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Using Alien Resources: Caribbean Dwarf Geckos Nesting Communally in Invasive Flora

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Communal nesting is a widespread behavior among sphaerodactylids and has been documented in some Neotropical taxa such as *Coleodactylus meridionalis* (de Oliveira et al. 2015) and *Gonatodes humeralis* (Oda 2004). Field observations of some species of *Sphaerodactylus*, such as *S. armasi* and *S. elegans*, also have revealed both intraspecific and interspecific communal nesting (Krysko et al. 2003; Alfonso et al. 2012). *Sphaerodactylus* generally are known to nest under or near rocks, in leaf litter, and in anthropogenic litter (Henderson and Powell 2009), although Collette (1962) reported arboreal nesting in *S. cinereus*. Communal nesting within tree stumps or logs has been reported in other species, such as *S. townsendi*, *S. cinereus*, *S. armasi,* and *S. randi* (Rivero 1998; Schwartz and Henderson 1991; Krysko et al. 2003; Alfonso et al. 2012). Nonetheless, field-verified life history information for many members of the genus remains scarce due to their minute size and secretive habits (Regalado 2006).

The introduction of alien flora and fauna has been widely recognized as detrimental to native species (Clavero and García-Berthou 2005; Short and Petren 2011). However, introduced species can have neutral or positive interactions with native species (Schlaepfer et al. 2010; Kuebbing and Nuñez 2015), and such counterexamples include the use of nonnative flora as nesting substrate (Smith and Finch 2014). We herein report on the use of non-native trees for communal nesting by two Caribbean dwarf geckos, the Puerto Rican Upland Sphaero (*S.* cf. *klauberi*; the taxonomy of the *S. klauberi* group is undergoing revision; Fig. 1) and the Inagua Sphaero (*S. inaguae*; Fig. 2) on Puerto Rico and Great Inagua Island, Bahamas, respectively.

Fig. 1. An adult female Puerto Rican Upland Sphaero (*Sphaerodactylus* cf. *klauberi*) from the Guilarte State Forest. Photograph by Alejandro J. Sánchez.

Fig. 2. An adult Inagua Sphaero (*Sphaerodactylus inaguae*) from Great Inagua Island, Bahamas. Photograph by Aaron H. Griffing.

We found a communal nest of *S.* cf. *klauberi* at 1630 h on 4 July 2015 in the trunk of a Mango Tree (*Mangifera indica*) in a shaded area at the edge of Secondary Road 135 between Villa Pérez and Adjuntas, Puerto Rico at 568 AMSL (Fig. 3A). This area is part of a secondary anthropic forest that is highly disturbed by traffic and extends onto the slopes southwest of Cerro Don Quiño and north of Río Guilarte. We found one unhatched egg in addition to three hatched eggs and many eggshells covered by loose bark approximately 1 m above the ground (Fig. 3A–B). The intact egg contained an embryo (approximate embryonic stage 32, using the staging

