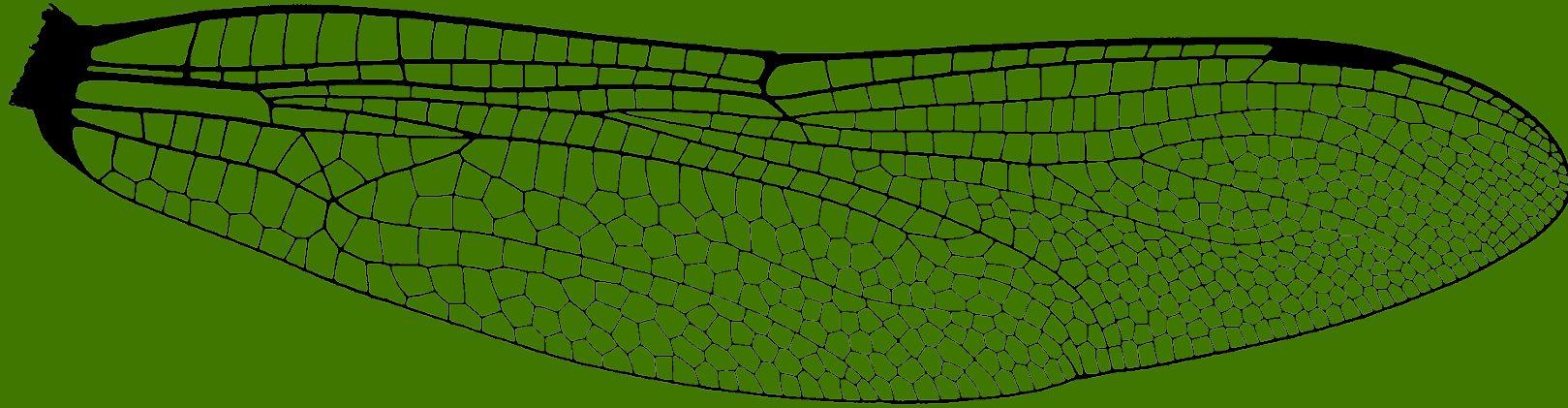
1. phylogenetic analysis:
preclude creation of para- or polyphyletic groups
2. consideration of solution that leads to least change:
merging is safer than splitting, thus consider splits
with additional care
3. practical considerations:
genera are practical tools, so supplementary
'subjective' arguments may be considered,
such as number of species

