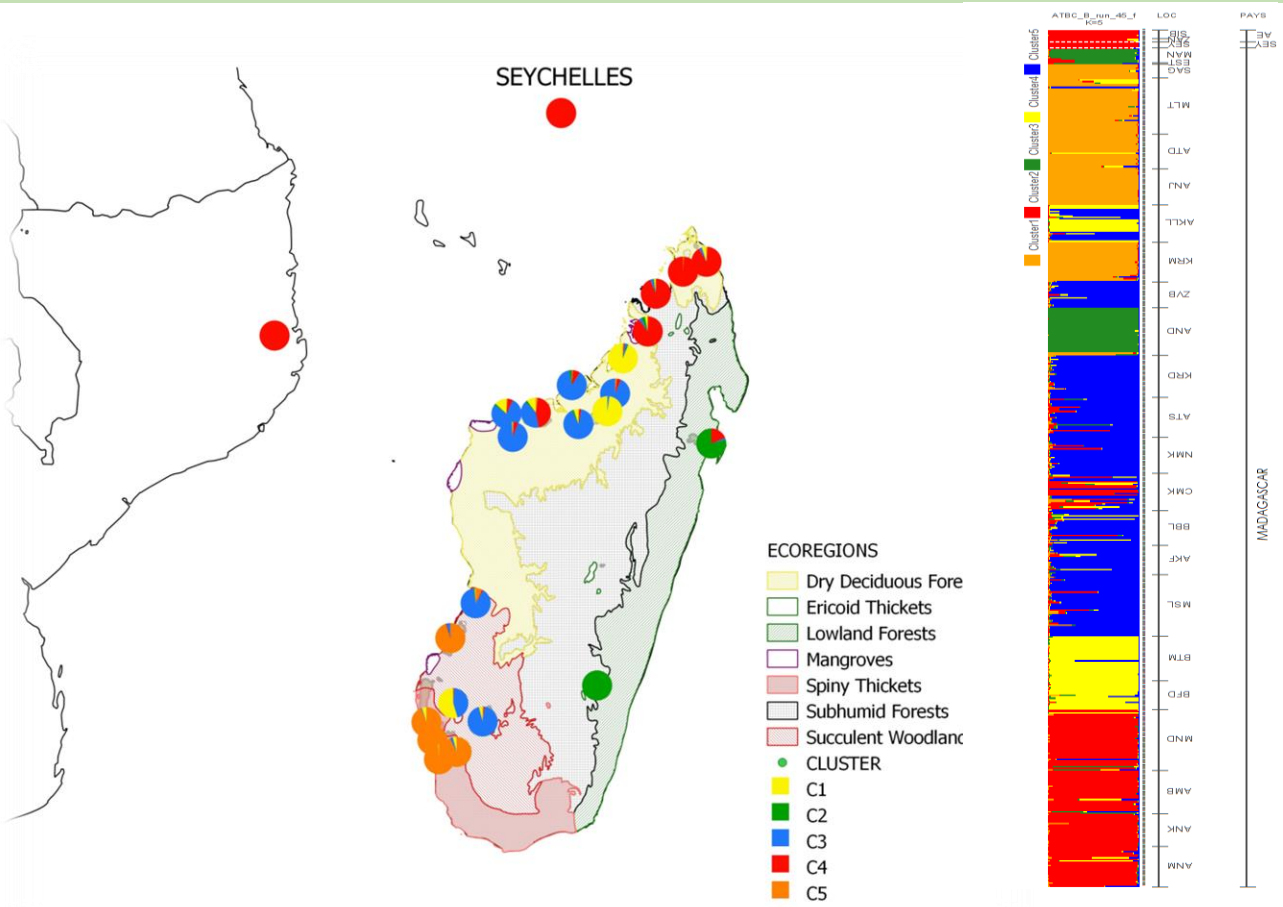
CONTRIBUTION OF GEOGRAPHICAL DISTANCE AND CLIMATE ON GENETIC DIFFERENTIATION: CASE STUDY OF APHYLLOUS *VANILLA* SPECIES FROM SOUTH WESTERN INDIAN OCEAN REGION

- **7 aphyllous *Vanilla* species (AVS)** are described to be endemics to **SWIO** region (Porteres, 1954).
- **AVS** from **SWIO** form an unique species with morphological variations due to geographical adaptations (Cameron, 2011). **IS IT TRUE?**



- **Statistical model question:**

What is the relative contribution of geographical distance and climate on patterns of genetic differentiation of AVS in Madagascar?

