Effects of global climate change of the Brazilian fauna: a conservation physiology approach

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Team: 4 Foreign collaborators
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       3 Technicians
CONTEXT AND MAIN GOAL

Global climate change, increase in extreme climatic events

* e.g., Becker et. al., 2007, 2009

- Pollution
- Invasive species
- Pathogenic agents
- Habitat split*
- Genetic isolation
- Fragmentation

* e.g., Becker et. al., 2007, 2009
To investigate (for key elements of the Brazilian fauna):

- effects of climate on ecological performance
- effects of the interaction [climate – environmental change] on ecological performance,
- the physiological mechanisms of effects, and the scope for physiological adjustment

To raise hypotheses regarding:

- elements of highest impact in the climate-environmental change interaction
- Impact of climate change on the distribution of species

To produce knowledge helpful to:

- raise in captivity some endemic species that appear to be threatened by climate change
**Temperature and development**

- Thermal effects on metabolism, cell membrane organization and development in fish

- Thermal tolerances of anuran larvae from Caatingas and Atlantic Forest

**Interaction climate-habitat fragmentation**

- Climate, habitat fragmentation and physiology in rodents and bats from different Brazilian biomes.

- Endocrine control and reproductive blocking in migrating fish exposed to dams: The *surubim do Paraíba*

- Microclimate, habitat fragmentation and cutaneous microbiota in anuran amphibians.
Temperature and physiological tolerance

• Climate, stress and physiological tolerance in the endemic bird *Cinclodes pabsti* from the Brazilian *Campos Sulinos*

• Critical temperature in anurans and arthropods in terrestrial brazilian biomes

• Tolerance to freezing in anurans

Aridization and physiological tolerance

• Aestivation physiology in Caatinga anurans: consequences in an aridization scenario
Physiological function

Global Climate Change

Environmental Change

Allostatic capacity
- depends on the limits of
- has limits defined by
- is challenged by changes in

Homeostasis
- is the pool of reactions to stimuli able to disturb
- have limits defined by

Stress
- may cause depression of

Species richness
- may cause

Ecological variables
- are

Temperature
- Humidity
- pH
- Oxygen concentration

Immune function
- Behavioral performance
- Energy metabolism

Phenotypic flexibility
- includes the ability to change via
- may cause decline or local extinction of

Evolution
- (Adaptation)

Phenotypic Plasticity
- via individual effects may cause decline or local extinction of

Populations
- conform

Ecological success (Fitness)

Affect

may shift demands on

may modify or create

are types of environmental impact that may accentuate regional effects of

Ecological gradient
- involve simultaneous variation in

Habitat fragmentation
- Introduction of pathogens
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• The surubim tolerates an increase in water temperature. Higher temperatures promote growing, but at metabolic spend.

• Observed adjustments involve re-organization of cell membranes, and an increase in saturated fatty acids.
Threatened fishes of the world: *Steindachneridion parahybae* (Steindachner, 1877) (Siluriformes: Pimelodidae)

Renato M. Honji - Danilo Caneppele - Alexandre W. S. Hilsdorf - Renata G. Moreira

- Climate-reproduction interactions explained via physiology of the brain-pituitary-gonads axis and reproductive hormones;

- Artificial reproduction in captivity is now viable in this threatened fish species;

- Survival improved through studies of embryonic and larval stages.
Specific diversity; ~ 7% forms found exhibit pathogens inhibition

Micro climate?

Mean number of Colony forming Units

18
14
10
6
2

Continuous  Fragmented

Landscape

Dendropsophus minutus
Phyllomedusa distincta
Aplastodiscus leucopygius
Proceratophrys boiei

Brito & Navas, 2010
Pleurodema diplolistris