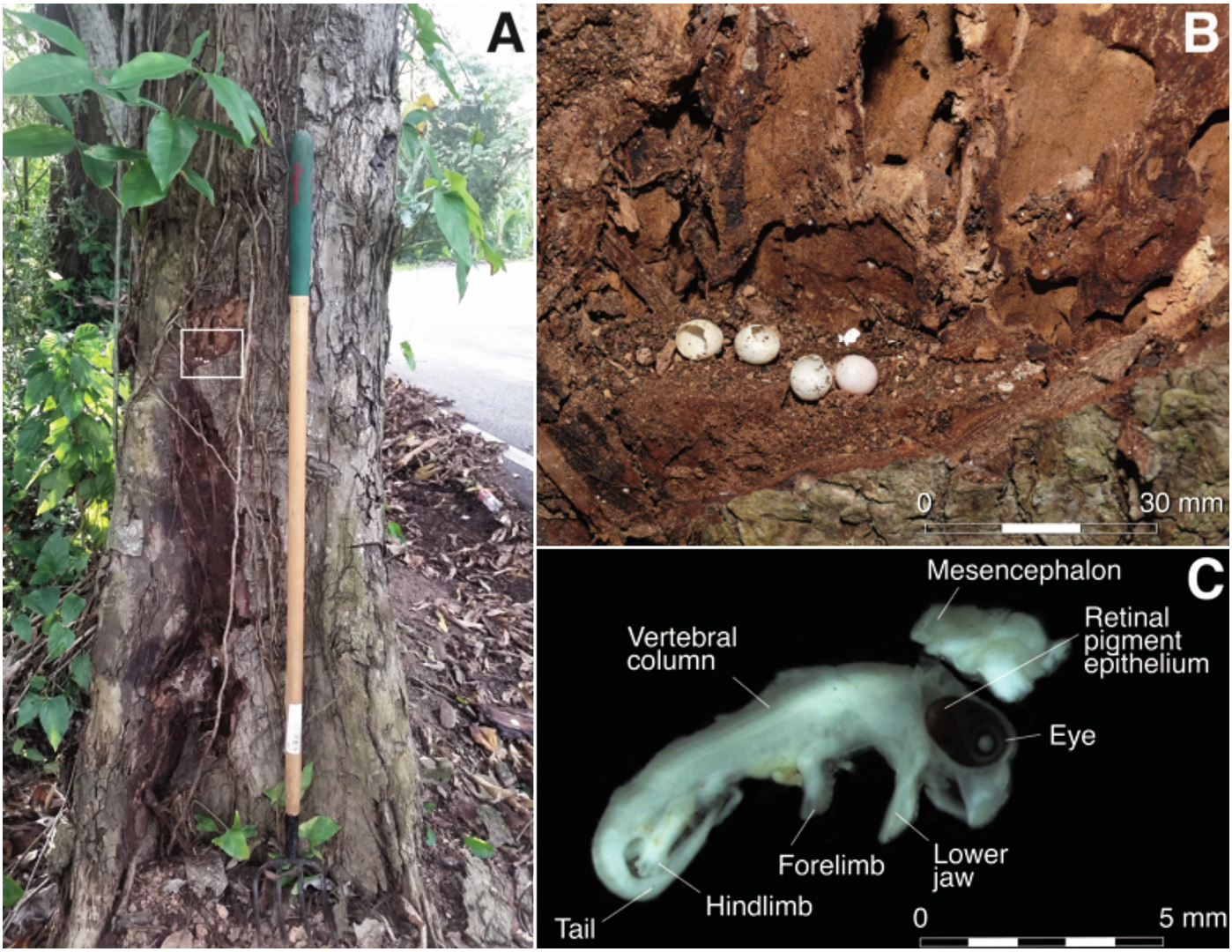

Fig. 3. A communal nest of *Sphaerodactylus* cf. *klauberi* on the trunk of a Mango Tree. (**A**) Location on the tree, white rectangle (potato rake measures 1.4 m; also note the proximity to the road); (**B**) Closer view of the nest; and (**C**) Embryo inside the intact egg (scale bar = 5 mm). Photographs by Justin M. Bernstein and Juan D. Daza.

system derived for *S. argus*; Werner 1971). Additional broken shells on the ground indicated the long-term use of this nesting spot. Attribution to *Sphaerodactylus* is based on the presence of an ovoid retinal pigmented epithelium (Fig. 3C; Guerra et al. 2014). The embryo was identified as *S.* cf. *klauberi* based on observation of an individual climbing the bark (not collected) and mitochondrial DNA sequences obtained from the embryo (T. Gamble and J.D. Daza, unpublished data). In Puerto Rico, communal nests of *S. macrolepis mimetes*, *S. gaigae*, and *S. macrolepis ateles* have been found on the ground under anthropogenic trash or leaf litter, and Rivero (2006) previously reported a preference by *S. klauberi* for anthropogenic trash. Similarly, *S. macrolepis* inhabits the leaf litter of introduced coffee and banana trees in the mountains (Schmidt 1928), whereas *S. roosevelti* uses introduced coconut trees in coastal areas (Henderson and Powell 2009), for example, the Bahía de la Ballena in Guánica, Puerto Rico (Cavalieri and Kohn 2011). Although this is the first recorded use of living Mangoes by *Sphaerodactylus*, *S. omoglaux* and *S. streptophorus*, both Hispaniolan, and *S. vincenti* from St. Vincent have been found in leaf litter and under rocks in the proximity of Mangoes, which were introduced from Asia to Puerto Rico by 1750 (Morton 1987).

We observed communal nests of *S. inaguae* at 0930 h on 15 July 2015 in coastal, xeric scrub on Great Inagua Island, Bahamas (20.926059°N, 73.667345°W; WGS 84). This locality is approximately 1 km southeast of the Matthew Town Lighthouse and 27 m from the shore. Communal nests of *S. inaguae* were in She-oaks, also known as Australian Pines (*Casuarina equisetifolia*) approximately 0.5–1.2 m from ground level at the nodes of branches where abscised branchlets accumulate (Fig. 4A). Attribution to *Sphaeroactylus* was