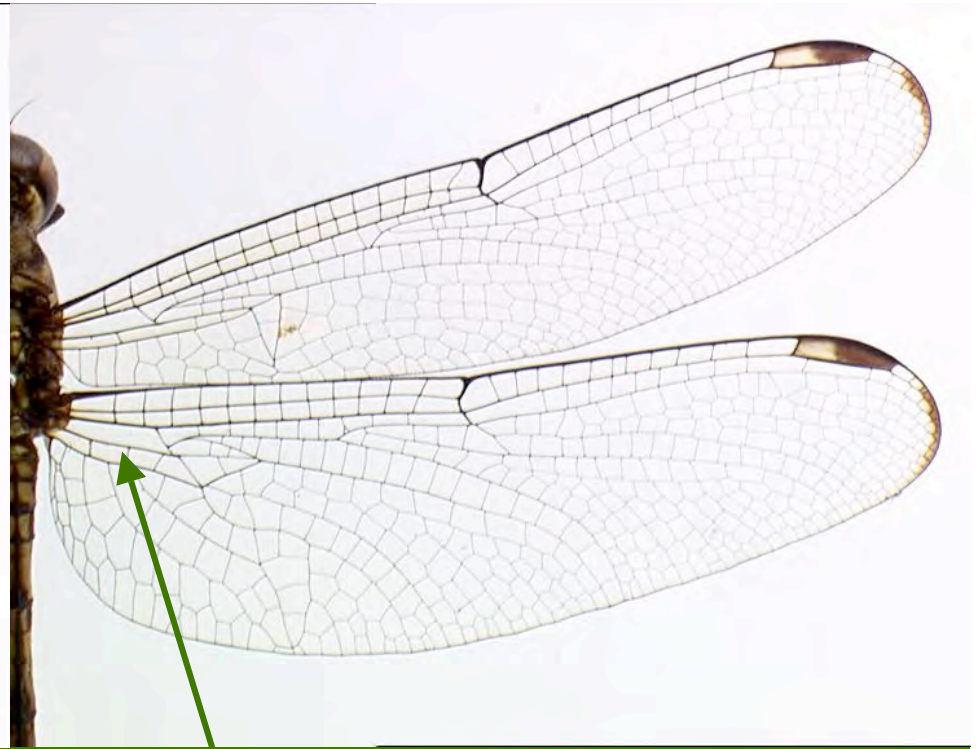
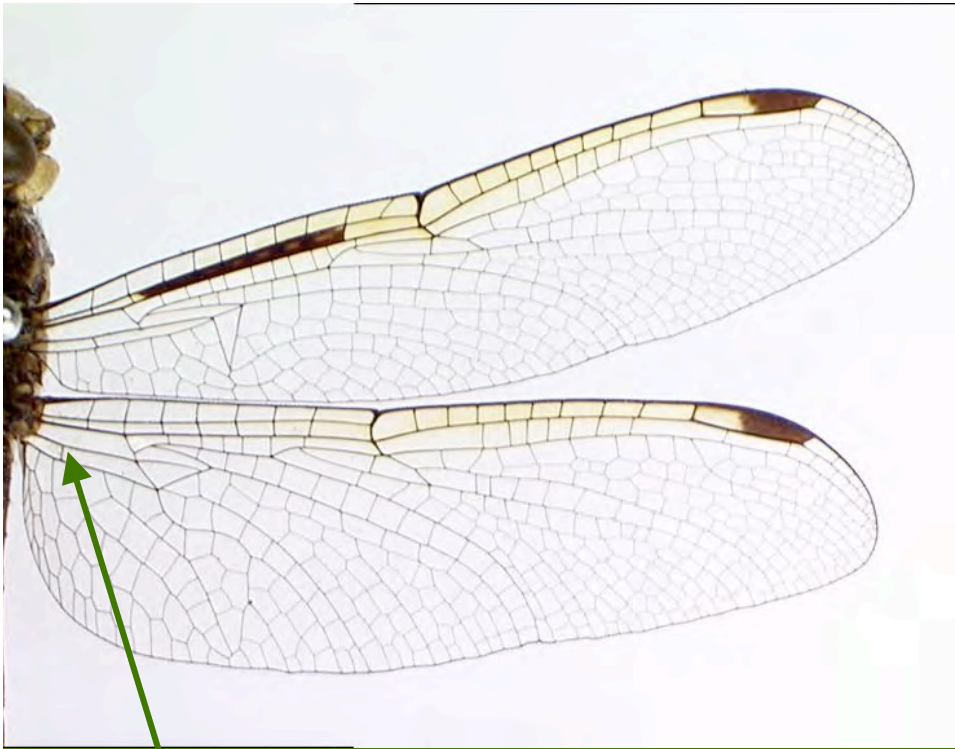
larval and adult morphology,
behaviour and genetics show that
Cercion lindenii belongs in
Erythromma

Asian “*Cercion*” are not related:
Paracercion Weekers & Dumont 2004



Main culprit for superfluous genera: venation!

