There are about 800 species of fig plants located in tropical and subtropical ecosystems worldwide, all of which produce hollow, globe-shaped inflorescences, commonly called fig fruit. Figs have a mutually beneficial relationship with species-specific fig wasps, with the figs depending on wasps for pollination of flowers, and the larvae of the wasps galling and developing within a subset of fig ovules. However, this relationship is subject to parasitism by a diversity of non-pollinating fig wasps whose larvae develop within the same set of ovules as the pollinator wasps. To coexist, ecological theory predicts that these wasps should evolve minimize overlap in niche space and resource usage.

**Objectives**

A. Determine extent of niche overlap (ovule use) among pollinating and non-pollinating fig wasp species.

B. Determine the relative abundance and co-occurrence of pollinating and non-pollinating wasps within fig fruits.

C. Test our prediction that increasing niche overlap between species (Objective A) negatively impacts wasp co-occurrence (Objective B).

**Study System**

The fig–fig wasp system investigated in this study was the Sonoran Desert rock fig (*Ficus petiolaris*) and its obligately associated pollinating (*Pegoscapus* sp.) and non-pollinating wasps (*Idarnes* and *Heterandrium* sp.). *Ficus petiolaris* has the northernmost distribution of any New World fig and is widespread in Sonoran Desert habitats of northwestern Mexico. We focused on species interactions in two natural populations in central Baja California, Mexico: Site 113, which has diverse non-pollinators, and Site 95, where non-pollinators are absent.

**Introduction**

Fruits containing developing wasps were preserved in vials of 90% ethanol. In the lab, each fruit was cut into quarter sections with a razor. Ovule depth was measured with a digital caliper and wasps dissected from ovules were classified into inner, middle, or deep categories based on their depth within the fruit. The image below illustrates these depth categories. Generalized linear models (Poisson variance with log link function) were conducted to determine how wasp counts are influenced by both ovule depth and wasp species.

**Results**

At Site 113, both ovule depth and wasp species significantly influence the counts of wasps within an ovule layer.

**Results (Cont.)**

At Site 95, where non-pollinating wasps are absent, ovule depth did not significantly influence the counts of pollinator wasps within an ovule layer.

**Conclusions**

Our results from site 95 show that in the absence of non-pollinating fig wasps, developing pollinators are evenly distributed across ovule layers. The results from site 113 show, in contrast, that where non-pollinators are abundant, pollinators minimize competition and niche overlap by shifting towards inner ovule layers. Our results are consistent with the competitive exclusion principle in ecology.

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**Image 1.** *Pegoscapus* (1 pollinator sp.).

**Image 2.** *Idarnes* LO1 and SO (2 non-pollinator sp.).

**Image 3.** *Heterandrium* (2 non-pollinator sp.).

**Image 4.** Fig ovules classified into inner, middle, and deep categories within a fig fruit.

**Figure 1.** Distributions of Site 113 pollinator (*Pegoscapus*) and non-pollinator wasp species across ovule depth categories. *Pegoscapus* and *Idarnes* LO1 species are concentrated in inner ovule layers, whereas other non-pollinator species are concentrated in outer ovule layers.

**Figure 2.** The distribution of pollinating fig wasps across ovule layers at site 95. The pollinating wasps do not seem to favor inner layers of the fruit when non-pollinators are not present.