- **Mechanistical model question:**

How can we explain the effect of geographical distance and climate(T°, P) on AVS differentiation in Madagascar?

- **Ankowledgement:**

Fanohy, Sylviane, Sylviane, Cedrique, all students, all mentors, all instructors

Statistical question: What is the relative contribution of geographical distances and climate on patterns of genetic differentiation of AVS in Madagascar?

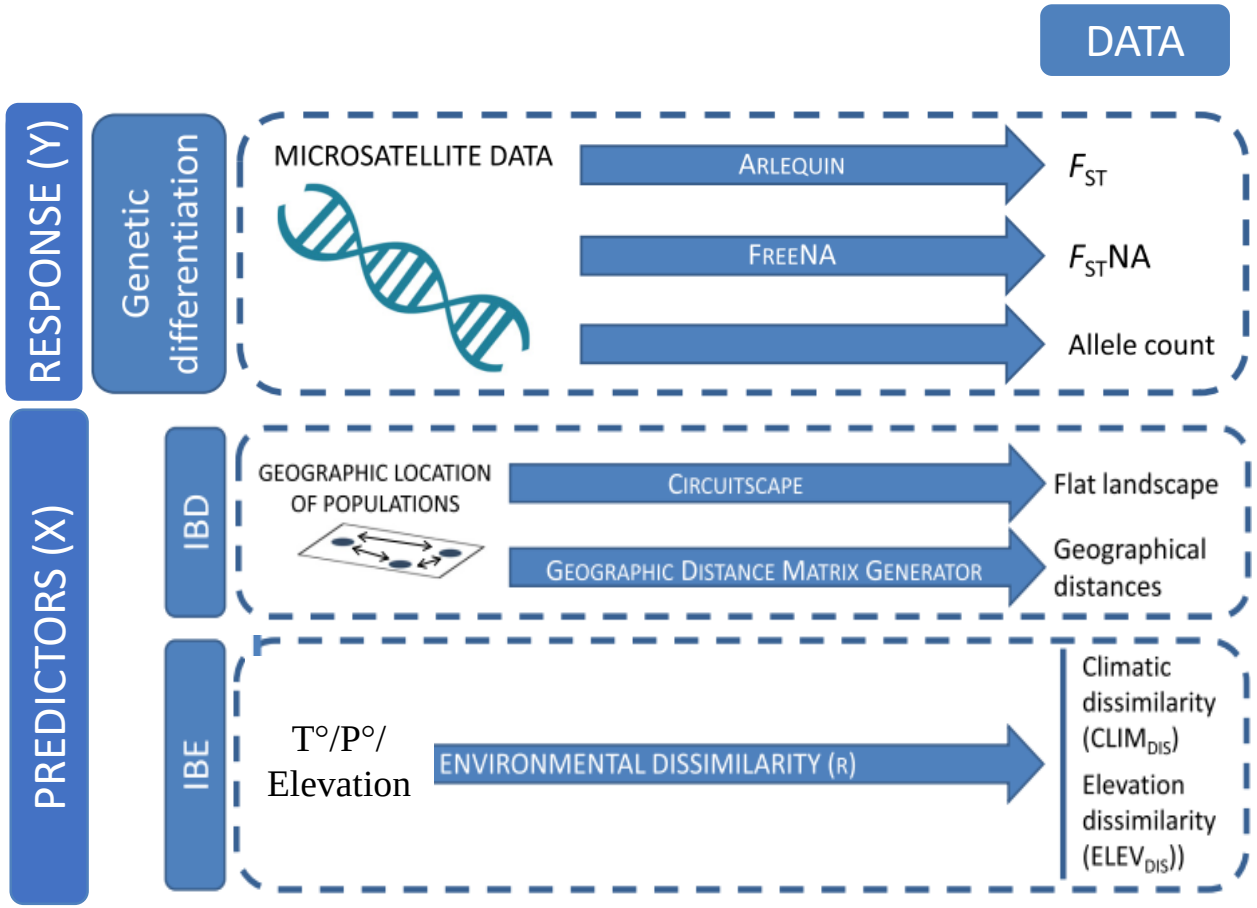
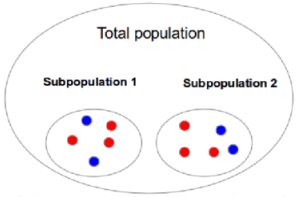
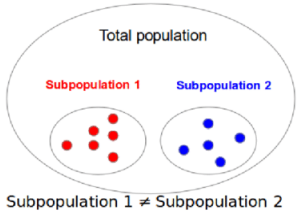


Table 3. The pairwise Fst distance of the 6 populations of red hybrid Tilapia analysed.