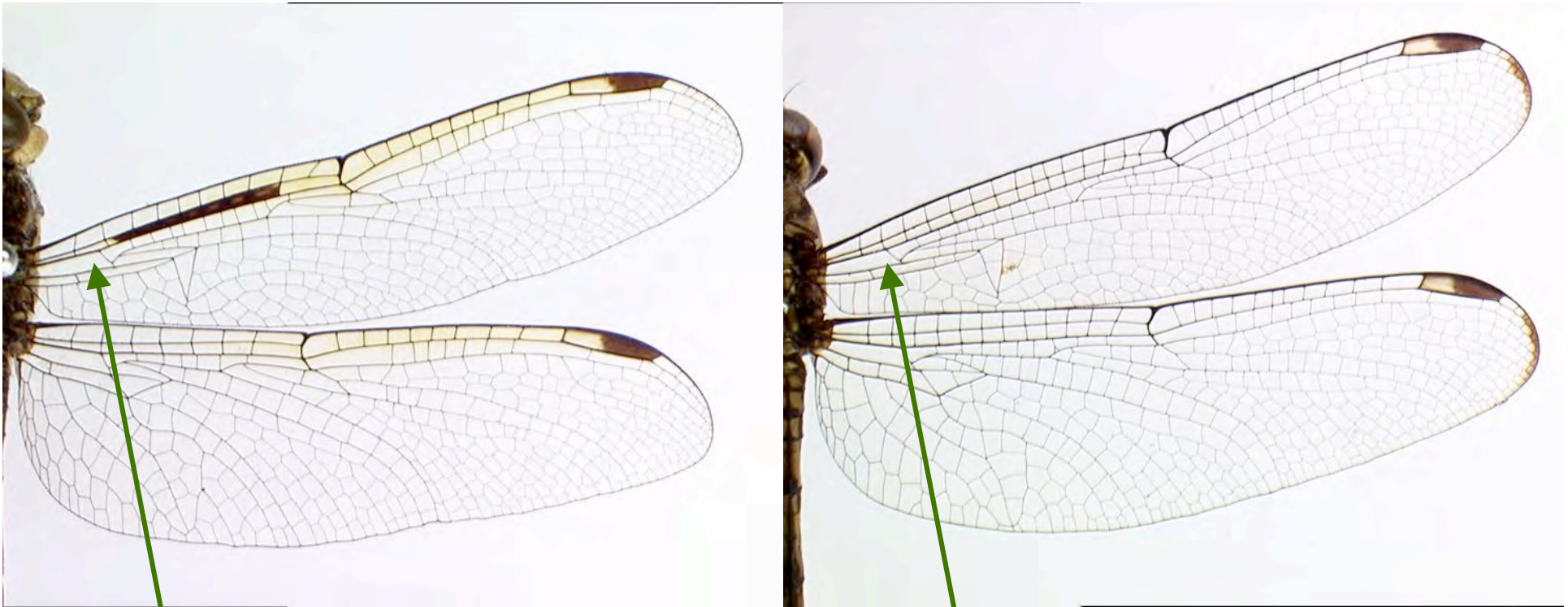




1 Cux (cubital cross vein)

3 Cux

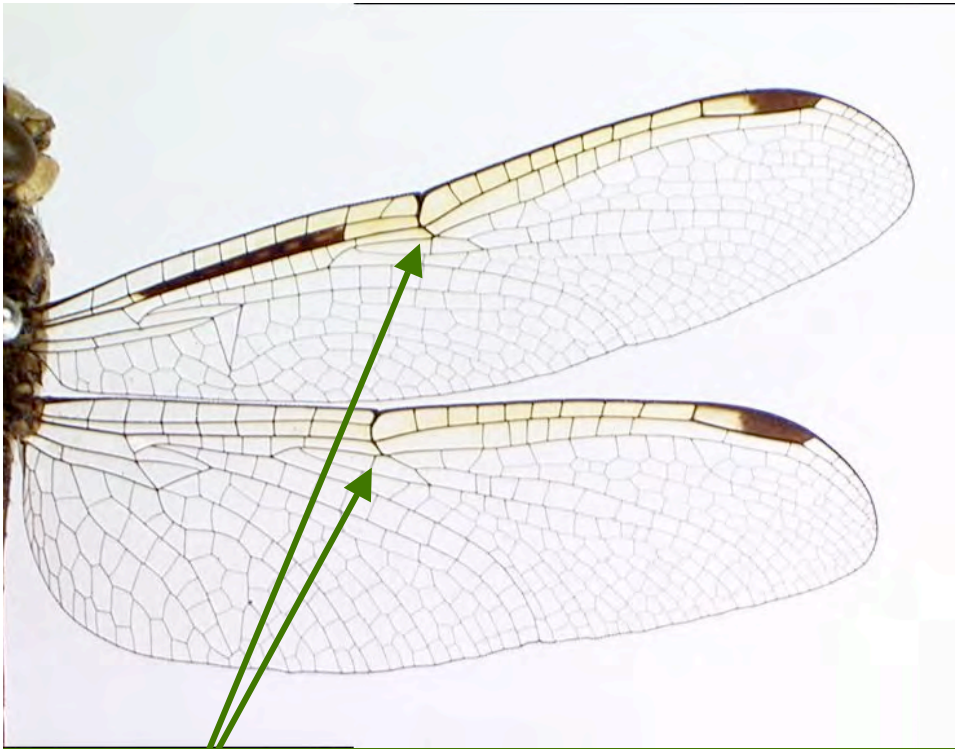
over-emphasis on venation



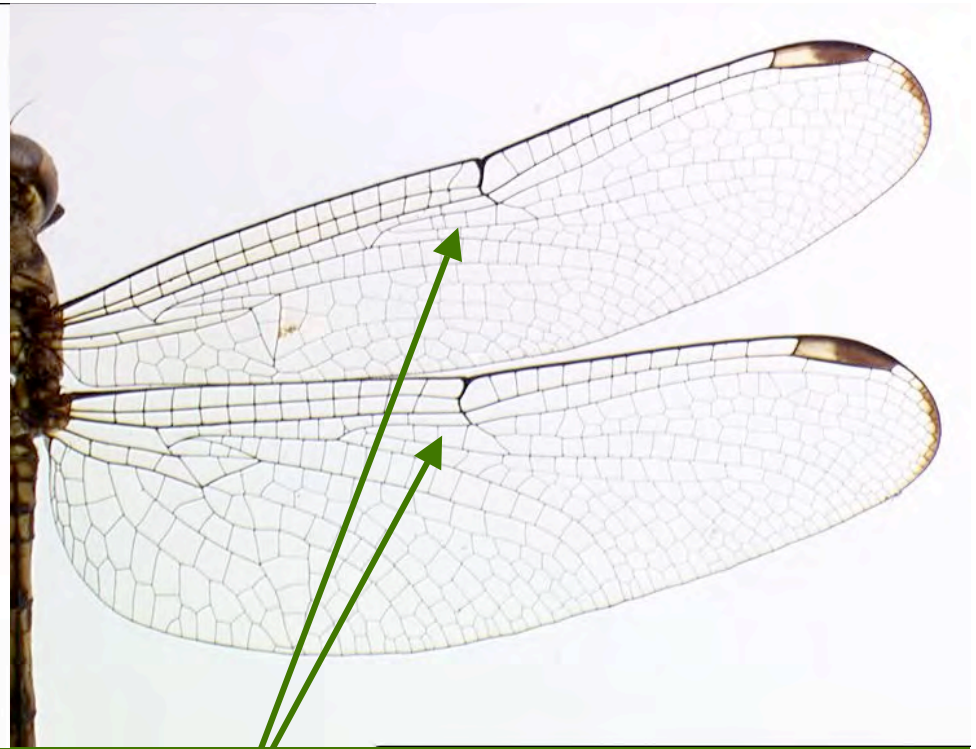
