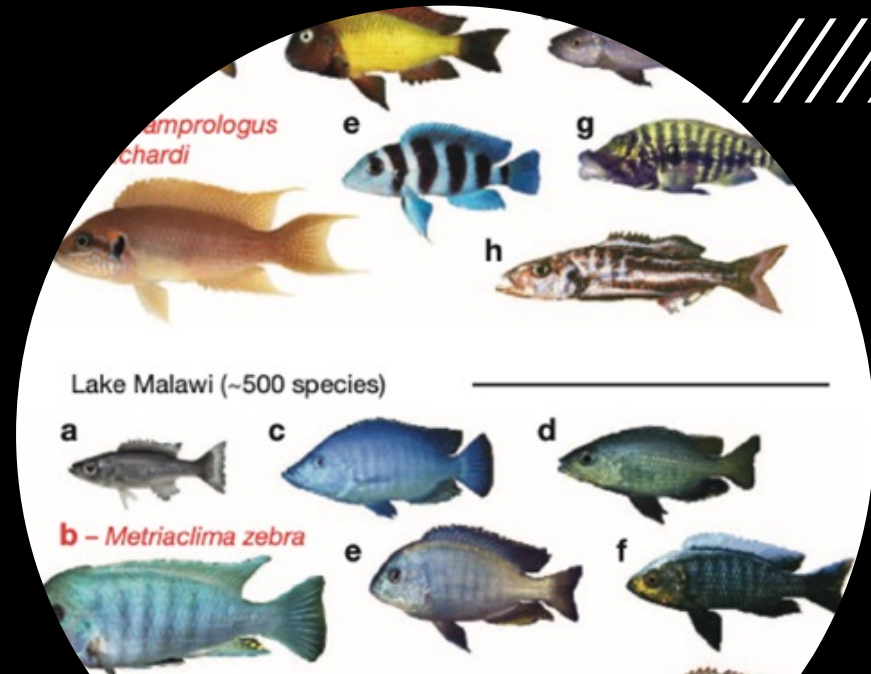
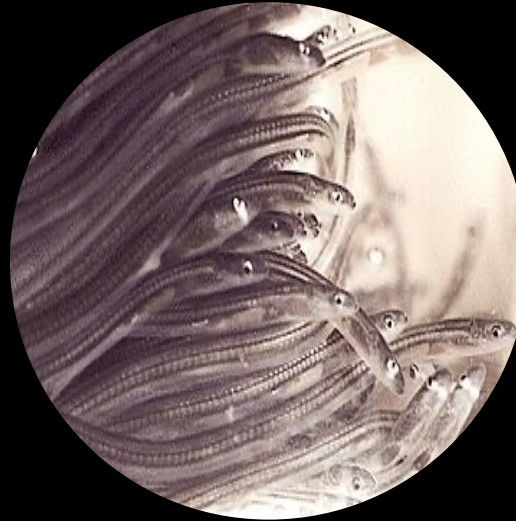


Molecular Methods in Ecology and Evolution 2025



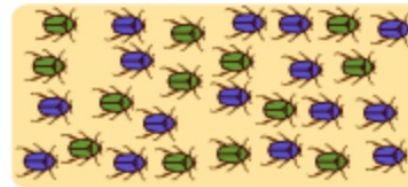
The theme:

Understand the evolutionary and ecological drivers of population divergence and speciation

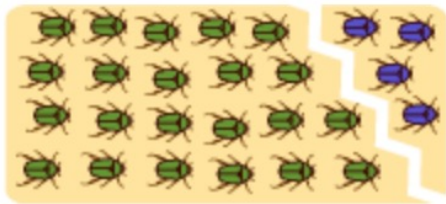
Geographic modes of speciation



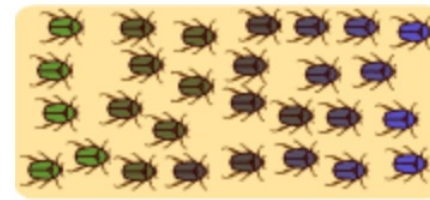
Allopatric: (allo = other) New species formed from geographically isolated populations



Sympatric: (sym = same) New species formed from within the range of the ancestral population



