



# Assessing the Invasion of *Procambarus clarkii* in Andean Lakes: Monitoring, Experiments, and Future Predictions

## Introduction – Timeline

The specie is known worldwide as a highly invasive species capable of habitat alteration.

Timeline of *P. clarkii* in Ecuador

- 1986: *The specie* was introduced in Ecuador.
- 2013: First introduction in an Andean lake (Yahuarcocha)
- 2016: Monitoring of eDNA and traps in water bodies
- 2018: Status of the lake: hypereutrophic
- 2019: Specie introduction in three Andean lakes
- 2020-2022: Mitigation strategies to recover Yahuarcocha
- 2021-2024: Aquarium/pond experiments

## Ecological implications

### Yahuarcocha

- P. clarkii* is a major contributor to the hypereutrophic state of Lake Yahuarcocha.
- Changes in macroinvertebrate and fish communities.
- Decline of submerged macrophytes correlated with *P. clarkii* population dynamics.

### Molecular techniques

- Detection of *P. clarkii* in eleven Andean water bodies

### Aquarium

- Preferences of six submerged macrophytes
- Reproduction in all months with a preference for August-September (2.8 broods per year)
- Ciprianus carp* observed as potential predator (>3mm)

### Pond Experiments

- The species collapses the ecosystem in 2.2 years

### Ecological modeling

- Climate models predict significant shifts in habitat suitability for *P. clarkii* by 2050, with warmer temperatures potentially expanding its invasive range

## Methods

### Lake Yahuarcocha monitoring

Population, restoration methods, metabarcoding eDNA, bathymetry, nutrients, physicochemical variables, microbiology

