Tradeoffs and coexistence in fluctuating environments: evidence for a key dispersal-fecundity tradeoff in five nonpollinating fig wasps: online appendix

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This online appendix presents details for estimating wasp wing loadings. It also includes images of wasps within the community surrounding the Sonoran Desert rock fig (*Ficus petiolaris*), and a figure showing the relationship between the absolute difference between species life history traits (egg load and wing loading) versus the correlation between species among patch densities.

Keywords: storage effect, competition, *Ficus*, ephemeral patch, dispersal, tradeoffs

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Wing loading estimation

Body volume (V) of wasps was calculated by summing estimates of wasp head, thorax, abdomen, and ovipositor volume for 15-19 individuals of each wasp species. To estimate head volume, head width (W_h) and height (H_h) were measured. We assumed a spherical head shape and estimated head radius as $r_h = (1/2)\,(W_h/2 + H_h/2)$; using this estimate of head radius, we estimated head volume using the formula to determine the volume of a sphere, $V_h = (4/3)\,\pi r_h^3$. To estimate thorax volume, we measured thorax length (L_t) and width (W_t), then used the formula describing the volume of an ellipsoid, $V_t = (4/3)\,\pi\,(L_t/2)\,(W_t/2)^2$. We estimated abdomen volumes in the same way as we did thorax volumes. To estimate ovipositor volumes, we measured ovipositor length (L_o) and width (W_o), then used the formula describing the volume of a cylinder, $V_o = \pi L_o\,(W_o/2)^2$.

To estimate wing surface area, either the left or right forewing and hindwing were removed for each wasp, and images of both wings were taken using a stereoscope camera. We used ImageJ software to estimate wing surface area in the collected images, then multiplied this estimation by two to estimate total wing surface area. The wing loading for each individual is total body volume divided by total wing surface area.

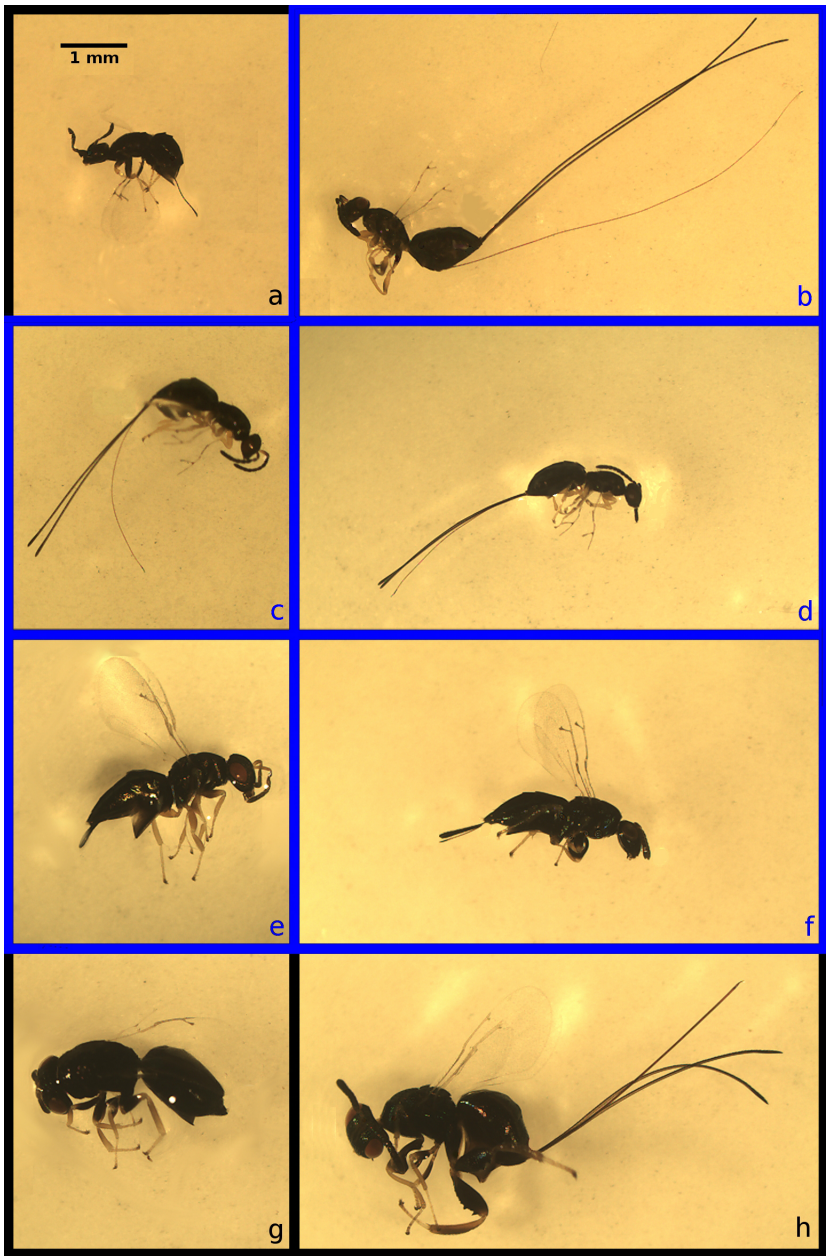

Figure A1: Community of fig wasps associated with *F. petiolaris* in Baja California, which is pollinated by a wasp of the genus *Pegoscapus* (a). Five gallers shown with blue borders include three species of *Idarnes* (b-d) and two species of *Heterandrium* (e-f). Additionally, a species of *Aepocerus* (g) feeds on an inner layer of *F. petiolaris* syconia and is parasitized by a species of *Physothorax* (h). All wasps pictured developed from the same *F. petiolaris* syconium.