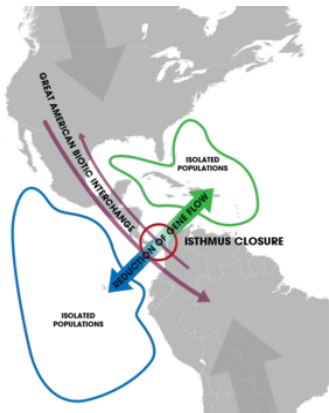
Peripatric: (peri = near) New species formed from a small isolated population at the edge of a larger population



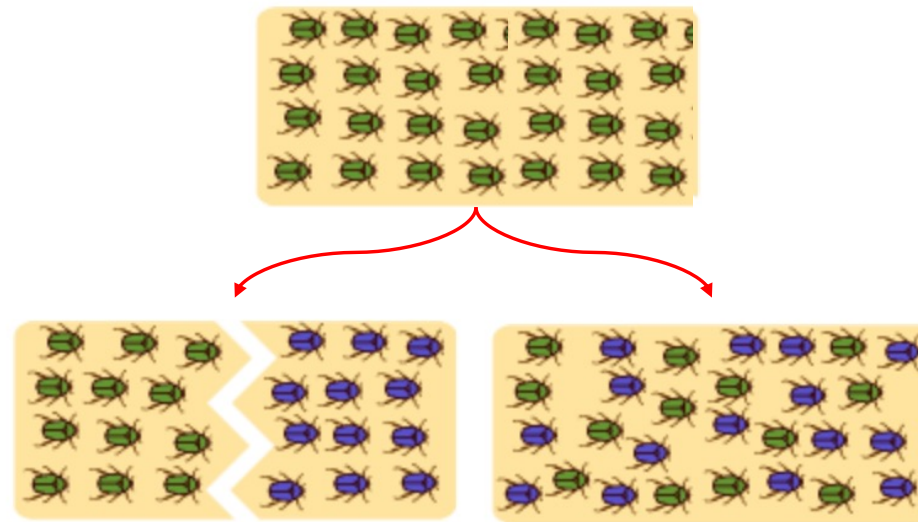
Parapatric: (para = beside) New species formed from a continuously distributed population

The theme:

Understand the evolutionary and ecological drivers of population divergence and speciation



Isthmus of Panama



Geographical / Allopatric
divergence

Ecological / sympatric
divergence



Scincid lizards

The theme:

Understand the evolutionary and ecological drivers of population divergence and speciation

A special case of **parapatric speciation**: Greenish warbler (*Phylloscopus trochiloides*)

