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EDITORIAL

HERPETOPARASITOLOGY IN BRAZIL: WHAT WE KNOW ABOUT ENDOPARASITES, HOW MUCH WE STILL DO NOT KNOW

HERPETOPARASITOLOGÍA EN BRASIL: LO QUE SABEMOS SOBRE LOS ENDOPARÁSITOS, LO MUCHO QUE TODAVÍA NO SABEMOS

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THEORIC BACKGROUND

Knowledge about the biological diversity on the planet is still pretty scarce (Wilson, 1997). To say how many species of a taxonomic group there are in the world, or even in a small forest remnant is extremely difficult or almost impossible (May, 1988). Projects related to conservation and environmental recovery require knowledge of the diversity, ecology and systematic of organisms and ecosystems involved (Scott *et al.*, 1987). The inventory the fauna of a particular portion of an ecosystem is the first step in the conservation, restoration and rational use of the environment (Santos, 2003). Additionally, Neotropical biota has been understudied and the number of newly described organisms is disappearing faster than new organisms are being described (Greene & Losos, 1988; Muniz-Pereira *et al.*, 2009). Thus, the study of biological diversity is the first step for further studies.

According to Poulin & Morand (2000), parasites represent a diversity invisible within the biodiversity that we are accustomed to seeing every day. Only a small part of that diversity has medical or veterinary importance, the majority represents an important component of biodiversity in all ecosystems, contributing to the maintenance of local diversity of hosts and the ecosystem functions (Bush *et al.*, 1997; Poulin & Morand, 2000; Thomas *et al.*, 2005; Poulin, 2007).

The helminth parasites of vertebrates are a remarkably diverse group. Nevertheless its richness is poorly known (Gregory *et al.*, 1996; Hugot *et al.*, 2001) and underestimated (Anderson, 2000; Poulin & Morand, 2004). The diversity of life on Earth is underestimated at 1.5 millions of species. Similarly, the number of species of parasites is underestimated at 100,000 (Poulin & Morand, 2004) and about 40% of species in any natural community present a parasitic life (Thomas *et al.*, 2005). Wildlife inventories and descriptions of helminth species are required as they increase our understanding of parasitism in vertebrate groups and establish a basis for further studies (Ávila & Silva, 2010; Muzzall, 2005).

HERPETOPARASITOLOGY

With regard to herpetofauna, Brazil has the greatest richness of amphibians (over 870 species, (SBH, 2010) and the second highest diversity of reptiles, over 670 species (Bérnils & Costa, 2011). However, associated helminth fauna is known for only about 80 amphibian species (Vicente *et al.*, 1990; Luque *et al.*, 2005; Lunaschi & Drago, 2007; Holmes *et al.*, 2008; Campiao *et al.*, 2009; Pinhão *et al.*, 2009). For reptiles, especially lizards, the number of species surveyed is slightly higher (Vicente *et al.*, 1993; Vrcibradic *et al.*, 2000; Rocha & Vrcibradic, 2003; Lunaschi & Drago, 2007; Vrcibradic *et al.*, 2007; Cardoso, 2008; Vrcibradic *et al.*, 2008; Ávila & Silva, 2010). This situation is especially alarming when one considers the current rate of loss of natural ecosystems and the high rate of species extinction (Wilson, 1997) and the global process of declining populations of amphibians and reptiles (Alford & Richards, 1999; Gibbons *et al.*, 2000; Wake, 2007; Whitfield *et al.*, 2007; Sinervo

et al., 2010). One of the first organisms to suffer from the human disturbance are parasites (Gibb & Hochuli, 2002; Laurance *et al.*, 2002).

The popularity of studies focusing on parasites of wildlife has approached these limits. Current studies in ecology and evolution, bring a renewed interest for these subjects. Systematic studies and inventories of parasitic fauna associated to amphibians and reptiles in Brazil began with the research of Dr. Lauro Travassos (Travassos, 1925, 1913), with "Sobre as species brasileiras da subfamília Heterakinae Railliet & Henry" and "Contribuições para o conhecimento da fauna helmintológica dos batráchios do Brasil. Nematódeos Intestinais" were the first study to report the fauna of parasitic nematodes of reptiles and amphibians, respectively. Other surveys, expeditions and contributions to the knowledge of the helminthological fauna of amphibian and reptiles were carried out over decades of research. From this knowledge some patterns began to emerge, such as low richness and diversity of helminth species and community composition of parasites strongly influenced by biological and ecological aspects of hosts.

Knowledge of the aspects of the parasitism by helminths of neotropical reptiles had increased in the last decade (Vrcibradic *et al.*, 2000; Rocha & Vrcibradic, 2003; Luque *et al.*, 2005; Trombeta, 2008; Campiao *et al.*, 2009; Muniz-Pereira *et al.*, 2009; Ávila & Silva, 2010; Werneck, 2011). Although Brazil has the second highest diversity of reptiles (over 670 species of reptiles (Squamata), the richness of nematodes of lizards was summarized at just two major revisions (Vicente *et al.*, 1993; Ávila & Silva, 2010). Brazil has 248 species of lizards and 67 species of amphisbaenas (Bérnils & Costa, 2011). However, the proportion of lizards that were surveyed for parasites is low. The parasite fauna of only 114 species of lizards (48%) is known (Ávila & Silva, 2010). Regarding amphibians, that number is even lower; only six species (8%) were surveyed for parasites (Ávila & Silva, 2010). Of the seven species of sea turtles in the world, five occur in Brazil. The helminth fauna of this chelonian group has been extensively reviewed (Werneck, 2011). However, this information for freshwater turtles is scarce. Furthermore, the most representative parasites are the nematodes of family Atractidae (Gibbons *et al.*, 1997; Moravec & Thatcher, 1997).

Despite the increase in research on the helminth fauna of reptiles and amphibians and knowledge of host-parasite interaction, there are still many blanks in this puzzle. The helminth fauna of crocodilians and freshwater turtles must be reviewed and more studies carried out. To the current knowledge of parasites of reptiles new ecological and evolutionary questions became to be addressed. Studies on helminth fauna composition and patterns of richness associated to host phylogeny, or biogeography, begin to emerge as a new trend in evolutionary studies of amphibian and reptile parasites.

Many basic research projects and inventories of helminths of wildlife should continue to be practiced, particularly in biomes and species of hosts that have been not sampled because the missing information is even greater than current state of knowledge.

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