

Evolutionary relationships of genus *Orthetrum*, Newman, 1833



CG2 Final Presentation

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**American Museum
of Natural History**



The genus *Orthetrum* Newman, 1833



- The largest genus of dragonfly in the Libellulidae family
- 67 species described
- 30 species African taxa

Why study *Orthetrum*



Orthetrum stemmale



Orthetrum brachiale



Orthetrum machadoi



Orthetrum icteromelas

We do not know their
evolutionary history

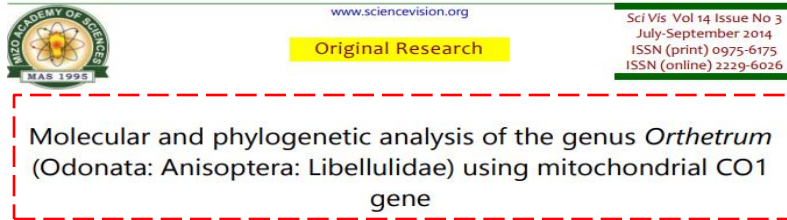


Whence they originated



Some species are not easily
separated from each other by
morphological characters

The previous work on genus *Orthetrum*



Laltanpuui^{1,2*}, N. Senthil Kumar² and Manu Thomas Mathai¹

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COI gene
22 species

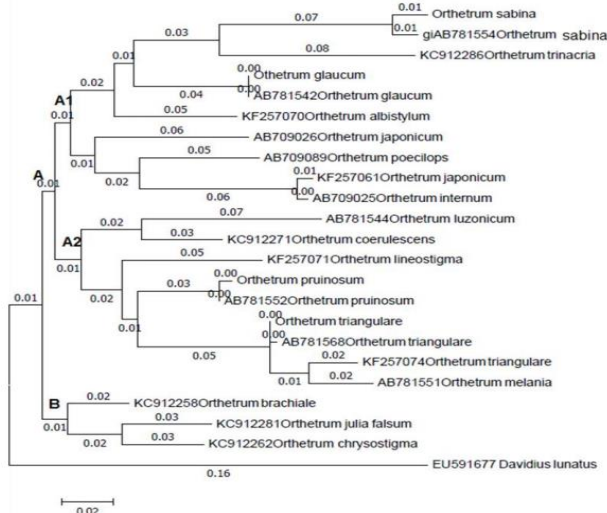


Figure 1. Molecular phylogenetic analysis by maximum likelihood method.

Laltanpuui et al. 2014

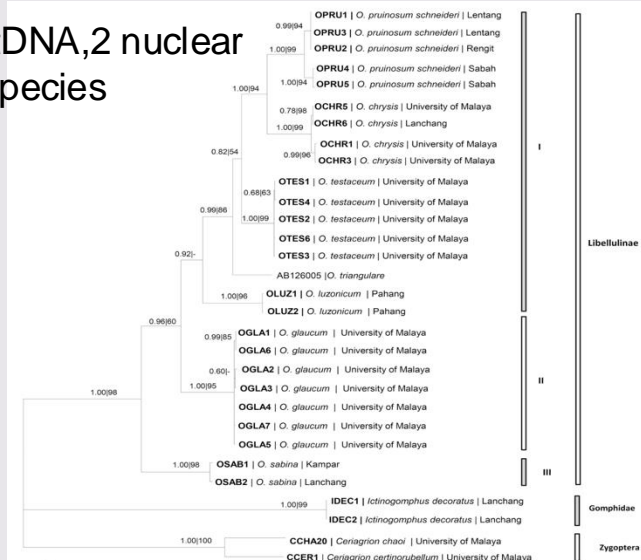


OPEN Molecular phylogeny of *Orthetrum* dragonflies reveals cryptic species of *Orthetrum pruinosum*

SUBJECT AREAS:
ENTOMOLOGY
TAXONOMY
SYSTEMATICS
PHYLOGENETICS

Hoi Sen Yong¹, Phaik-Eem Lim^{1,2}, Ji Tan^{1,2}, Yong Foo Ng³, Praphathip Eamsobhana⁴ & I. Wayan Suana⁵

