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Cover photographs. Front: Close-up of *Orthophytum eddie-estevesii*, a new species from Minas Gerais State, Brazil. Text begins on page 55. Photo by Elton M.C. Leme. **Back:** *Tillandsia 'Aristocrat'* a John Arden cross between *T. ionantha* and *T. bourgaei*. Photograph by John Arden.

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Bromeliads: Biodiversity Amplifiers

**Carlos Frederico D. Da Rocha, Luciana Cogliatti-Carvalho,
Danielle R. Almeida & André Felipe Nunes De Freitas**

In Nature the presence of an organism in an ecosystem always provides an opportunity for the survival of other species. For instance, members of a certain species living in a given ecosystem allow their predators to become established also. Many animals are hosts to parasites that live inside (endoparasites) or outside (ectoparasites) their bodies. Likewise, a plant species provides a microhabitat where other species find shelter and feed on plant tissues (these are called herbivores -- those which feed on plant leaves or sap). Studies have shown that the more branches, twigs and leaves a plant has, the greater is its “architectural complexity” and therefore the more organisms that find shelter, food and mates there.

Thus we see that each organism in an ecosystem provides a chance for other species to exist and that biodiversity will be greater or smaller, depending on how many species that organism can support.

Accordingly, we can conceive of the importance of bromeliads as organisms that act as true amplifiers of biodiversity in an ecosystem. Two characteristics of bromeliads are responsible for this: the complex and heterogeneous architecture of the plant and the ability of most species to collect water in the tank. The complex architecture of bromeliads offers a wide range of microhabitats for organisms to find the necessary conditions for their survival. These organisms use the bromeliad in a variety of ways depending on their needs. Many animals seek shelter in bromeliads from predators or from the harsher weather outside the plant. Many invertebrate species are part of the bromeliad fauna, and live their whole life cycle, or part of it, inside these plants. Some vertebrates such as lizards and frogs find refuge from predators. Of course, since bromeliads attract a large number of organisms, many predators, like some snakes, also search here for their prey.

Furthermore, the water accumulated in the bromeliad tank is a vital resource for many animal and plant species. Several invertebrates, such as dragonflies and beetles, or even some vertebrates, such as frogs, depend on the tank water as a place to lay eggs and where larvae can grow and complete their life cycle. Several other animals (small mammals such as marsupials and rodents) depend on the water stored in forest bromeliads to maintain a balanced metabolism.

The humidity found inside bromeliads is very important not only to animals but to some plants as well. Seeds that fall inside a bromeliad during dispersal find more favorable conditions for germination and development as seedlings than in the drier environment outside the plant. This happens quite

frequently, especially in habitats where water is scarce and is concentrated inside the bromeliads, as in some coastal plain environments (restingas). Here, seed germination is rarer on the sandy soil than inside the bromeliads; these soils are poor in nutrients and exposed to high temperatures because of the sun shining on the sand. So it's easy to find seedlings growing inside many terrestrial bromeliads in forests and restingas.

However, it is not only in the water of the bromeliad tank or among its leaves that other organisms live or find resources. Bromeliad flowers and their nectar draw a wide range of pollinators that find nutrition here. So flowering bromeliads are an important source of food for pollinators such as bees, wasps, moths, butterflies and hummingbirds, among others. Organisms such as acarids also complete their life cycle in these flowers. Bromeliad flowers are a refuge for many acarid species that use the beak and nostrils of pollinating hummingbirds as a means of transportation from one flower to another in search of mates (Colwell, 1988). This relationship is so specialized that the flowers of one bromeliad species have only one acarid species. Although a humming bird pollinates the flowers of many different bromeliad species and therefore carries many acarid species in its beak and nostrils, each acarid gets off at the appropriate bromeliad species to find its mate and reproduce.

Of course, a relationship so specialized has taken thousands of years to evolve, but all can be lost in a few days when bromeliads are lost to forest destruction.

Recent estimates from scientific studies give an idea of how important bromeliads are to the environment where they live. One of these studies estimated that an impressive two million liters of water are stored inside the tanks of just one bromeliad species (*Vriesea neoglutinosa*) in an 210 hectare (520 acres) area of restinga in the state of Espirito Santo (Alves et al., 1996). This estimate leads us to imagine how many other life forms would be lost if this water were to vanish with the destruction of bromeliads. Another study estimated that there are nearly 104,000 bromeliads in each hectare (2.4 acres) of Atlantic forest. If we estimate conservatively that each bromeliad may hold some 50 organisms of different species (disregarding those that are aquatic or microscopic) then every hectare of forest would have at least 5,200,000 organisms living inside bromeliads. Furthermore, if we consider the thousands of microscopic beings that live in the water of the bromeliad tank and in its flowers, this number would swell to hundreds of millions of organisms. Suppose that we now add the animals that seek out bromeliads in search of drinking water or as a thermo-regulatory site or to find prey. The result would be that a considerable portion of ecosystem biodiversity depends on bromeliads for survival, making bromeliads key players in the ecosystem.

Thus we can imagine the huge amount of life that is lost when the bromeliads of a habitat are destroyed because the bromeliads act as amplifiers and multipliers of local biodiversity. Biodiversity is one of Brazil's greatest

riches, but, at the same time, preservation of this wealth is one of the biggest challenges we face today.

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Elton Martinez Carvalho Leme named Honorary Trustee

The BSI Board of Directors has voted to honor Elton M.C. Leme by naming him as an Honorary Trustee of the Bromeliad Society International.

Elton M.C. Leme has been one of the most active scientists in the bromeliad world in recent years, having described approximately 250 new species, many of them on the pages of the JOURNAL OF THE BROMELIAD SOCIETY. He has authored or co-authored more than 55 articles printed in the JOURNAL, including the description of two new species in this issue. Only Mulford B. Foster, Harry Luther, Victoria Padilla, Werner Rauh and Lyman B. Smith have published more articles in the JOURNAL'S 50-year history. He has written and published three wonderful books about the bromeliads of Brazil's Atlantic Rain Forest and a fourth, the long-awaited revision of the genus *Nidularium*, will be available very soon.

Elton has been a featured speaker at three of the World Conferences. He is a passionate conservationist and a powerful voice in the movement to preserve Brazil's magnificent bromeliad flora. Until recently, he has also been the editor of the Brazilian bromeliad journal BROMÉLIA. It is even more amazing that all of this has been accomplished while holding down a full time job as a Judge in the State of Rio de Janeiro's judicial system, and prior to that, as a Public Defender for the State of Rio de Janeiro....CHB