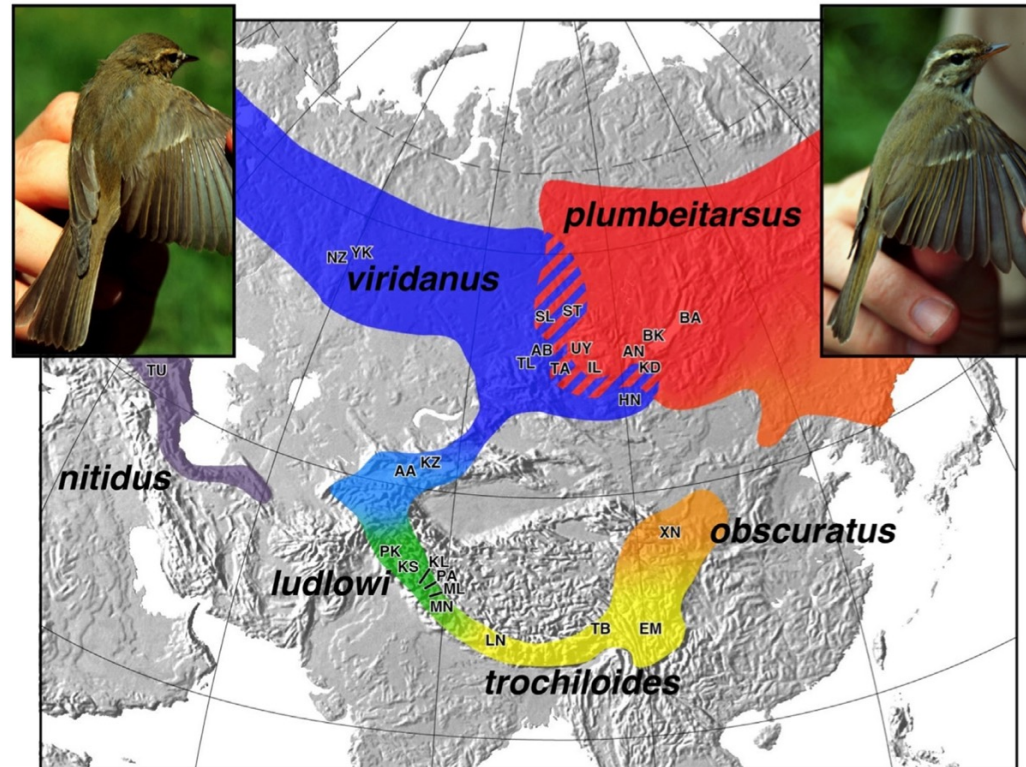


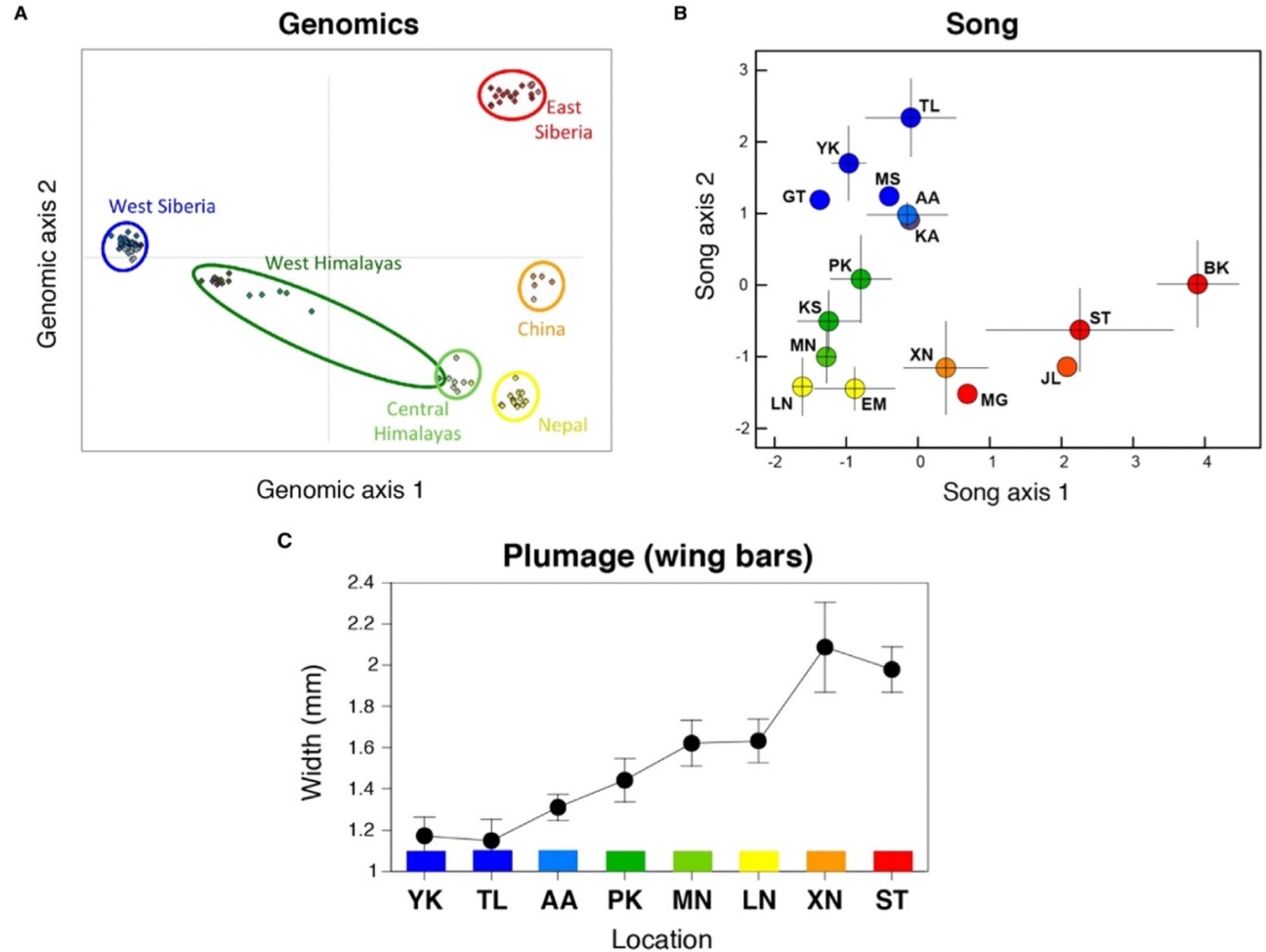
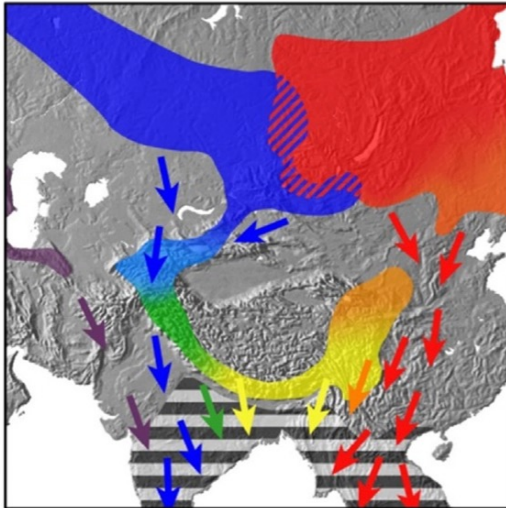
Fig. 4 The breeding range of greenish warblers (*Phylloscopus trochiloides*) in Asia. Subspecies designations according to [Ticehurst \(1938\)](#) are shown with different colors: *viridanus* in blue, *ludlowi* in green, *trochiloides* in yellow, *obscuratus* in orange, *plumbeitarsus* in red, and *nitidus* (outside of the main ring) in purple. Photos show the difference in wing bars between *viridanus* (upper left, with a single wing bar), and *plumbeitarsus* (upper right, with two wing bars).