3 mtDNA, 2 nuclear
17 species



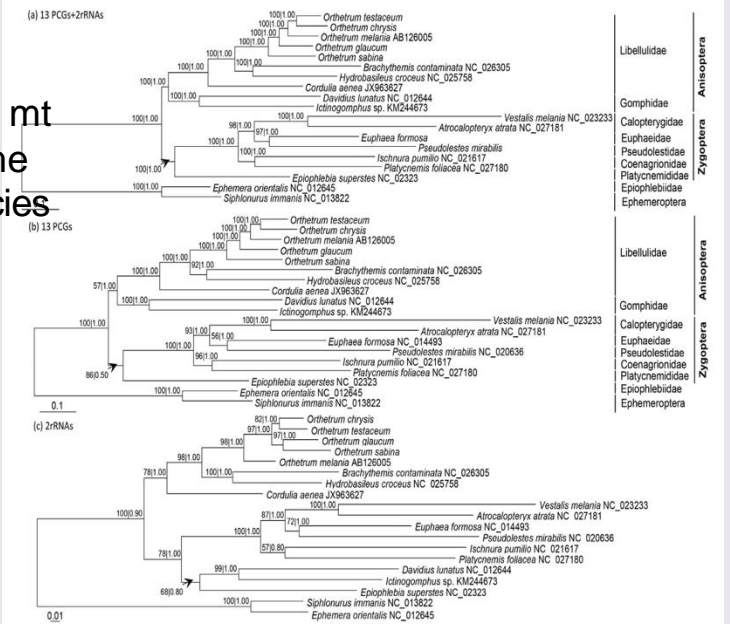
Yong et al. 2014



Complete mitochondrial genome of *Orthetrum* dragonflies and molecular phylogeny of Odonata

Hoi-Sen Yong^a, Sze-Looi Song^{b,*}, I. Wayan Suana^c, Praphathip Eamsobhana^d, Phaik-Eem Lim^{b,*}

