

Specifically unique asymmetrical pollen labelling of megachilid bees by members of three subgenera of Lotus: Hosackia, Syrmatium and Simpeteria

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As reported in Lotus Newsletter 16:51-53 (1985), both males and females of larger bees of the family Megachilidae regularly visit flowers of Lotus of the nevadensis-davidsonii complex. With time, they become marked on the left cheek and adjacent regions of the head behind the left eye with a firm, adhesive lump of agglutinated pollen. Because only female bees collect pollen, but both sexes take the nectar of Lotus, it is clear that (1) the acquisition of the sinistral lump of pollen is related in some special way to the bee's withdrawal of nectar.

Both male and female bees of other families, as well as aculeate wasps, of comparable sizes to megachilids sinistrally marked by a mass of pollen, also take nectar from the same flowers. Nevertheless, they at most only occasionally retain a light and diffuse dusting of scattered pollen that shows no regular asymmetry of distribution on the head (or elsewhere). Therefore (2) the observed sinistral marking owes to some peculiarity of morphology or (more likely) behavior common to megachilid bees. Furthermore, as other species of Lotus that are visited by the same or related megachilid bees do not leave these bees sinistrally marked, it follows that (3) there is a significant species-specific component of the Lotus visited.

Since that report was submitted, there has been severe drought in Southern California. The stands of the nevadensis-davidsonii complex in the study areas have severely suffered, and megachilids attending them were not abundant, either as individuals or in species (3 as compared with 16 in earlier years. Effort was therefore directed to collecting megachilids (and other aculeates) from as many species of Lotus over a wide range of habitats as could be found in the time available.

In all, megachilids have now been obtained in fair numbers from 16 species of Lotus, and two named varieties. They include the subgenera: Lotus (corniculatus Linn.), Hosackia (2 species), Syrmatium (6 spp + 2 subspecies), Microlotus (1 sp), and Simpeteria (6 sps.), as treated by Isely (1981). Of these, apart from those of the nevadensis-davidsonii complex, only L. (Hosackia) oblongifolius (Bentham) Greene and L. (Simpeteria) wrightii (A. Gray) Greene "label" many individuals (but not all?) of both sexes of larger species of megachilid bee.

Astonishingly, in both cases their pollen is placed dextrally, and not on the cheek or underside of the head with the nevadensis-davidsonii complex. Nor do their interactions with megachilid bees result in similar labelling. L. oblongifolius marks larger megachilid bees of the genera Anthidium, Callanthidium, Osmia, and Megachile (s.l.), and perhaps others, principally on the ventral surface of the right middle leg. In this case the agglutinated mass of pollen may form a very conspicuous lump on the lower surface of the femur. L. wrightii's label is less spectacular, and less conspicuous, being no more than a thickened deposit on the clypeus strongly biased to its right side. The

flowers of the three Lotus species now known to mark megachilid bees asymmetrically have similar morphology, and in turn are also similar to flowers of many species that do not mark the bees. While flowers of a given Lotus species may range widely in size, on average the flowers of those of the nevadensis-davidsonii complex are smallest, approximating a mean of 6-7 mm in length, those of L. oblongifolius are ca. 8-12 mm in length, and those of L. wrightii average largest (ca. 10-15 mm long). It is likely that the average size differences are in fact important in the labelling events. In relation to the bee's activities when taking nectar, it is also likely that the ease and consequences of tripping play a very significant role.

To the present I have not determined what events, on the part of the bee or flower, bring about labelling in the few seconds (or less) involved. I do know that where masses of pollen are built into lumps, a great many visits, and perhaps aging of the bees, are required. For on average it is the older bee, as shown by dulling of livery and fraying of wings, that have tumor-like pollen masses on their "target-sites". It is also known that when a larger megachilid (say from the size of Anthidium mormonum Cresson, > 8 mm) takes nectar at a member of the nevadensis-davidsonii complex, it first alights symmetrically on the flower's wings and keel, head facing the banner, then rolls abruptly over to the flower's right side (from front view). Events other than these prove too rapid to follow by eye.

In the case of visits to L. oblongifolius, the "handling" of the flowers by megachilids has not been clearly observed because the bees tend to visit flowers partially obscured by the leafy structure. In the case of L. wrightii, no field observations were made. Megachilid behavior on flowers of the nevadensis-davidsonii complex, and the relative sizes of the flowers of all three species bring to mind specific hypotheses as to how and why pollen labels occur, and asymmetrically so. However, knowledge as to the actual events require use either of high speed photography or videorecording.

There are of course other puzzling matters: do these bizarre labelling events prove advantageous in any way to either bee or flower, and what other species of Lotus, worldwide, leave their labels on their megachilid visitors? Though preliminary, and my research on these problems shall continue, no restriction is placed on citation of this and the earlier report by others who may wish to do so.

Finally, I would be very grateful to receive information from others who have observed similar phenomena involving species of Lotus or other papilionaceous legumes.

REFERENCE

- Isley, D. 1981. Leguminosae of the United States. III. Subfamily Papilionoidae: Tribes Sophoreae, Podalyriaceae, Loteae. Memoirs, New York Botanic Garden 25(3):1-264.