### Molecular techniques / traps

eDNA: single species detection - multiplexing  
37 lakes and 12 rivers sampled

### Aquarium

Reproduction patterns, natural behavior

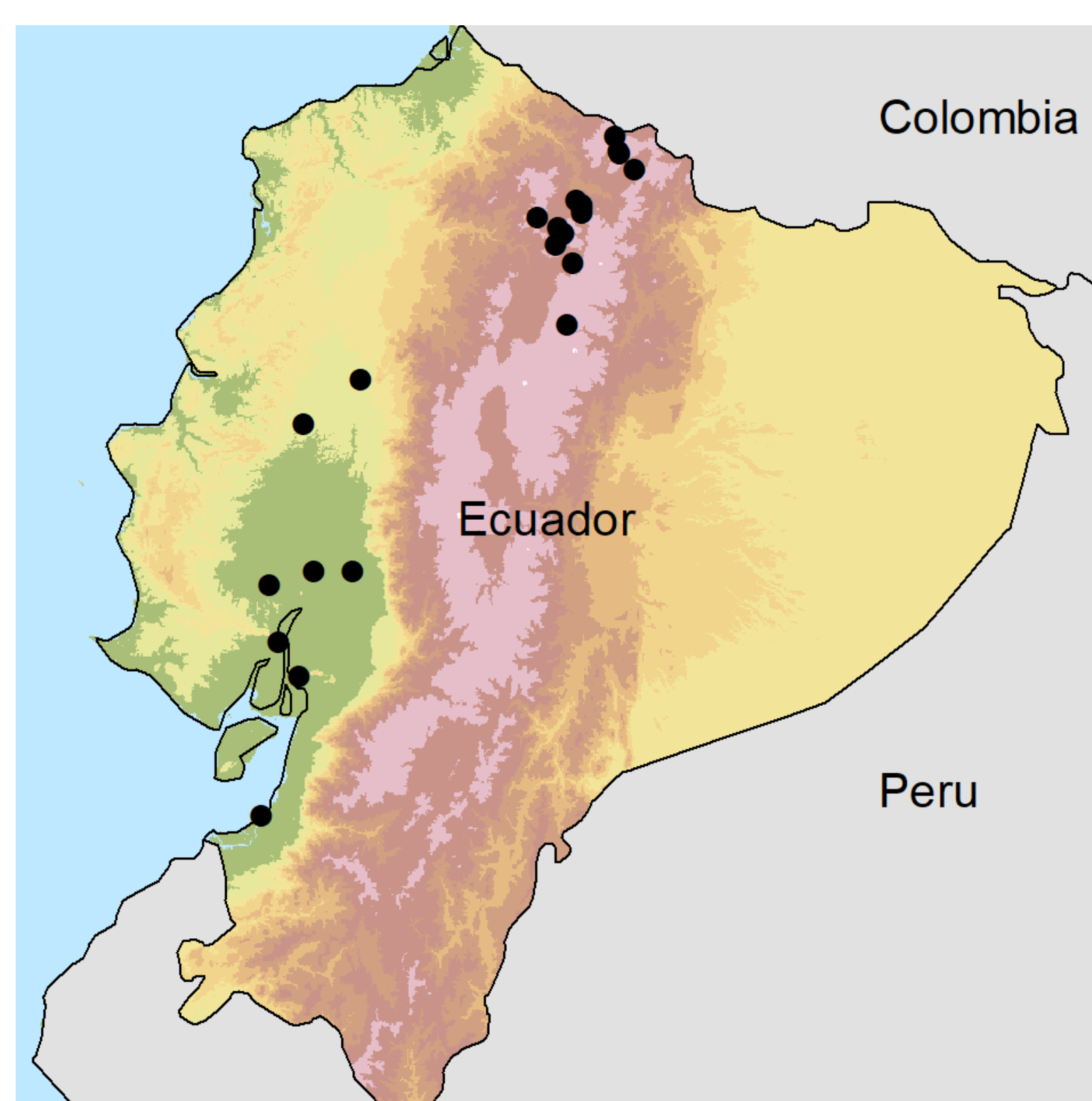
### Pond

Macrophytes, densities, predator-fish relationships

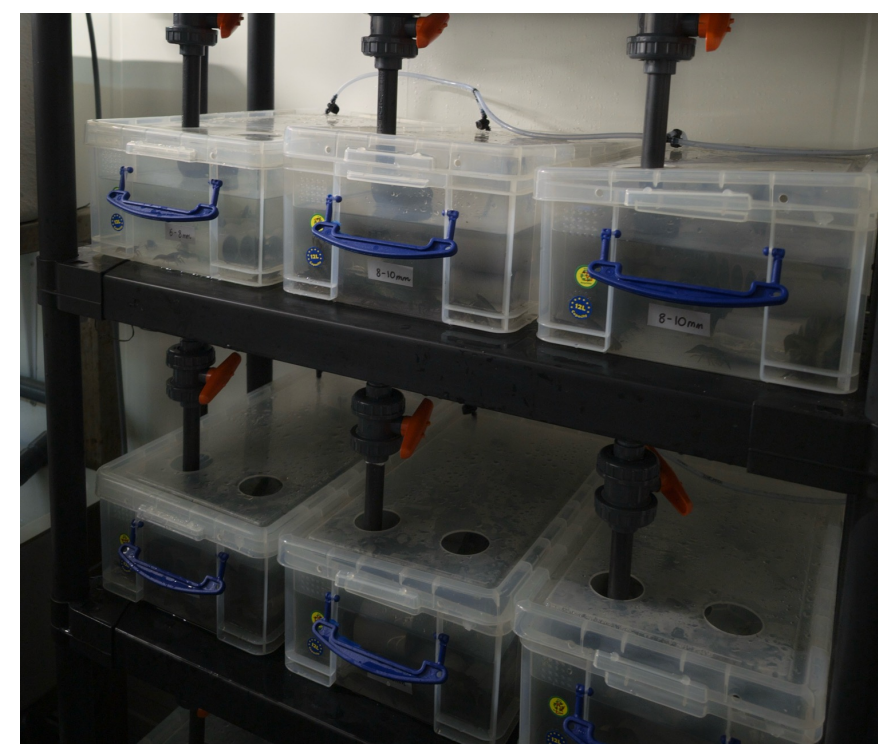