Whole mt
genome
4 species



Yong et al. 2016



H Zhang



H Zhang

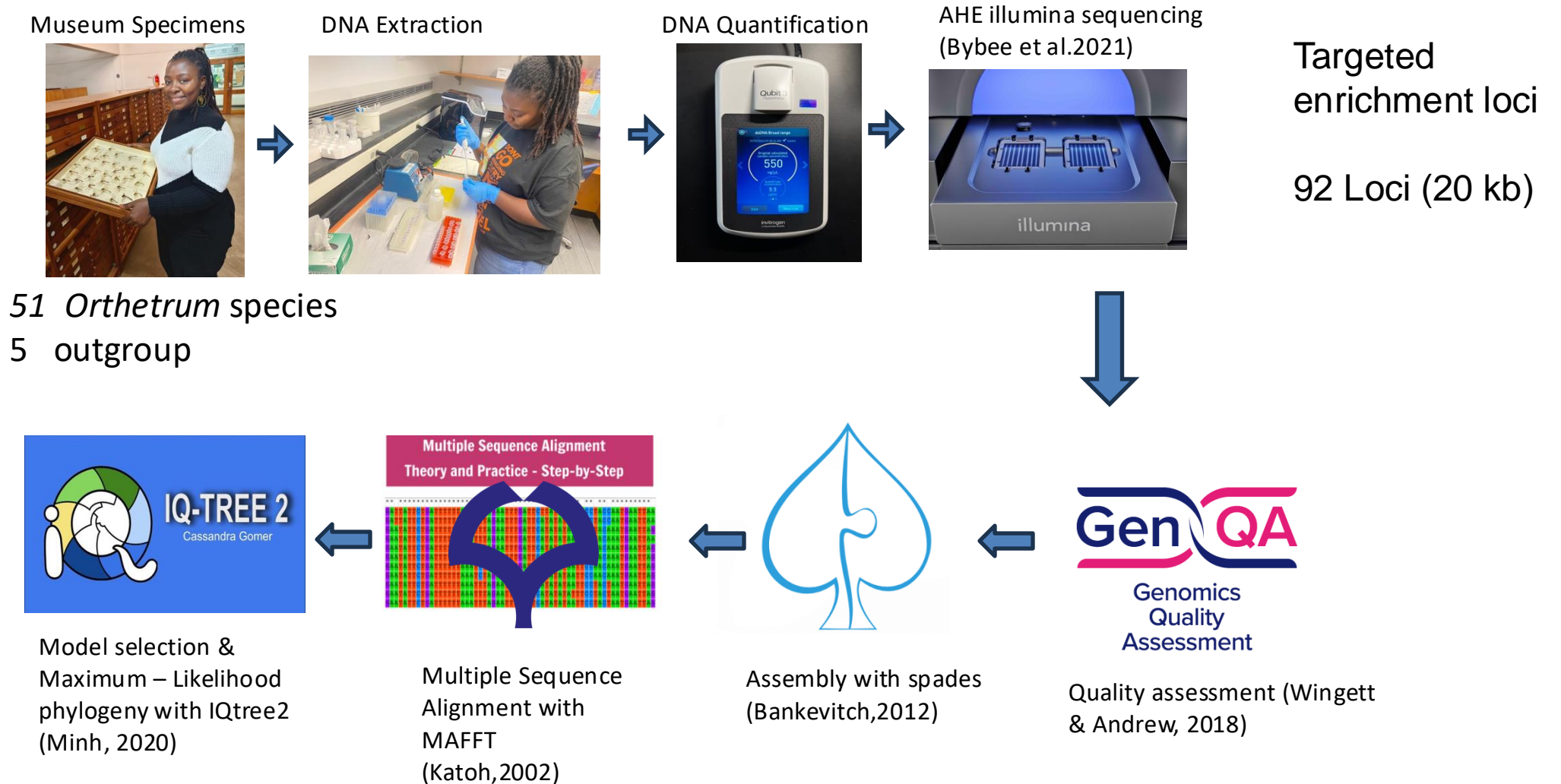
Research Questions



What are the evolutionary relationships among the *Orthetrum* species, and how have they diversified over time?

What are the geographical distributions & origin of *Orthetrum* species?

Methods



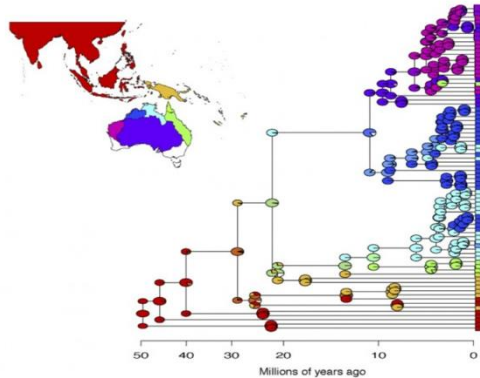
Gene tree phylogeny
with ASTRAL III
(Zhang et .al 2018)