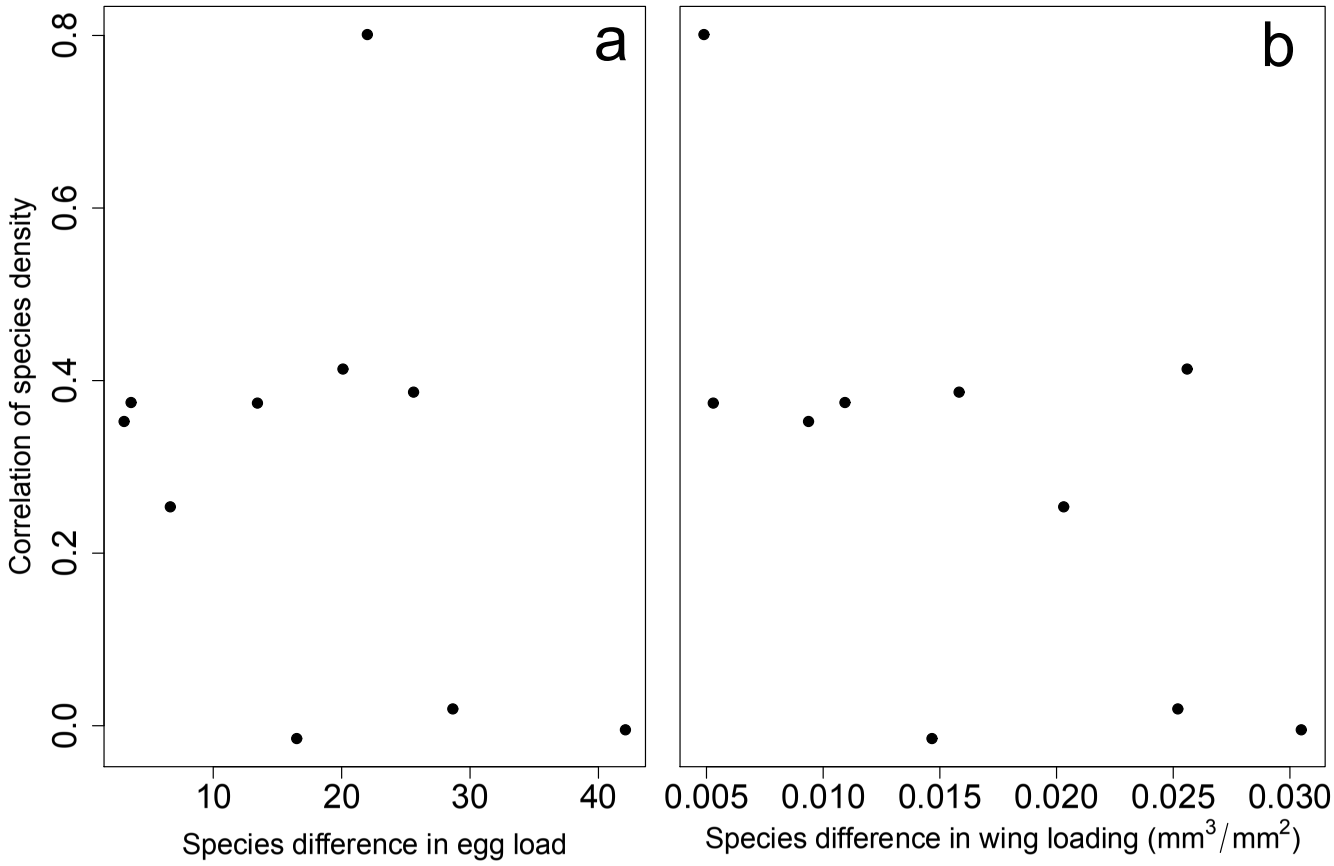

Figure A2: Nonpollinating fig wasp species egg load absolute differences versus the correlation between species densities on a fig crown (A), and wasp wing loading absolute differences between among crown correlations (B). Egg load is defined as number of mature eggs in wasps emerging from natal fig syconia. Wing loadings are defined as the ratio of body volume to wing surface area. Data points include ${}_5C_2 = 10$ trait differences versus between species density correlations among herbivorous nonpollinating fig wasps that develop within ovules of *Ficus petiolaris*.