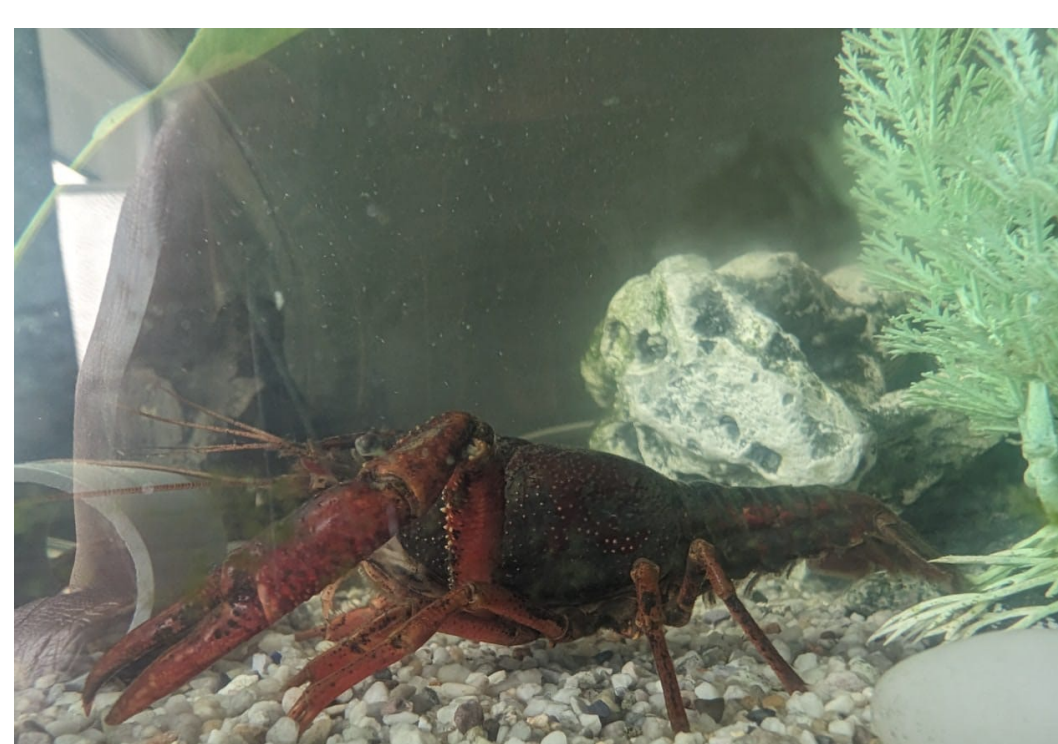
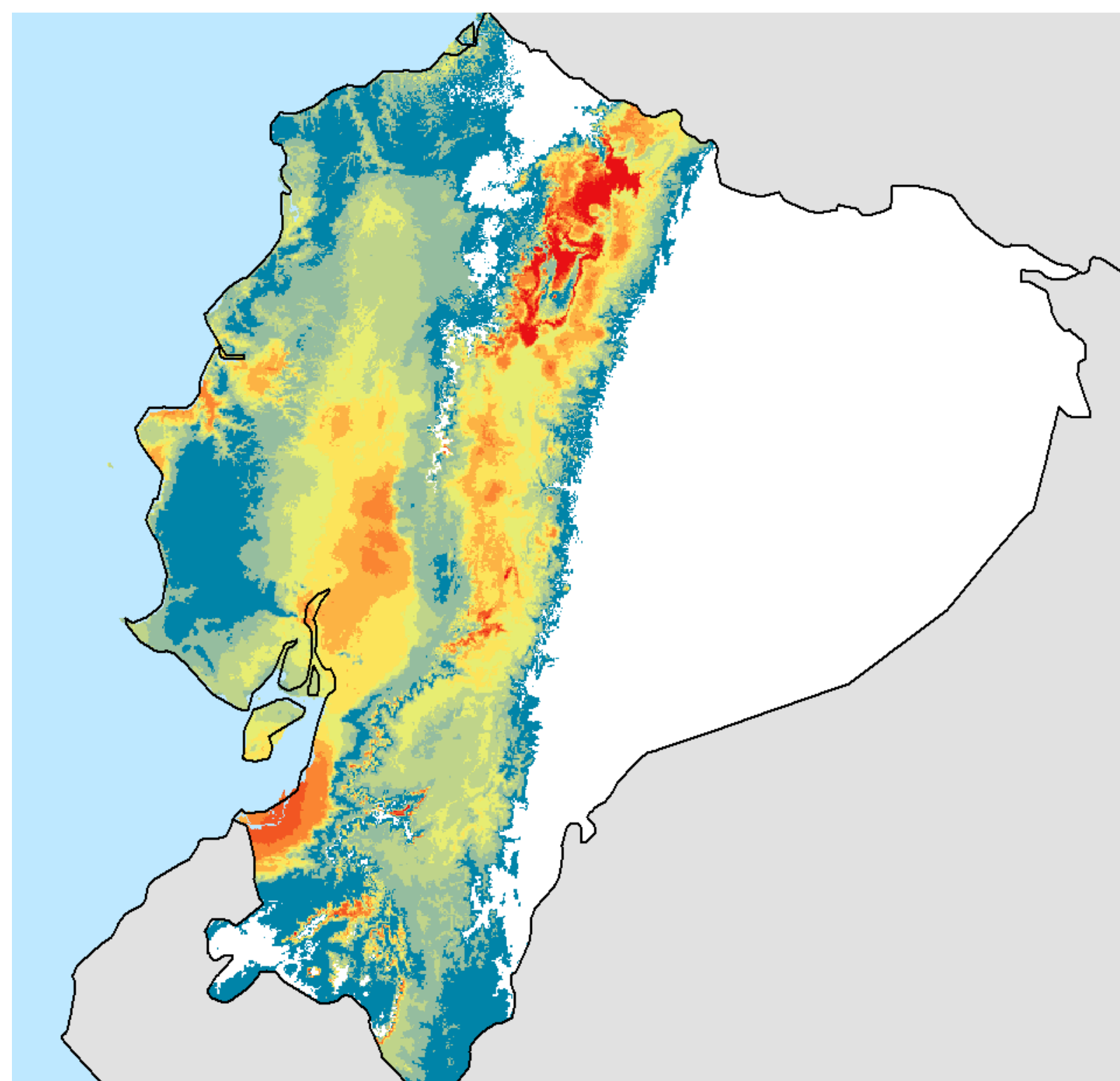
### Ecological modeling

Effects of climate change on the distribution of the specie

Current distribution of *P. clarkii* in Ecuador



Potential habitat suitability for *P. clarkii* in Ecuador



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