NEXT STEP



Estimating time
divergence
using
RevBayes

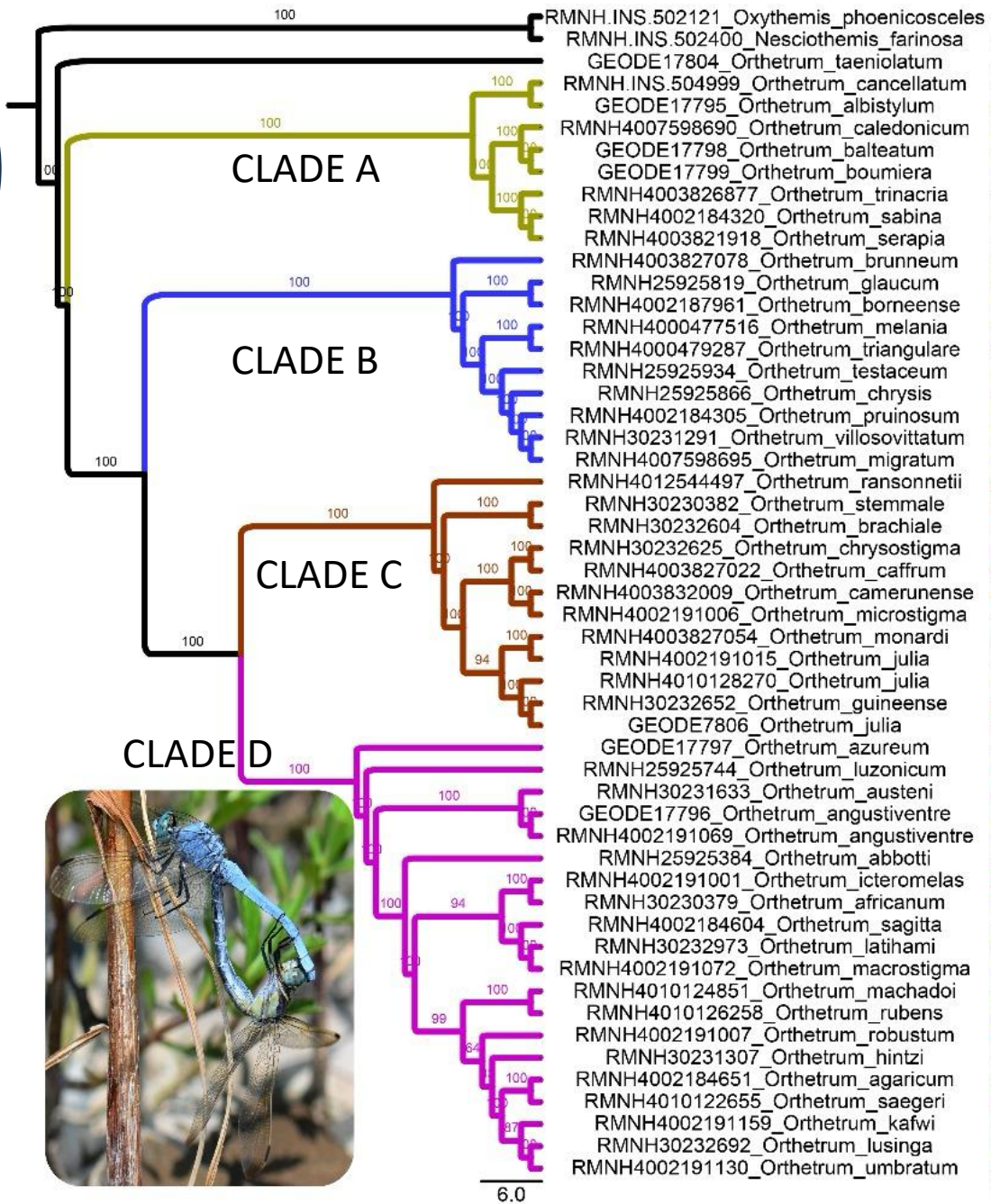


Estimating Biogeographic
history with BioGeoBEARS
LAGRANGE (Ree and Smith
2008)

