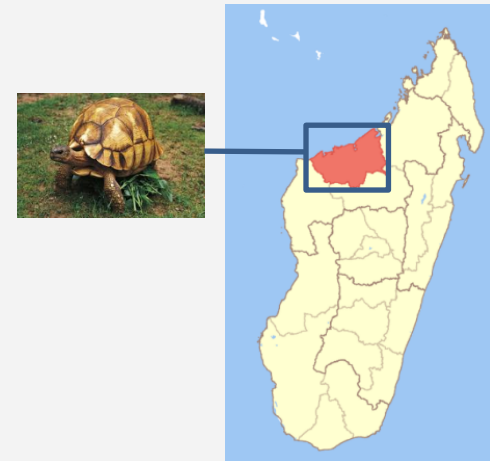


Combating tortoises poaching in Baly Bay National Park

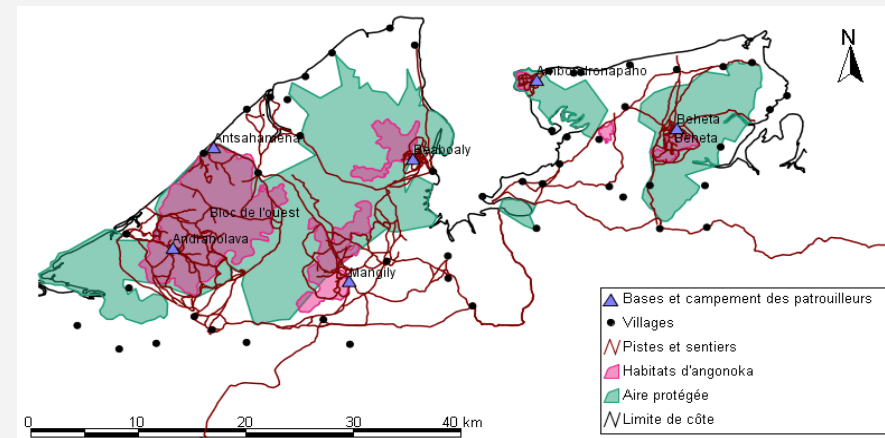
Liantsoa Rasoanarivo
Conservation Biologist, Durrell

- **Background** : One endemic tortoise (*Astrochelys yniphora*) which is located on the West of Madagascar is classified within the red list of International Union for Conservation of Nature (IUCN) as Critically Endangered (CR) species.
- **Statistical question** : Are tortoises easier to observe during the rainy season?
- **Mechanistical question** : How does the rate of poaching enhance the extinction of tortoises in the wild?

Acknowledgments : All instructors and mentors
Hélène and Diary



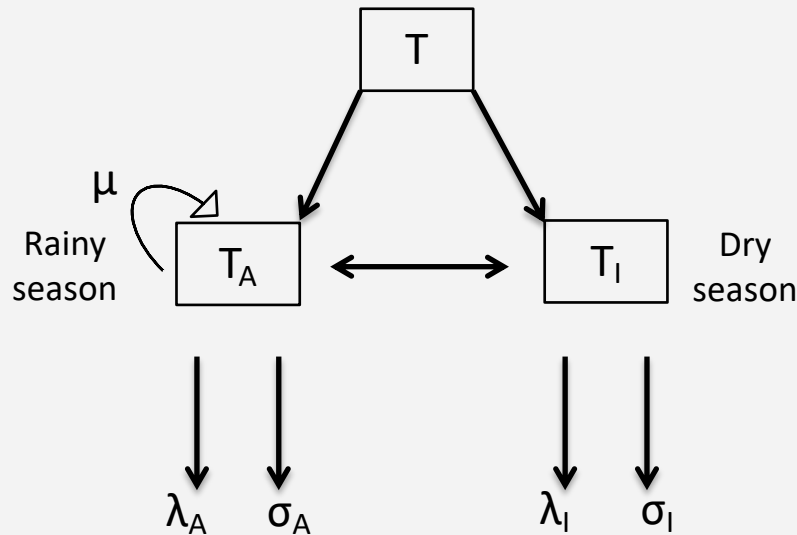
Madagascar



Statistical question : Are tortoises easier to observe during the rainy season?

- **Response variable** : number of tortoises observed per patrol
- **Predictor variables** : seasons (rainy season : nov-april ; dry season : may-oct), sites, Forest Area
- **Family** : poisson, negative binomial
- **Link** : natural log
- **Hypothesis** : number of tortoises observed during rainy season > number of tortoises observed during dry season.
- **Rcode** : *tappl*(number_of_tortoises, list(site, mois), mean, na.rm = T)
 - If mean \approx var : *glmer*(number_of_tortoises_per_patrol ~ seasons + sites + Forest Area + (1 | Frequency_of_data_collection) + (1|number_of_patrollers_per_patrol), family = "poisson", data = patrols.data)
 - If mean \ll variance : *glmer.nb*(number_of_tortoises_per_patrol ~ seasons + sites + Forest Area + (1 | Frequency_of_data_collection) + (1|number_of_patrollers_per_patrol), data = patrols.data)

Mechanistical question : How does the rate of poaching enhance the extinction of tortoises in the wild?



T : tortoises population

T_A : tortoises in activity

T_I : tortoises in inhibition

μ : birth rate

λ_A : poaching rate during rainy season

λ_I : poaching rate during dry season

σ_A : death rate during rainy season

σ_I : death rate during dry season

$$T(t+1) = -\lambda T(t) - \sigma T(t) + \mu T(t)$$

Dry season (may-oct) : $T_I(t+1) = -\lambda_I T(t) - \sigma_I T(t)$

Rainy season (nov-april) : $T_A(t+1) = -\lambda_A T(t) - \sigma_A T(t) + \mu T(t)$

Future directions

- *Statistical question* : where and when have more tortoises been observed in the wild?
- *Mechanistic question* : does the poaching rate depend on the life cycle of tortoises?
- Determine which factor has a major impact on the extinction of tortoises : poaching or degradation of Forest Area?
- Determine in which site more tortoises are found in order to enhance the Protected Area monitoring.
- Study alternative strategies to fight against tortoise poaching.