The theme:

Understand the evolutionary and ecological drivers of population divergence and speciation

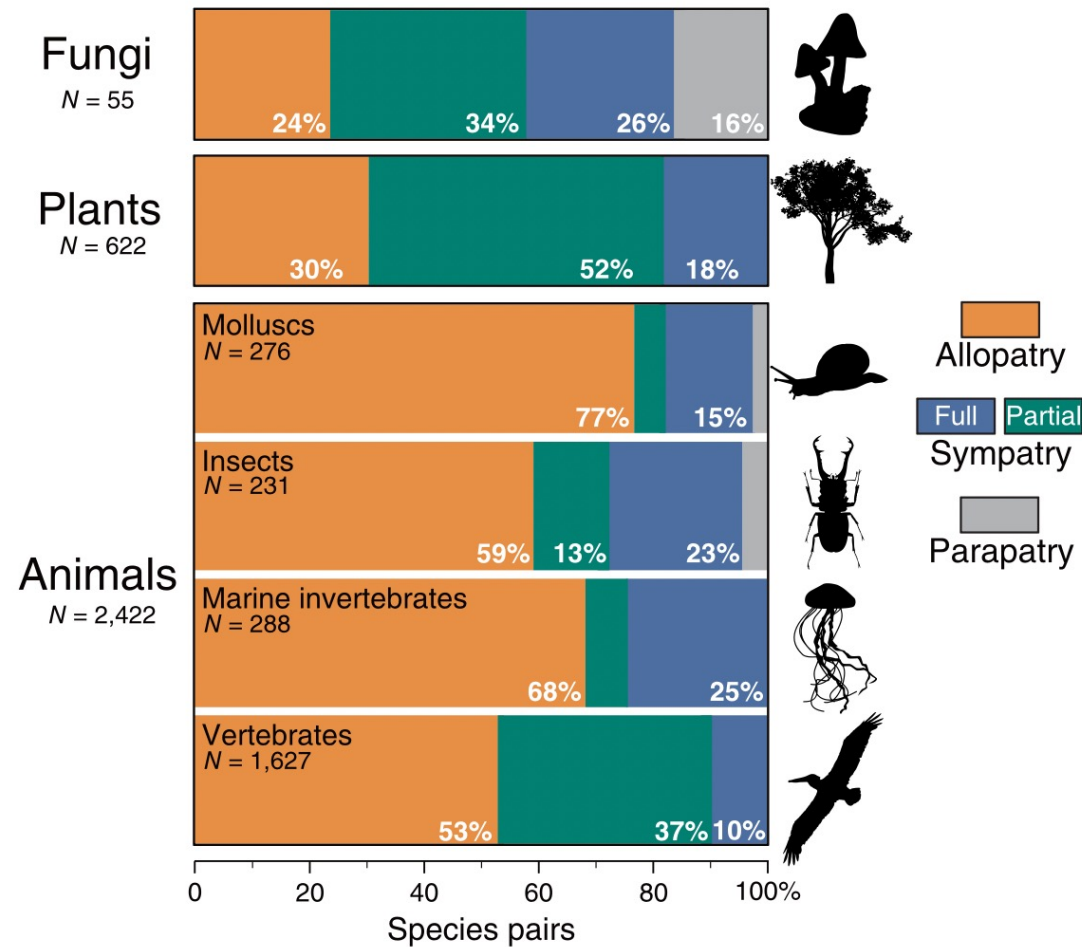
Patterns of genomic and phenotypic variation show strong differentiation between the mayor two forms, but gradual / stepwise variation through the chain of populations to the south.

