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## Predictive-like distribution mapping using Google Earth: Reassessment of the distribution of the bromeligenous frog, *Scinax v-signatus* (Anura: Hylidae)

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### Abstract

The hylid frog *Scinax perpusillus* species group comprises 13 species that share, in addition to a few morphological features, reproduction that occurs exclusively associated with bromeliads. Among the species in the group, *Scinax v-signatus* (Lutz, 1968) is one of the few with a relatively large geographic distribution, occurring in association with bromeliads growing on granitic outcrops above 800 m along the Serra dos Órgãos (a local designation of Serra do Mar) in the Atlantic forest, State of Rio de Janeiro. Here we demonstrate that previous assessment of the distribution of this species was overestimated, and reevaluate the available data on its occurrence. The distributional data analyzed was based on three levels of evidence. First, we assessed the distribution of the bromeliad, *Alcantarea imperialis* (Carrière) Harms, which is used by *S. v-signatus* at the type locality. We plotted potential occurrence data for this plant using Google Earth (GE) by visually inspecting GE images in search of indications of granitic outcrops where groups and large individual bromeliads could be identified. Second, we plotted the distribution of these plants and that of the frog based on locality data taken from the literature and voucher specimens in natural history collections and checked for congruence between these sets of data. Third, as a second test of accuracy of this methodology we visited four new localities indicated by the bromeliad-occurrence GE prediction map and searched for the occurrence of both the frog and the bromeliad. This simple process has proven efficient and accurate in finding new collecting sites and determining the distribution of the two involved taxa. We discuss this and other possibilities of using Google Earth as a tool for mapping and discovering the distribution of organisms and habitats. Furthermore, this study has shed light on a more accurate and realistic estimate of the distribution of *Scinax v-signatus* with implications for the assessment of its conservation status.

**Key words:** Atlantic Forest, *Alcantarea imperialis*, Bromeliaceae, conservation, endemism, geographic distribution, Hylidae, *Scinax perpusillus* species group, taxonomy

### Introduction

The application Google Earth (GE) has been online since 2005 (Google 2005) and has revolutionized the way people see, understand, access, and interact with different levels of geographic information on a global scale. Users rely on GE when looking for directions, finding street addresses, pre-visiting touristic sites, guiding TV viewers on developing stories, and enhancing teaching (Patterson 2007). In some cases, even more sophisticated geographical querying is performed using GE (Myers 2010). GE has created several opportunities for geographical exploration and understanding the planet at different levels of complexity. In fact, the uses of this application may never be exhausted as the quality of the images improves and new tools are added. Free access added to the intuitive and easy operation of GE, and the quality of the satellite images already available are amongst the most striking features of this ingenious application.

Recently, in a more scientific-oriented use of GE, three findings made their way into scientific news. The first relates to biodiversity mapping. Researchers from the Royal Botanical Gardens discovered a new biodiversity hotspot in Mozambique, Africa (Anonymous 2011; Bird Life International 2009). Although the team was working with conservation efforts in the region, the new area was only considered and included in the survey efforts after being found using GE. A second finding made the pages of *Science*, where Folco et al. (2010) reported the