arculus between Ax1 and Ax2

arculus at Ax2

over-emphasis on venation

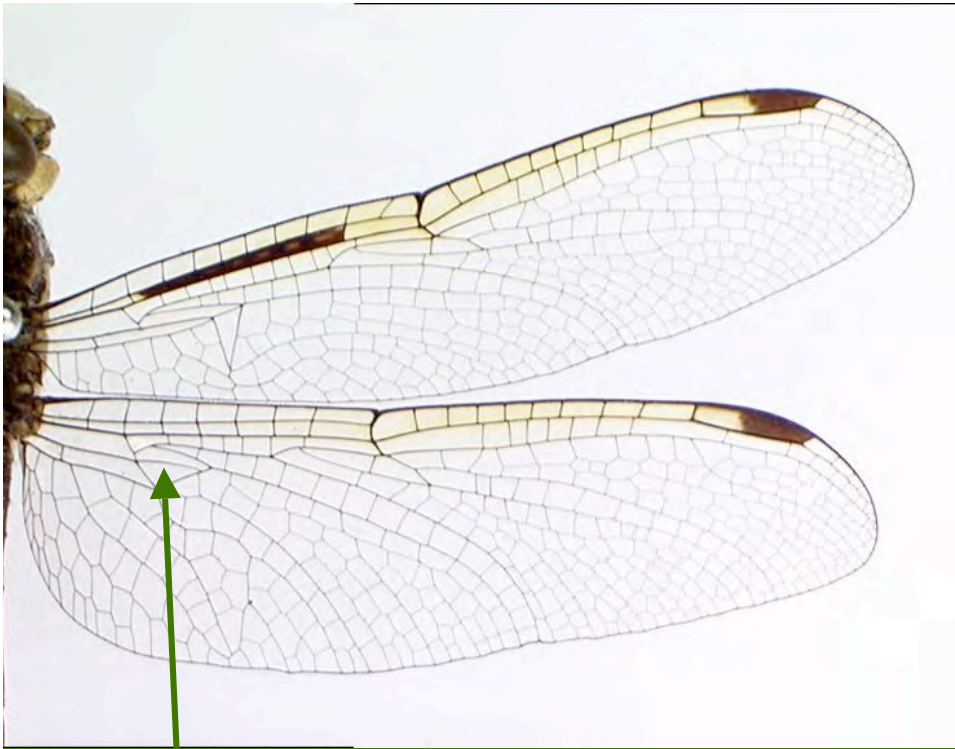


1 Bx (bridge cross vein)

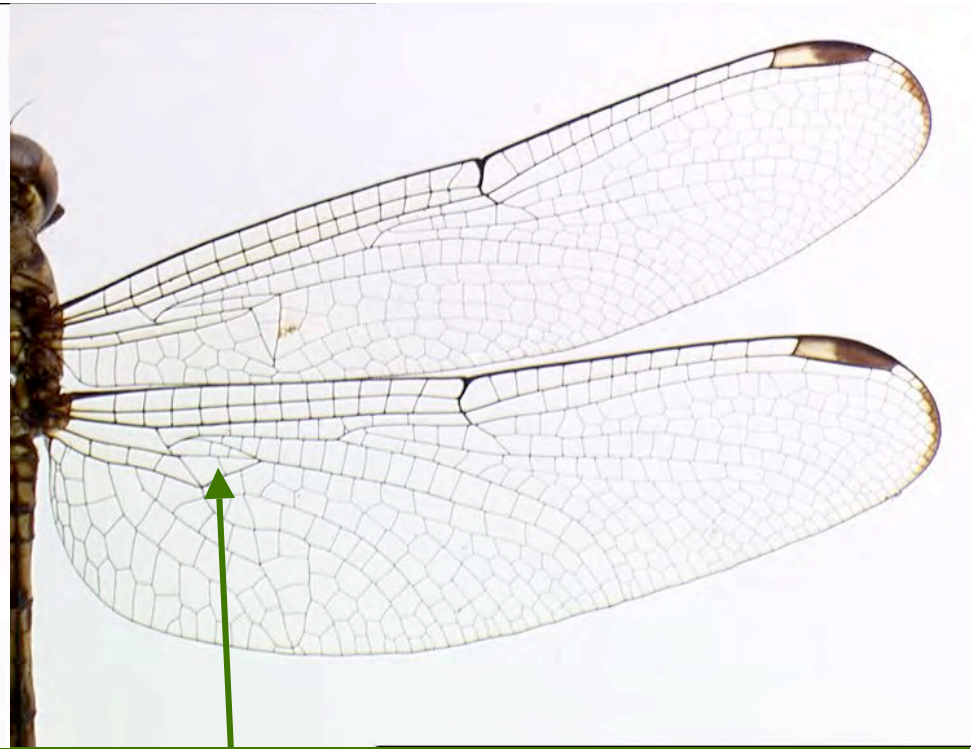


3-4 Bx