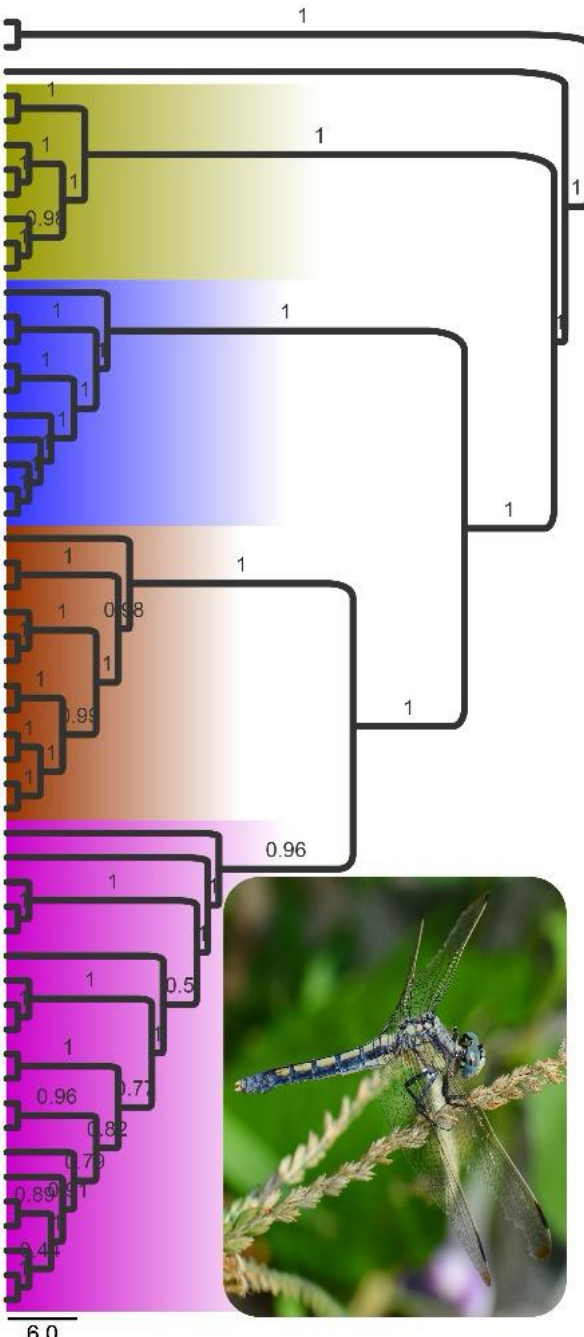


**What is the Phylogenetic
Relationships of the
Genus *Orthetrum*
Newman, 1833?**

Maximum-likelihood
Concatenated tree

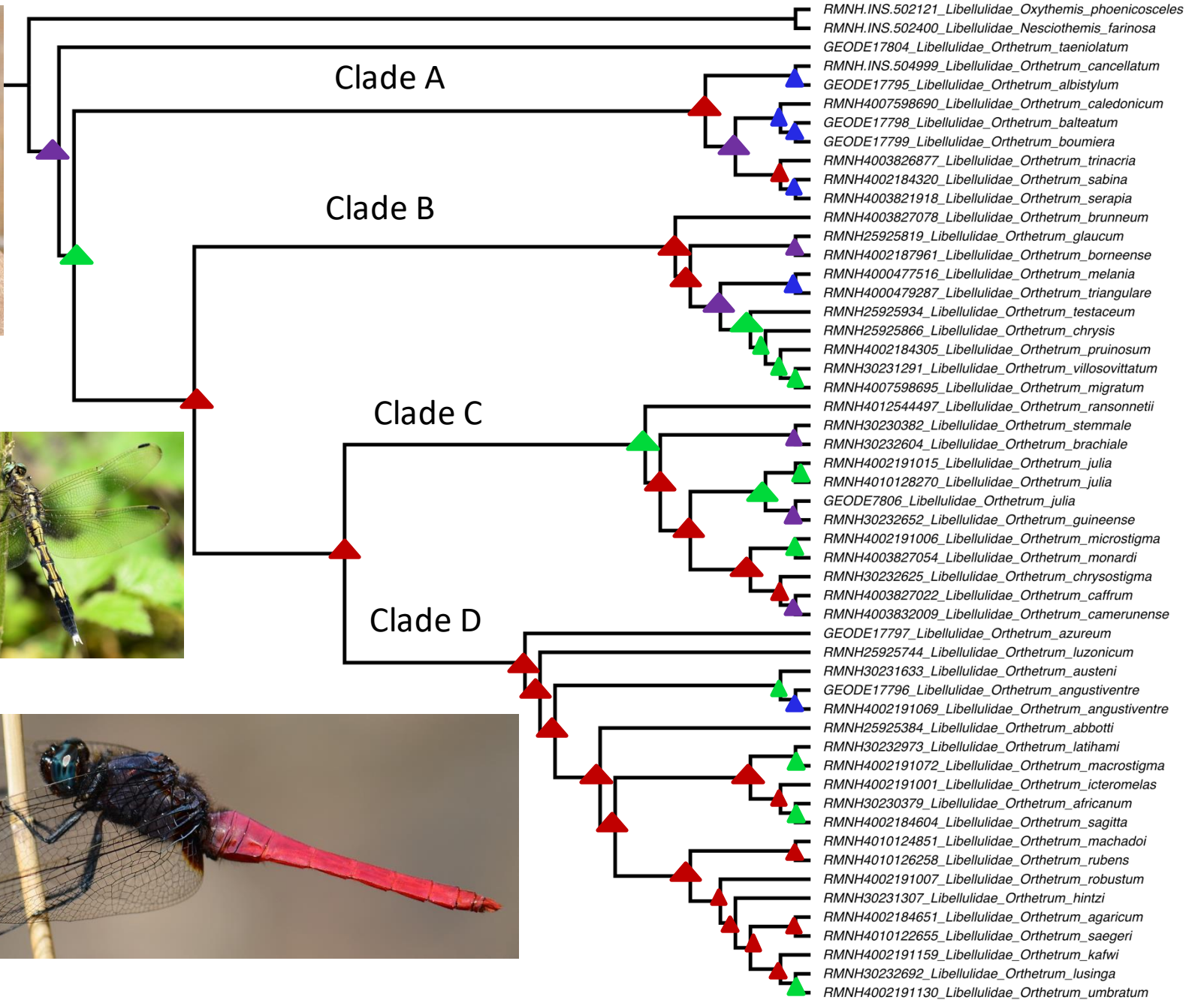


Astral tree
Gene tree





Gene
concordance
factor (gCF)



- ▲ < 50
- ▲ 51-75
- ▲ 76-90
- ▲ 91-100

NEXT Steps

Estimate time
divergence

Biogeographic
patterns

Take home message

01

For the first time, we've generated anchored hybrid enrichment (AHE) data for this genus, sampling 51 of 61 *Orthetrum* species globally

02

The genus was found to be monophyletic, forming four distinct monophyletic clades

03

Resolved subspecies as distinctive species

04

Our data provide the most compelling hypothesis for *Orthetrum* phylogeny and classification to date

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THANK YOU