Migratory routes



The theme:

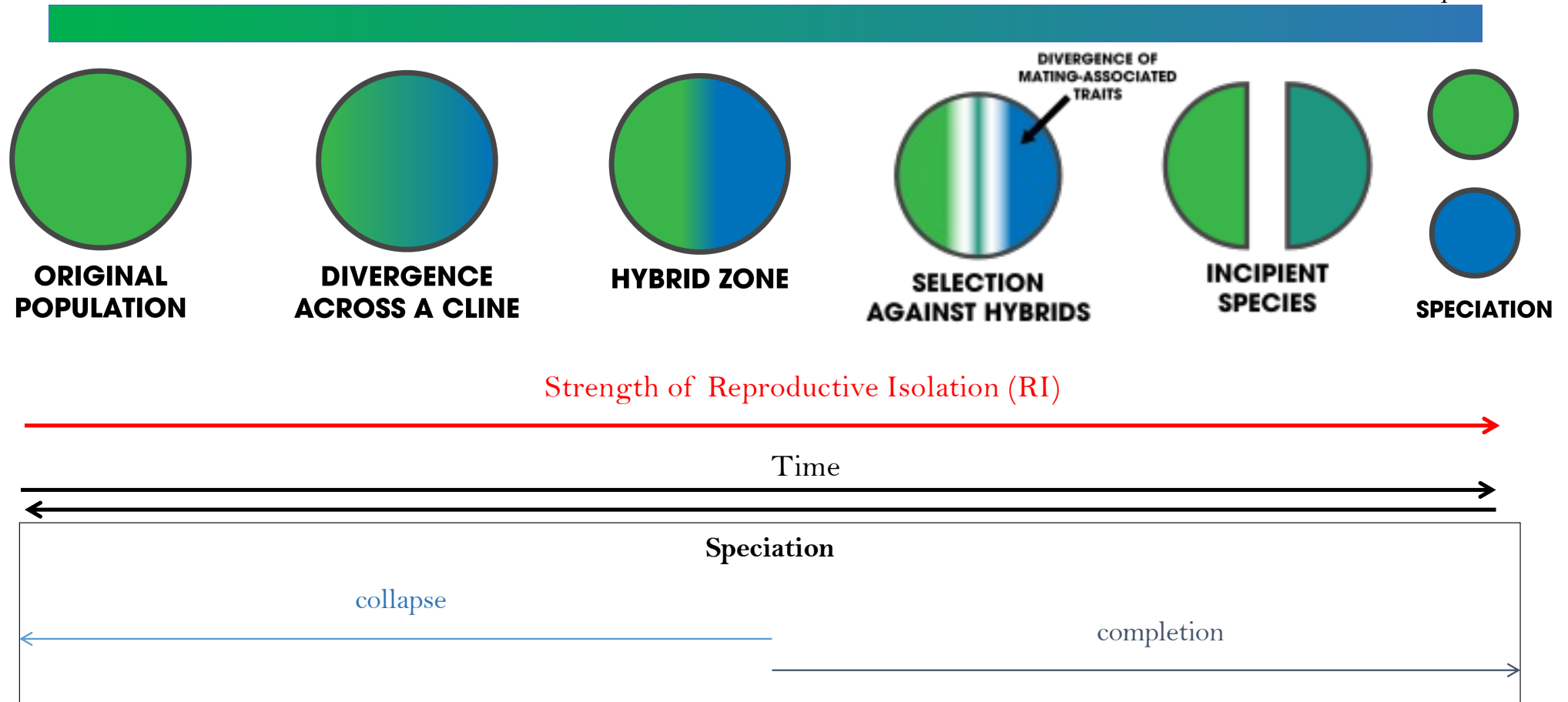
Understand the evolutionary and ecological drivers of population divergence and speciation