Population	1	2	3	4	5	6
1	0.000					
2	0.195	0.000				
3	0.132	0.192	0.000			
4	0.105	0.138	0.124	0.000		
5	0.160	0.205	0.221	0.153	0.000	
6	0.221	0.239	0.229	0.171	0.157	0.000



Subpopulation 1 = Subpopulation 2
$F_{ST} = 0$



Subpopulation 1 ≠ Subpopulation 2
$F_{ST} = 1$

- **Family: Normal**
- **Link: Identity**
- **Hypothesis:**

Both geographical distances and environmental conditions are correlated positively with genetic distances

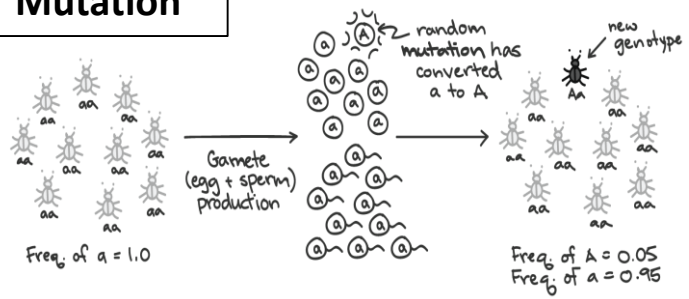
- **R code: Contribution <- MMRR(Genetic_Distance,list(as.matrix(Geographic_Distance),as.matrix(Climate_Distance)))**

MMRR (Multiple Matrix Regression with Randomization): based on multivariate linear model

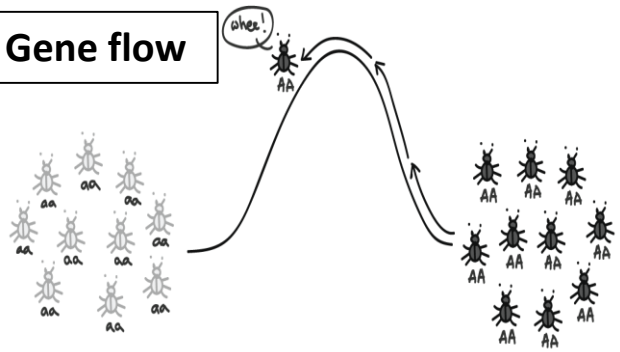
Mechanistical question: How can we explain the effect of geographical distances and climate on AVS differentiation in Madagascar?

