PRELIMINARY SURVEY OF SOIL ANUROFAUNA IN A SEMI-ARID AGROECOSYSTEM IN PERNAMBUCO UNDER CONVENTIONAL AND ORGANIC MANAGEMENT

For decades, the anurofauna from the semi-arid region of Brazil has been believed to be extremely poor – and only in the last years have field surveys attempted at mapping and quantifying species and populations. Despite their important role in food webs and their potential as bioindicators for major environmental changes (DUELLMAN & TRUEB, 1986), it is likely that several anuran species are yet to be reported for the first time or even discovered in the region.

Anurans are associated with humid environments since they typically require aquatic habitats for breeding and larval growth (DUELLMAN & TRUEB, 1986). However, most species spend the largest part of their lives in terrestrial habitats, where their distribution patterns are influenced by factors such as hydroperiod, presence of natural enemies, food availability and the type and amount of vegetation (PRICE et al., 2004). Thus, assessing the impact of management on terrestrial habitats is of uttermost importance to understand the dynamics of anuran populations, especially given the decline in their populations in most ecosystems (ALFORD & RICHARDS, 1999).

Several characteristics of the Brazilian semi-arid region – and its most typical biome (a type of dry savannah known as *Caatinga*) – make it more difficult for anuran populations to thrive: low and irregular rainfall (limited to a short period in the year), low relative humidity, extremely high temperature and solar radiation, scarcity of ponds and other temporary water resources (RODRIGUES, 2003). As part of a study on biodiversity in agroecosystems in the semi-arid region (where soil insects were the initial target), we investigated, on a local scale, the influence of agricultural management (*i.e.*, conventional *vs* organic) on the richness and abundance of small to medium-sized soil anurans. Our hypothesis was that, even in a short-term basis, land use practices would influence the local anurofauna.

The experimental area was located in the municipality of Petrolina (09°09"S; 40°22"W), State of Pernambuco, Northeastern Brazil. The experiment was carried out in August-September 2003, in the dry season, and had the approval of the farm's owner and the ethic's committee from UFPE. Six private areas were selected for the field collections: three under "conventional" (i.e., that allows the use of chemical insecticides, fungicides, herbicides and fertilizers, among others) and three organic plantations separated from one another for at least 200 m. Even in the "conventional" area, the input of insecticides was kept to a minimum, and chemical fungicides and fertilizers were parsimoniously allowed. All areas had grapes grown for export (varieties Rubi, Isabel) and a minor presence of herbaceous weeds – slightly more abundant in the organic plots. The areas were irrigated by micro irrigation and droplet techniques, which kept the soil constantly moist without excessive superficial water. There were no permanent freshwater reservoirs or rivers in a perimeter of at least 15 km around the plantation.

In each area, nine 500 ml pitfall traps placed at soil level, with a suspended plastic lid were set in a 3 x 3 grid, with 4 m distance between them. Pitfall traps contained 70% alcohol and were emptied at every 72 h for the duration of the trial (21 days). Animals were kept individually in glass vials containing 70% alcohol until identification, carried out by comparison with the specimens kept at the scientific collection at the Universidade Federal da Paraíba (UFPB), where they were deposited.

A limited amount of individuals was collected, partially due to the short duration of the experiment and to the environmental characteristics found in the harsh dry season. However, this also reflects the low populations in which most anuran species are found in the semi-arid region of Brazil. Five species from three families were recorded (Table 1) from which *Physalaemus cuvieri* Fitzinger, 1826 was by far the most abundant. Most species observed are often found in disturbed environments, which contradicts the assumption that anurans have limited repertory of adaptations to stress (*i.e.*, low humidity) and environmental modifications (GUERRY & HUNTER, 2002).

Although the limited sampling hampers further ecological analysis, a significantly higher

abundance was found in the organic areas (χ^2 = 11,36; P < 0,01; d.f. = 1). Curiously, more species were registered at the conventional plantations, although the low number registered does not allow for proper statistical analysis.

There are comprehensive data showing differences in the diversity and abundance of invertebrates in organic and conventional agricultural areas, most of which pointing to a higher richness and abundance in organic systems (ALTIERI & NICHOLLS, 1999). However, studies addressing the role of agricultural practices on anuran communities are scarce (but see GUERRY & HUNTER, 2002). Soil dwelling anurans, with their permeable skin, are natural repositories of insecticide drift, since it is known that almost 70% of the spray applications end up reaching – and being deposited on - the soil or water (PIMENTEL, 1995). Considering that insecticide is usually applied in the early hours of the morning when the heat is less intense, the likelihood of animal-chemical encounter is still considerable. The slightly higher diversity of herbaceous plants visualized at the organic plots reinforce the concept that vegetation complexity provides more diverse microhabitats, refuge against predators, substrate for herbivore insects and more humid shelter, especially against direct UV radiation.

Curiously, a post-metamorphic form of *Physalaemus cuvieri* lacking the posterior left leg (due to mutation) was registered in one of the conventional areas. Several factors such as toxins, parasite infestation, predation and excessive exposure to UV radiation are known to have mutagenic effects on amphibians (OUELLET et al., 1997). Ouellet et al. (1997) found high incidence of abnormalities in three species of frogs from agricultural sites exposed to toxins. However, this interpretation for the deformity reported here must be cautious since other biotic and abiotic factors could be involved and no final inference can be made without biochemical and genetic analyses.

This is, to our knowledge, the first attempt to investigate – even in a restricted spatial and temporal scale – the effect of agricultural production systems on anuran diversity in the semi-arid region of Brazil. It is also the first reference to mutagenic deformities in *P. cuvieri* for the region. Considering the major impact the area has suffered, with the replacement of local vegetation for intensive high-input agriculture, it is important to take into account the complexity of the interactions among the local fauna when designing programs of biological conservation.

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Table 1: Richness and abundance of anuran species in agro-ecosystems in Petrolina, Pernambuco, under conventional and organic farming.

Family	Species	Agricultural Management	
		conventional (N)	organic (N)
Bufonidae	*Rinella jimi* (Stevaux, 2002)	2	13
	Rinella granulosa (Spix, 1824)	1	0
Leiuperidae	*Physalaemus cuvieri* Fitzinger, 1826	10	20
Leptodactylidae	*Leptodactylus fuscus* Schineider, 1799	1	7
Hylidae	*Scinax x-signatus* Spix, 1824	1	0
Total of Species		**5**	**3**
Total of Specimens		**15**	**40**