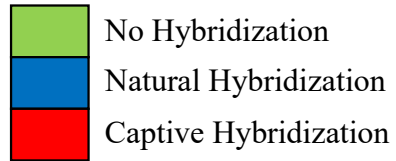
The Speciation Continuum

Panmictic
population

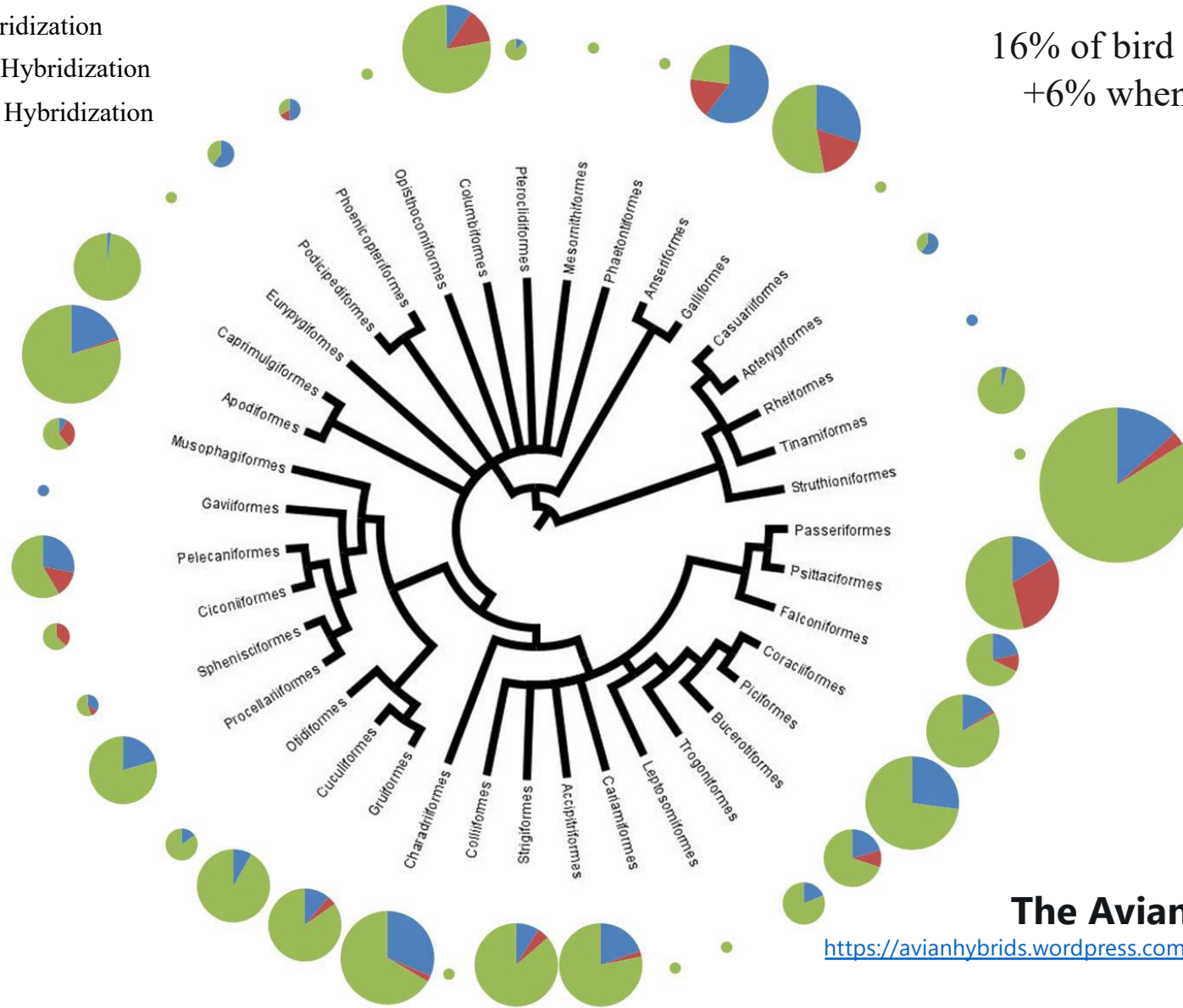
Two isolated
species



The speciation process is dynamic, bidirectional and continuous.



