DIVERSITY OF TROPICAL SPIDERS - GROUND-DWELLING SPECIES OF BRAZILIAN SAVANNAS

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Summary

Spiders are one of the biggest and most diverse groups of arthropods. There are around 40000 described species of spiders, belonging to more than 100 families and 3600 genera. However, 170000 species of these arachnids are estimated to exist in the world, which reflects the scantiness of studies about this group. The distribution and diversity of spiders in macro and micro-scale in the tropics are discussed in this chapter, showing the most important differences between this region and the temperate region. In addition, the most important groups of spiders, their natural history and their diverse ecological strategies are presented. Finally, we will exemplify with data about a current study on diversity of tropical spiders conducted in a Brazilian savanna.

1. Introduction

Biodiversity, or simply diversity, is defined as the number of *taxa* (e.g. an animal or plant taxonomic group) in an area (local or regional). It is also used as a measure of variety of *taxa* in a community, considering the relative abundance of each *taxon*.

Moreover, biodiversity can be discussed in a smaller or bigger scale than species. For example, the genetic diversity in individuals from the same population can be evaluated as far as the diversity of types of plant communities observed in a region.

A pattern frequently revealed by studies of ecological communities is the tendency of the diversity of species in tropical regions exceeds that observed at high latitude (temperate areas). The fact that tropics are more diverse than other climatic zones is an old idea accepted worldwide. However, the tropical region, i.e. the zone extending approximately 30º north and south far from the Equator, includes also huge extents of desert and savanna which appear, on the contrary, to contain low numbers and diversities of living organisms.

The latitudinal tendencies in species richness have been hard investigated in the last 50 years. In spite of it, it is defended nowadays that what determine the biological diversity is not the latitude but the environmental variables correlated with latitudinal variance. More than 25 different mechanisms have been suggested for generating latitudinal diversity gradients, but no consensus has been reached yet. There are many factors that can contribute for the maintenance of this pattern. Firstly, the terrestrial tropical zones have a larger climatically similar total surface area larger than terrestrial zones at high latitudes, with similarly small temperature fluctuations. It could be related to higher levels of speciation and lower levels of extinction in the tropics. Secondly, during the Tertiary geological period, a large part of the Earth's surface used to be tropical or subtropical. These evolutionary and historical processes can explain, in part, the higher diversity found in the tropical region.

Finally, tropical lands receive more solar radiation than those in the temperate region, which researchers believe it increases the productivity, causing a higher diversity. For the same reason, tropical areas are hotter than temperate areas and higher temperatures can also shorten generation times and increase mutation rates, accelerating the speciation process in the tropics. However, in spite of all of these facts and all efforts of scientists around the world, the knowledge available until today about the biological diversity of the tropical ecosystems is very poor.

2. The Araneae Order

The Araneae order is an extremely diversified group distributed all over the world. Spiders can be found in all continents, with the exception of Antarctica. They have conquered almost all terrestrial environments and some aquatic too. Spiders are considered the seventh largest arthropod group, surpassed in number of species only by the order Acari and five orders of insects, comprising until now 39882 species scientific named by taxonomists and arachnologists. The main differences between spiders and the other arachnids are the pedicel between the cephalothorax and the abdomen and the presence of spinnerets. The great success of these animals is probably due to their innovation in the use of silk, which result in a big capability of adaptation, culminating in a high diversity in this group.

All spiders are exclusively carnivorous. There are evidences that these animals evolved in conditions of food privation. Spiders are able to live without feeding for a long period

of time. They also eat an enormous quantity of prey when they are available, having the anatomical possibility of expand their abdomen. In addition, they can decrease their metabolic levels during periods of low prey availability, mainly during winter or dry season in the tropics. Some species of spiders can feed themselves on nectar and pollen in some special environmental conditions, but just for a brief period of time.

For their abundance, biomass and diversity, spiders are considered important predators of the food chain, influencing in the density and activity of detritivorous and funghivorous and affecting the decomposing processes. These animals show a great variety of predatory strategies, occupying many spatial and temporal niches. Furthermore, they are characterized by presenting a high taxonomic diversity within a habitat, they can exhibit taxon-specific and guild-specific responses to changes in the environment and are relatively easy to be sampled and identified. Spiders are also important regulators of insect populations and can be used as efficient indicators of richness variations and of the operation of biotic communities.

About its classification, the Araneae order can be divided in two suborders: Mesothelae and Opisthothelae. In Mesothelae, there is just one infraorder, Liphistiomorphae, which includes spiders with primitive characters such as traces of abdominal segmentation. These animals found exclusively in Asia. The suborder Opisthothelae is composed of two infraorders: Mygalomorphae and Araneomorphae. The Mygalomorphae spiders are commonly known as “caranguejeiras” or “tarantulas” and are easily distinguished by the parallel position of the chelicerae and (most of the times) two pairs of spinnerets. The spiders that belong to Araneomorphae infraorder, which includes approximately 90% of known species of this taxon are distinguished by the opposing vertical chelicerae and three pairs of spinnerets.

The distribution of species of spiders in a macro-scale is directly related to their susceptibility to abiotic conditions, mainly to climatic conditions. Some species, named stenecious, are more susceptible to changes in climatic conditions. These spiders live in more stable habitats, with little climatic variation. Other species of spiders are able to survive and reproduce in extremely diverse environmental conditions. These species are named euryecious and have a large distribution, including many types of habitats and large geographical areas.

Within the levels of tolerance of abiotic conditions, the distribution of spiders can also be affected by many biotic factors. The abundance of competitors is one of these factors and the competition is not just for food but also for other resources as partners and nesting sites. Another biotic factor that can affect spiders is the supply of prey, predators and parasites. The vegetation type of each habitat contributes a lot with the kind of distribution of these animals. Despite most of species of spiders use plants or litter just as substrate, the phytophysiognomy determines the quantity and the type of prey, influencing the predation and parasitism levels and the micro-climatic conditions.

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Biographical Sketches

Marina Farcic Mineo is currently with the Behavioral Ecology and Interactions Laboratory of the Federal University of Uberlandia where she develops her doctoral thesis. Her main research interests are the community and population ecology of spiders.

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