SHORT COMMUNICATION


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The alfalfa leafcutting bee *Megachile rotundata* (F.) is managed in western North America as a pollinator in seed alfalfa (*Medicago sativa* L.) fields, where it is provided with large, high density arrays (i.e., nest boards) of artificial nest tunnels made of wood or polystyrene. Each nest of this solitary bee consists of a linear series of leaf-lined brood cells provisioned with pollen and nectar, and finally capped with other leaf pieces after an egg is laid (Pitts-Singer and Cane, 2011). Other species of cavity-nesting Hymenoptera sometimes occupy the same nest boards, often using the same tunnels as *M. rotundata* (O’Neill and O’Neill, 2003; O’Neill et al., 2010). One co-inhabitant of *M. rotundata* nests is the solitary wasp *Isodontia mexicana* (Saussure), which uses dried pieces of grass as nesting materials (Krombein, 1967; O’Neill and O’Neill, 2003, 2009).

O’Neill and O’Neill (2003) reported 16 nests that contained cells of both *M. rotundata* and *I. mexicana*. In 14 nests, the wasp’s cells were constructed after the nest tunnels had been first occupied by *M. rotundata* females that had completed up to three cells of their own. In two other cases, *M. rotundata* superseded *I. mexicana* in partially-completed nests, but no evidence was found in any nest that either species destroyed cells of the other. In addition, by simply observing the spatial patterning of cells in mixed-species nests, one cannot determine if two species are in direct competition or whether one occupied a nest only after it was abandoned by the other.

Recently, however, we found evidence that suggests a more direct effect of one species on the other. While studying *M. rotundata* in alfalfa fields near Laurel, Montana in July–August 2010 and 2011, we opened 20 sets of polystyrene-laminate nest boards (Beaver Plastics, Ltd., Acheson, Alberta, Canada) to extract bee cells from the 6 and 7 mm diameter tunnels; each set of nest boards contained 750 tunnels (total = 15,000 tunnels). We observed *I. mexicana* nests that had not only been superseded by *M. rotundata*, but in which the bees had apparently damaged and even occupied the wasps’ cocoons. *Isodontia mexicana* cocoons are ellipsoidal in shape and, in this study, measured 16.5–24.5 mm in length and, at their midpoints, 5.8–7.0 mm wide (N = 170). Each cocoon contained two layers constructed by the larva prior to entering its prepupal phase: an outer, light-gray layer of silk and an inner, smooth, brown, paper-thin pupal case of unknown composition.

Examining the contents of nest boards, we found 38 cocoons of *I. mexicana* that had been damaged, out of a total of 208 collected; 28.1% of the cocoons were damaged in 2010 (N = 121), but only 4.6% in 2011 (N = 87), when overall nest density on the boards was considerably lower due to early season bee mortality after a heavy hail storm. In nests with more than one *I. mexicana* cell, only the outermost cocoon was affected. In each of 31 nests, a *M. rotundata* female had apparently penetrated the wasp’s cell partition, and perhaps the final nest plug, and removed a portion of the outer silk covering of the wasp’s cocoon, exposing but not breaking into the inner brown pupal case (Fig. 1A, B); frequently, the bee then placed one or more of her own cells outside of the damaged wasp cocoon. Most wasp cocoons lost about one-quarter of the silk layer, but the amount removed was variable. Sometimes a small amount of silk was missing at the tip of the cocoon, but in one case half of the outer silk layer was stripped off. Removal of more than half of the silk would have been difficult for the bees because the ellipsoidal *I. mexicana* cocoons fit tightly into the tunnels, so a bee could not reach beyond its midpoint.

In the other seven nests, damage to the *Isodontia* cocoons was much more extensive. In these, not only was part of the silk covering removed, but the inner brown pupal case was penetrated. In six nests, an adult female *M. rotundata* had then constructed one or more of its own leaf-lined brood cells within the pupal...