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SHORT NOTE

# A Fatal Nest Construction: Man-mixed Cement Used by Mud-daubing Wasps

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Abstract

Some sphecid wasps apparently show tolerance to urban habitats. However, resilience to man-made environments may have harmful consequences when behavioral errors can lead to ecological traps. We report failures in nesting construction of Sceliphron jamaicense by erroneous choosing of building material (i.e. mud). We found a proportion of nests (1.26%)where the wasps used both mud and concrete to seal the nests. Consequently, the brood was unable to emerge through the hardened material. It seems that the discrimination between building materials appears to be poor in these hymenopterans. Such ecological traps could have long term negative consequences around urban environments.

Species sometimes make mistakes and choose a poor habitat quality or adopt an erroneous behavior in response to analog environmental cues (e.g. ecological traps: Kokko & Sutherland, 2001; Schlaepfer et al., 2002; Robertson & Hutton, 2006).The use of unsuitable materials for nesting is one of this type of errors since bad choices can have fatal consequences for individuals (Rodríguez-Estrella et al.,1995; Schaedelin & Taborsky, 2009; Votier et al., 2011). Among mud-daubing wasps, *Sceliphron jamaicense* (Fabricius, 1775) is a spider hunter species commonly associated with human buildings where it establishes its nests (Bohart & Menke, 1976;Coville, 1987; Jiménez et al., 1992; Starr et al., 2018). Until now, no previous reports have documented a wasp behavior of taking man-made cement to construct the nest. In this work, we discuss potential causes and consequences of this maladaptive behavior for this species around house constructions in urban environments.

A survey to collect nests of *S. jamaicense* was conducted in four oases of the Cape Region of Baja California Sur, Mexico: a) El Triunfo, 23°48'N, 110°06'W, b) San Bartolo, 23°45'N, 109°51'W, c) Las Cuevas, 23°32'N, 109°41'W, and d) Santiago, 23°29'N, 109°43'W. These localities are small suburban towns with at most 800 inhabitants where most nests of *S. jamaicense* (≈ 90%) occur in human buildings (Jiménez et al., 1992). The vegetation surrounding these communities is low deciduous tropical dry forest (Axelrod, 1978), dominated by *Prosopis* spp., *Washingtonia* spp., and several exotic plants (Rodríguez-Estrella et al., 2010).

We collected 316 nests of *S. jamaicense* that contained 2,224 cells. More than 90% of the nests were collected from man-made constructions, especially those places that were highly protected from sun and rain. Remarkably, at El Triunfo town we found four nests (1.26%) built using a mud-cement mix. Females of the wasp *S. jamaicense* applied outer layers of recently-mixed concrete to cover their nests. This action affected 24 brood cells, causing mortality to two dozen potential progeny, which represented the 5.05% of cells samples at El Triunfo. The offspring reached adulthood, but they could not emerge because these wasps were not able chew the hardened layer with their mandibles to emerge from the nest (Fig 1).

It could be that this was a random or even an exceptional error due to an opportunistic behavior. However, most mistakes can lead in the long-term to ecological traps that negatively affect an unknown number of individuals (Battin, 2004). Choosing the wrong habitat can be attributed to analog environmental cues that may modify the instinct and learning critical in making decisions (Dukas, 2008). Adaptation to urban landscapes has costs and benefits for colonizing species (King & Buckney, 2000; McKinney, 2008; Ordeñana et al.,2010). For example, 40% of female nesting wasps *Sceliphron spirifex* L. inhabiting urban zones omit the last layer of mud of the nest apparently because the urban environment overprotects nests (White, 1962). Previously, *S. jamaicense* was defined as a generalist predator

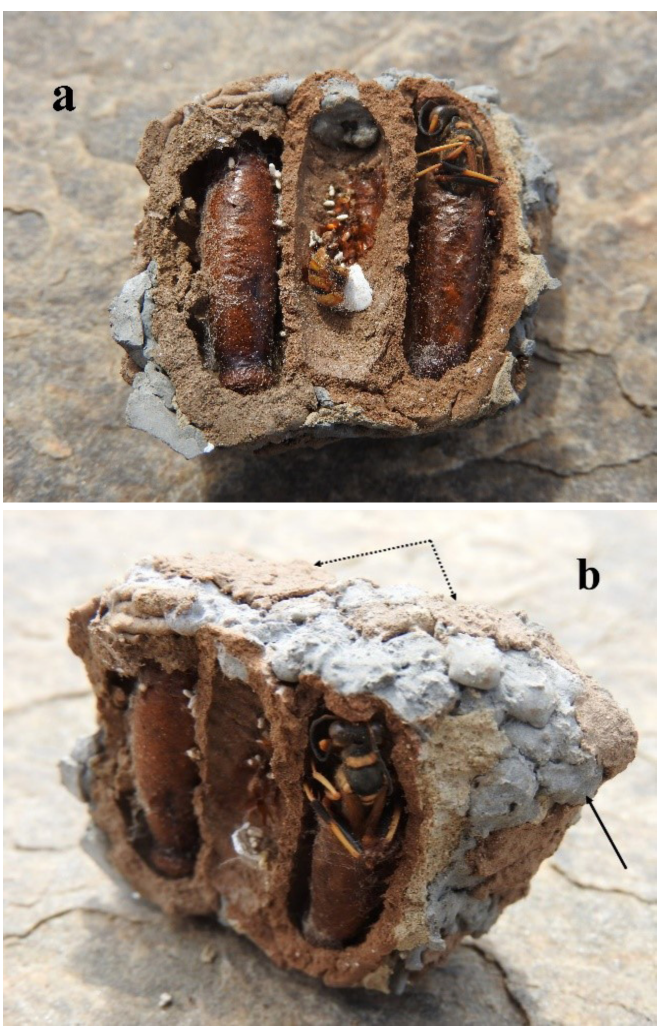


Fig 1. a. Transversal view. Fully developed female of *S. jamaicense* (right cell) tried to emerge from the pupa. b. Oblique view. Note the pattern in which small spheres of concrete were applied (solid arrow) and how the wasp intended to apply another mud layer (dashed arrows).

that broadly accepts human residences and takes advantage of any possible shelter (Jimenez et al.,1992).

In our study, more than 90% of the nests were found in man-made structures. This wasp seems to benefit from human settlements, finding shelter and probably less predation. However, a potential cost could be utilization of foreign resources, especially when materials with analogous texture to mud (e.g. fresh cement) are available, with fatal results for the offspring, as we found. It could be interesting to evaluate if other mud-daubing wasp species (e.g. *Sceliphron caementarium* (Drury) and *S. spirifex* L.) gather wrong materials for construction of nests as well.

Mud selection by females of *S. jamaicense* may rely on moisture content and texture, rather than chemical composition, color or scent of the substrate. The mortality of *S. jamaicense* affected by concrete usage could be small compared to natural failure and parasitism rates (Starr et al., 2018). Nevertheless, more research is needed to determine the cues utilized in the choice of building materials and to quantify the potential impact on wasp populations of cement usage under highly urbanized conditions.

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