16% of bird species hybridize in the wild
+6% when including captive hybrids



The Avian Hybrids Project

<https://avianhybrids.wordpress.com/2017/12/01/hybridization-in-birds-the-trilogy/>

Ottenburghs et al. (2015) *Ibis*

The goal:

To give you an insight to how biologists use specific techniques and tools to tackle ecological and evolutionary questions

To gain experience on some of these approaches, and the application of the scientific method to real-world systems.



- Marker gene amplification and sequencing
- Restriction site Associated DNA sequencing (RADseq)



- Phylogenetic reconstruction
- Population genetics
- Population structure analyses
- Genomic-scale analyses of natural selection
-

Project 1.

A mysterious frog



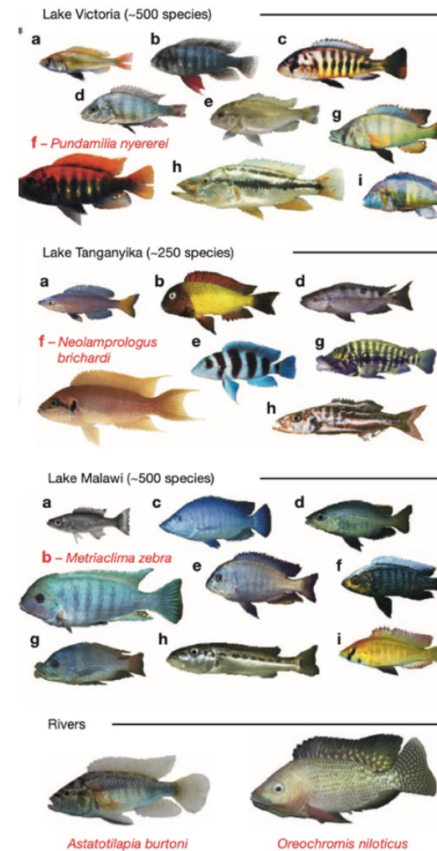
Project 2.

Hylid frogs



Project 3.

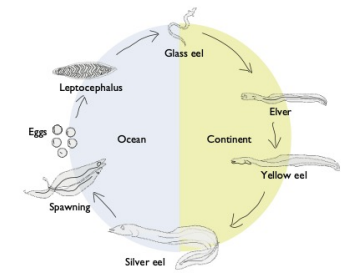
Cichlids



Brawand et al., 2014

Project 4.

European eel



Schedule

Time	Monday Sept 29	Tuesday Sept 30	Wednesday Oct 1st	Thursday Oct 2nd	Friday Oct 3rd
08:00 - 08:45	DNA extraction	PCR Gel preparation	Sequencing prep	Lecture IS	
09:00 - 09:45					
10:15 - 11:00	Lecture IS	Lecture IS	Lecture IS	Lecture NS	
11:15 - 12:00					
12:15 - 13:00				DEE Seminar	Lecture NS
13:15 - 14:00	TP Introduction	Electrophoresis		Lecture LF	
14:15 - 15:00	DNA extraction				
15:15 - 16:00	Quantification	Lecture IS		Introduction & Installation	
16:15 - 17:00	Dilution				
17:15 - 18:00		PCR purification			

Project 1. →

Time	Monday Oct 6th	Tuesday Oct 7th	Wednesday Oct 8th	Thursday Oct 9th	Friday Oct 10th
08:00 - 08:45	Project 1	last comments project 2 & start Project 3	last comments project 3. & start Project 4	Project 4. & Final questions	
09:00 - 09:45	Phylogeny- Sanger				
10:15 - 11:00	Lecture LF				
11:15 - 12:00					
12:15 - 13:00				DEE Seminar	Personal Research Work
13:15 - 14:00	Project 2 Cryptic speciation in hyild frogs.	Project 3. Genomic analyses of divergence between Lake Malawi cichlids	Project 4. The curious case of the European Eel		
14:15 - 15:00					
15:15 - 16:00					
16:15 - 17:00					
17:15 - 18:00					

Wet-Lab Experiment	POL 203 and 205
Lecture	POL 334
Computer Analyses	POL 204.2

↑
Project 2.

↑
Project 3.

↑
Project 4.

