The persistence of *Anolis trinitatis* as a naturalized lizard in Trinidad against hybridization pressure with *Anolis aeneus*

Adrian Hailey 1, Victor C. Quesnel 2 and Hans E.A. Boos 3

1 Department of Life Sciences, The University of the West Indies, St Augustine, Trinidad and Tobago, West Indies
2 P.O. Box 47, Port of Spain, Trinidad and Tobago, West Indies
3 P.O. Bag 50 B Wrightson Road, Port of Spain, Trinidad and Tobago, West Indies

Abstract

*Anolis aeneus* and *A. trinitatis* were introduced to Trinidad before 1900, and *A. extremus* was a more recent introduction in the 1960s-1980s. The three species are of similar body size, and *A. aeneus* and *A. trinitatis* are known to hybridize in Trinidad. Detailed studies from the late 1960s indicated that *A. aeneus* was widespread but *A. trinitatis* was localized and apparently in decline due to hybridization pressure. In this study we examined all the known sites of *A. trinitatis* (*A. extremus*) in Trinidad, and many new sites. *A. trinitatis* remained abundant in and to the east of San Fernando in southern Trinidad. Two small populations remained in northern Trinidad, at one site in Port of Spain and at St Augustine, but *A. trinitatis* no longer occurred at most former sites there. *A. trinitatis* and *A. aeneus* had high niche overlap (0.99 or greater) for the three dimensions examined (substrate type and perch height and diameter). Both species were apparently still spreading into vacant habitats east of San Fernando. Of 12 sites from which *A. trinitatis* had disappeared, four had no anoles, four had sparse populations of *A. aeneus*, and only four had dense populations of *A. aeneus*. This pattern suggests that the decline of *A. trinitatis* is not related to hybridization with or competition from *A. aeneus*. An alternative hypothesis is presented, that *A. trinitatis* requires more vegetated habitats, which have been increasingly lost during urban development especially in northern Trinidad. *A. extremus* is apparently now extinct in Trinidad.

Key words

*Anolis aeneus*, *Anolis extremus*, *Anolis trinitatis*, Caribbean, hybridization, introduced species, naturalized species, niche overlap, Trinidad, West Indies.

Introduction

*Anolis* is arguably the most successful genus of introduced reptile, the 20 naturalized species (Lever, 2003) being more than those of any other genus of herpetofauna. Small islands with native *Anolis* lizards have either a single small to medium
sized species, or one small and one large species (Roughgarden, 1995). Introductions of *Anolis* fail where there is already an ecologically similar species (Losos et al., 1993), and most successful introductions to islands have been of large species (Roughgarden, 1995). Introduced *Anolis* on Trinidad are of interest as there are several species, all of them small. The single native species *A. (Norops) chrysolepis* is found in forest habitats into which none of the introduced species has penetrated. The most recent introduction is *A. wattsi* in west-central Trinidad (White and Hailey, 2006), which coexists with the older established *A. aeneus* being slightly smaller (male SVL 58 mm and 77 mm respectively in their native islands) and less arboreal. This paper considers the other two introduced species *A. trinitatis* and *A. extremus*, which are of similar size (male SVL 74 mm and 83 mm, respectively) to *A. aeneus*.

Both *A. aeneus* and *A. trinitatis* have been in Trinidad for over a century (Murphy, 1997), and possibly substantially longer. They are similar, and were only recognized as distinct species in Trinidad in the 1950s (Kenny and Quesnel, 1959), although *A. aeneus* is grey/brown and *A. trinitatis* is typically a bright grass-green colour in Trinidad (Underwood, 1959). *A. trinitatis* is ecologically ubiquitous (Hite et al., 2008) and variable in colour in its native St Vincent; bright green lizards are typical of montane forest habitat (Thorpe, 2002), suggesting that the original colonists of Trinidad were from well-vegetated areas. *A. trinitatis* was first described from Trinidad (Reinhardt and Lütken, 1863), before its true origin was known. Lazell (1972) suggested an introduction on breadfruit saplings, brought to St Vincent from Tahiti by William Bligh around 1793 and distributed to other Caribbean islands in the early 1800s. Large populations existed in the main southern city of San Fernando in the 1950s and 1960s (Boos, 1996). Intensive work on this species in Trinidad from the late 1960s suggested it was in rapid decline, due to hybridization and competition with *A. aeneus* (Gorman and Atkins, 1968; Gorman et al., 1971; Gorman and Boos, 1972). The most recent review of the Trinidad herpetofauna (Murphy, 1997) gave no recent locations and suggested that *A. trinitatis* may be extinct in Trinidad. In addition to San Fernando, populations were also known from Usine Ste Madeleine to the east, and from the capital Port of Spain and St Augustine in northern Trinidad (Underwood, 1962).

*Anolis aeneus* is native to Grenada, and Boos (1996) suggested that its introduction was linked to the large migration of French plantation owners to the then Spanish colony of Trinidad following the Cedula of Population in 1783. That legislation encouraged the immigration of Catholics from former French colonies such as Grenada which had been taken over by the British. *A. aeneus* is the most widespread of the introduced *Anolis* in Trinidad, found over large areas of the country including several offshore islands (Boos, 1984, 1990). It can be regarded as an invasive species in the broad sense of having expanded its range and become abundant (Lockwood et al., 2007), although not in the narrower sense of having a noticeable ecological or economic impact. *Anolis extremus* (from Barbados) was released in small numbers on Huevos Island just off north-west Trinidad in 1967 (Boos, 1967).