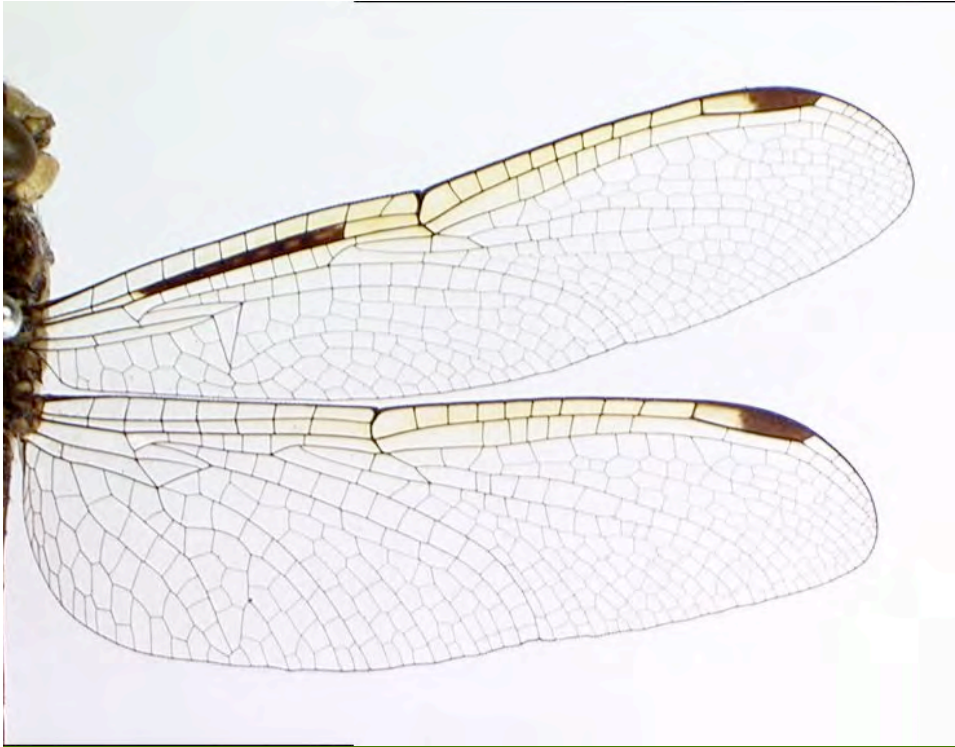
over-emphasis on venation



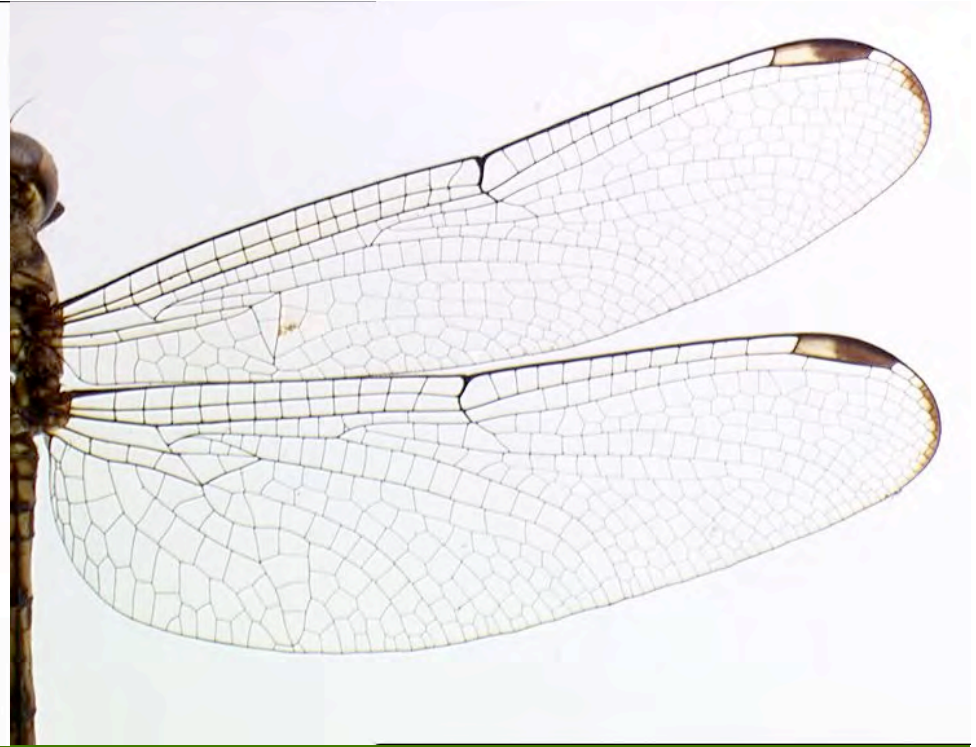
(supra-)triangles uncrossed
over-emphasis on venation



(supra-)triangles crossed



Hemistigma Kirby, 1889



Thermochoria Kirby, 1889

over-emphasis on venation

traditional: many 'primitive' characters (plesiomorphies)

alternative: single 'advanced' character (apomorphy)

The doom of palaeodontology?