The report

General introduction
Wet lab / Project 1 <ul style="list-style-type: none">- methods- results & Discuss
Computer lab: Project 1 & 2. <ul style="list-style-type: none">- Intro- methods- results- discussion- conclusion- references
Project 3. <ul style="list-style-type: none">- Intro- methods- results- discussion- conclusion- references
Project 4. <ul style="list-style-type: none">- Intro- methods- results- discussion- conclusion- references
General Discussion

max **5 pages** per project
(including text and figures)

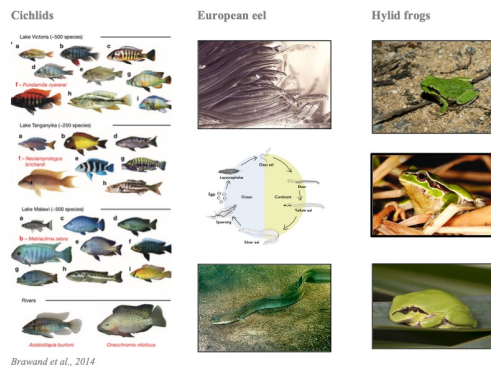
max **25 pages** in total
(including text, figures and references)

DEADLINE: 27 / 10 / 25

Report grading

Molecular Methods in Ecology and Evolution – 2025

Using molecular approaches to understand the drivers of population divergence and speciation.



See “**Advice on preparing your report**” section in your manual, these guidelines are there to help you write your report, but they will also be the basis of the marking scheme used to grade your reports.

Prof. Ian R. Sanders, Dr. Luca Fumagalli, Prof. Nicolas Salamin

Teaching assistants: Dr. Soon-Jae Lee, Dr. Angélica Pulido, Dr. Anna Hewett, Dr. Jaime Gonzalez, Dr Ricardo Arraiano, Marion Nyamari, Kenneth Kim.

https://github.com/Angelica-Pulido/MMEE-2025/

Angelica-Pulido / MMEE-2025

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<> Code

Issues

Pull requests

Actions

Projects

Wiki

Security

Insights

Settings

MMEE-2025

Public

Pin

Unwatch 2

Fork 1

Star 0

main

1 Branch

0 Tags

Go to file

t

Add file

<> Code

About

Angelica-Pulido

Add files via upload

bdb7455 · last week

77 Commits

1.Frogs_Sanger	Add files via upload	27 days ago
2.Frogs_RADseq	Add files via upload	27 days ago
3.Cichlids	Add files via upload	27 days ago
4.Eels	Add files via upload	27 days ago
MMEE_2025_Manual.pdf	Add files via upload	last week
README.md	Add files via upload	27 days ago
Schedule.png	Add files via upload	27 days ago

README

Molecular Methods in Ecology and Evolution - 2025 - University of Lausanne

This is the repository for the master course "Molecular Methods in Ecology and Evolution - 2025 - UNIL"

Here you will find all the information and data you will need for the computer analyses of the course.

This is the repository for the course "Molecular Methods in Ecology and Evolution - 2025 - UNIL Master"

Readme

Activity

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Create a new release

Packages

No packages published

Publish your first package

Contributors 2

Angelica-Pulido

Angélica Pulido

sciencesj

AMF.SJ

<https://github.com/Angelica-Pulido/MMEE-2025/>

Files

main

Go to file

> 1.Frogs_Sanger

> 2.Frogs_RADseq

> 3.Cichlids

> 4.Eels

MMEE_2025_Manual.pdf

README.md

Schedule.png

MMEE-2025 / README.md

Preview

Code

Blame

50 lines (26 loc) · 2.01 KB

Raw

Copy

Download

To be able to install and use all packages required you may need to use R version 3.6.x instead of R version 4.x.x. Consider switching versions if you have trouble installing the packages. If you already have an R version installed on your computer and want to change it, you can find instructions on how to do it [here](#).

Packages installation

To install all packages required, please run the following commands:

In case you don't have administrator's access to your computer, you can specify where the packages should be installed with the `lib` option in `install.packages()`

```
install.packages("ape", dependencies = TRUE)
```

```
install.packages("phangorn", dependencies = TRUE)
```

```
install.packages("seqinr", dependencies = TRUE)
```

```
install.packages("adegetnet", dependencies = TRUE)
```

```
install.packages("pegas", dependencies = TRUE)
```

```
install.packages("hierfstat", dependencies = TRUE)
```

```
install.packages("raster", dependencies = TRUE)
```

```
if (!requireNamespace("BiocManager", quietly = TRUE))
```

```
install.packages("BiocManager")
```

```
BiocManager::install("LEA", dependencies = TRUE)
```

```
install.packages("outliers", dependencies = TRUE)
```

```
install.packages("EnvStats")
```