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EFFECTS OF GLOBAL CLIMATE CHANGE ON THE BRAZILIAN FAUNA: A CONSERVATION APPROACH

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SCIENCE QUESTIONS AND OBJECTIVES

A pattern that is global, yet heterogeneous given regional nuances, is an unequivocal change in the climate of Earth. Although this trend is expected to cause pervasive effects on the biota, the nature, span and final consequences of climate change must differ among taxa, even among animal species, because of the vast diversity in physiological traits and ecological associations evident in the fauna. Understanding the nature of differential effects of climate change on animal species is one of the many urgent and interdisciplinary challenges faced by contemporary science, and enhancing this understanding is the main general goal of this project. We propose an integrative ecophysiological and comparative approach that is derived from the conceptual framework supporting the emerging discipline known as conservation physiology. A main tenet of this discipline is that populations exposed to environmental change may crash when most individuals deteriorate, and that populations decline when individuals reach a physiological state that prevents them to maintain proper internal equilibrium through time. It follows that the effects of climate change on animal species cannot be assessed from the type, magnitude or time scale of the perturbation, but from the physiological states caused by it; and that the same pattern may be deleterious for one species and innocuous to another. We ask: 1) How and why physical variables related to climate interact with other types of environmental change and induce noxious physiological states or prevent reproduction? 2) Why this is so for some animal species but not for others? 3) What are the limits and paths of physiological adjustment to climate? 4) How early stages of life cycles are affected by climatic variables? 5) What are the energetic costs and trade-offs imposed on animals by climate shifts? These general questions are tackled using key models carefully selected from the Brazilian fauna.

*Figure 1. Aestivating frog (*Pleurodema diplolistris*) in the semi-arid Brazilian Caatinga*

Figure 2. A dam blocking fish upstream reproductive migration

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

Ongoing projects partial results

1. The differential effects of fragmentation in bats relate to body condition and metabolic costs, in turn caused by differences in temperature and food supply. In rodents relate to different behavioral patterns, including personality. In birds, temperature and food supplies, as well as individual differences in reproductive success relate to the position of the nest in relation to the sun and to the temperature.
2. The resident microbiota living in the skin of anurans is affected by fragmentation, possibly via changes in environmental microbiota, in turn affected by local climatic conditions.
3. The catfish Steindachneridion parahybae has a reproductive period from October to March, with several spawning peaks that did not occur when migration was blocked.
4. Amphibians from the high tropical Andes differ in freezing tolerance whereas species from the semi-arid Caatingas differ in strategies for aestivation and water balance. These findings will help assessing distribution shifts and susceptibility to climate change. Lizard species differ in susceptibility to climate, and rain patterns, more than temperature, determine reproductive success.
5. Aluminum can be considered an endocrine disrupting compound for fish, decreasing plasma levels of progestagen and gonadotropins. Considering the influence of climate changes in fish, temperature affects the structure of fatty acids in cell membranes, and this alteration has a strong relationship with the length of exposure.

*Figure 3. Surubim do Paraíba (*Steindachneridion parahybae*), an endangered teleost species*

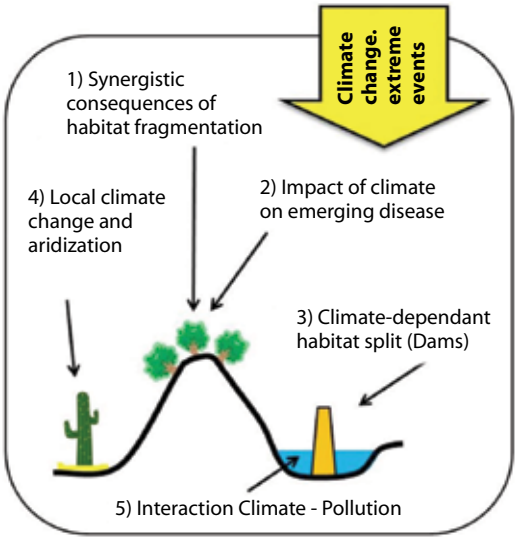

Figure 4. Schematic view of main problems assessed

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