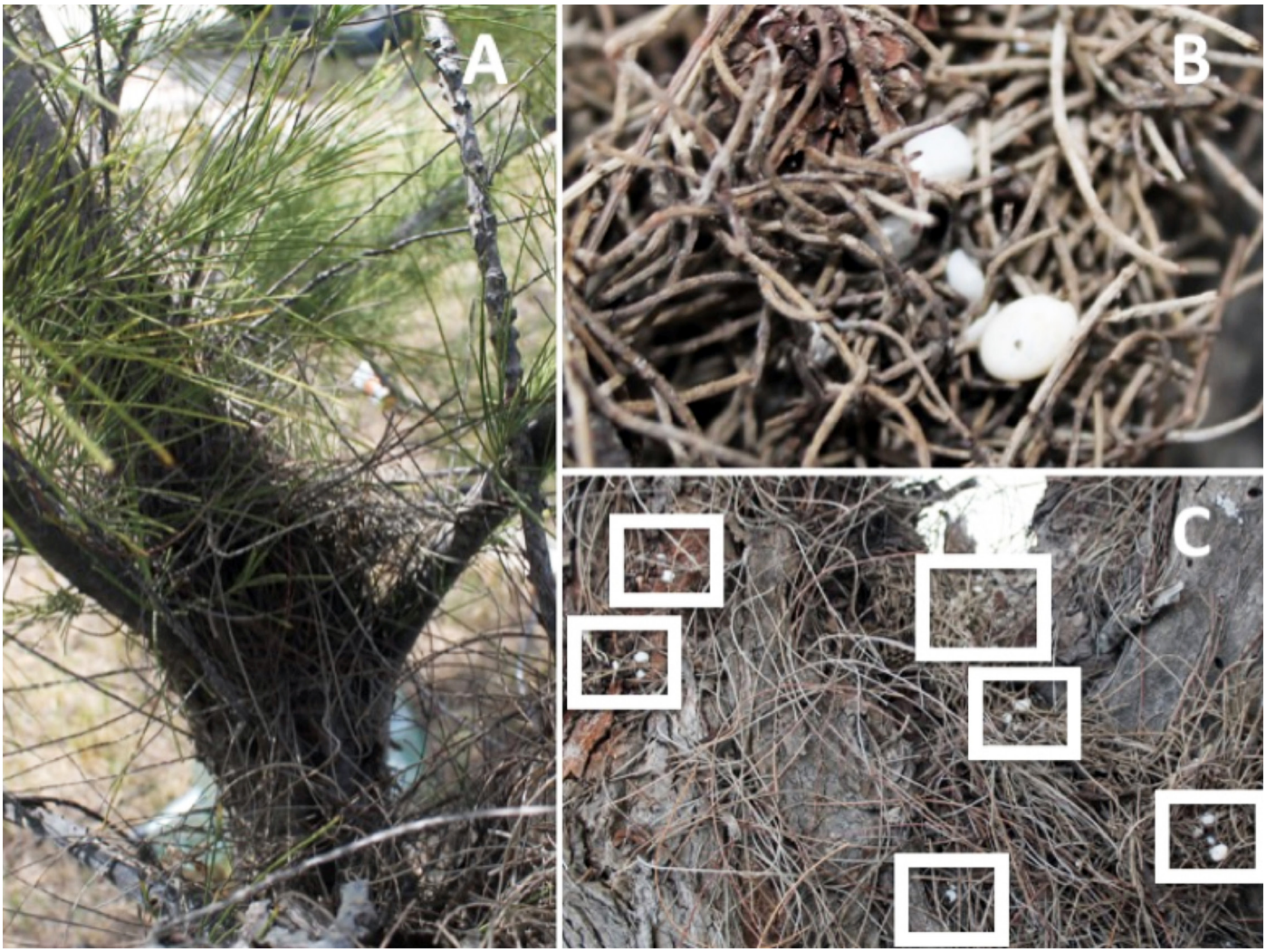

Fig. 4. (**A**) An Australian Pine in which *Sphaerodactylus inaguae* nested communally within piles of senesced branchlets; (**B**) Closeer view of the nest; (**C**) Pile of senesced branchlets with visible *S. inaguae* eggs and egg fragments. The majority of the branchlet's cover was temporarily removed to better expose the eggs. Photographs taken by Aaron H. Griffing.

based on egg morphology (hard-shelled ovoid eggs approximately 5.3 mm in width and 7.2 mm in height; Fig. 4B). Nests were identified as belonging to *S. inaguae* by the presence of 1–2 adult individuals. At this locality, nests contained 2–4 eggs and egg fragments. This phenomenon was observed at two other nearby localities (20.934727°N, 73.664732°W; 20.933387°N, 73.673910°W; WGS 84) with nests containing 4–13 eggs and egg fragments (Fig. 4C). She-oaks were introduced and became naturalized in the West Indies by 1920 (Morton 1980) and are now considered a dangerous invasive that creates superfluous shade and litter and displaces native vegetation (Nelson 1994). Very few species of *Sphaerodactylus* (*S. monensis* of Mona Island; Thomas and Schwartz 1966; *Sphaerodactylus* spp. nesting in the lower Florida Keys; Krysko et al. 2003) are known to occur among She-oak needles. Recent research by Allen et al. (2015) investigated *ex situ* microhabitat selection of *S. notatus,* a xerophilic species similar to *S. inaguae*. *Sphaerodactylus notatus* observed in that study typically favored humid shelters over dry shelters. The excess shade and litter produced by Australian Pines may provide *S. inaguae* with shelter and humidity ideal for oviposition and *in ovo* development.

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