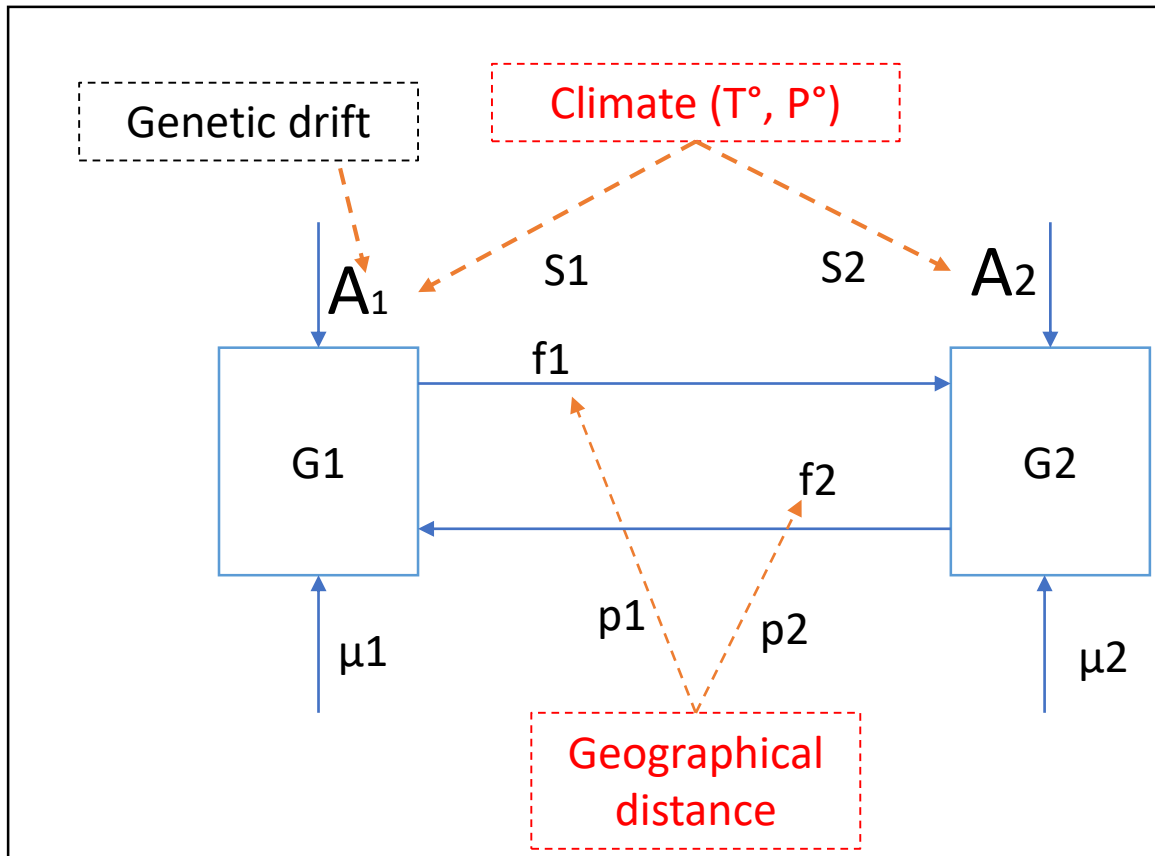
Evolutionary process	Genetic differentiation between populations
Mutation	Increases
Gene flow	Decreases
Genetic drift	Increases
Divergent selection	Increases

Mutation



Gene flow





States :

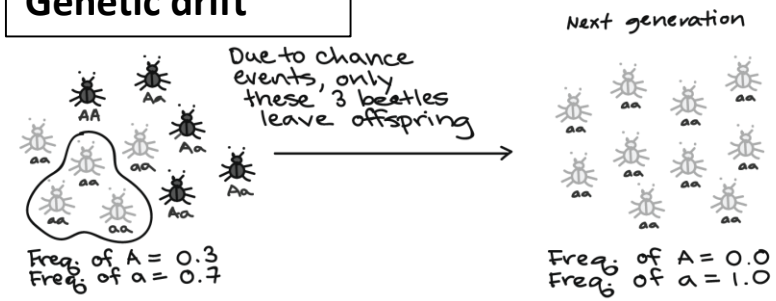
G1: Genetic group 1

G2: Genetic group 2

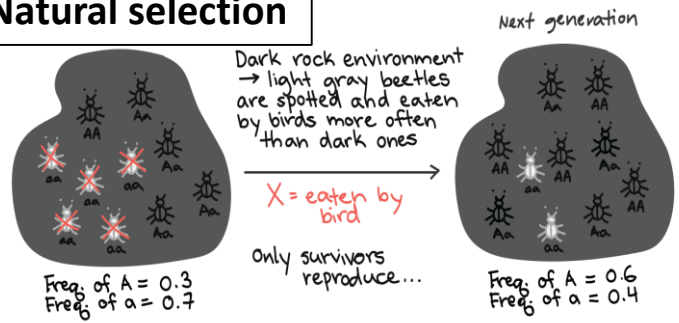
Process :

- f1: gene flow from G1 to G2
- f2: gene flow from G2 to G1
- A_1: allele frequencies in G1
- A_2 : allele frequencies in G2
- μ1: mutation rate in G1
- μ2: mutation rate in G2
- S1: Allele selection rate in G1
- S2: Allele selection rate in G2
- P1 :Pollination rate from G1(Pollen) to G2 (Ovule)
- P2: Pollination rate from G2 (pollen) to G1 (Ovule)

Genetic drift



Natural selection



NEXT STEPS

- **Data collection**: T°, P°, soil, forest cover
- **Construction of model framework**: dynamic equations and relashionship between parameters
- **Model Analyses, selection and validation:** fitting, parametrization, validation
- **Manuscript writting and submission**