**Bee- to bird-pollination shifts in *Penstemon*: effects of floral-lip removal and corolla constriction on bumble bee preference**

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Plants might be under selection for both attracting efficient pollinators and deterring wasteful visitors. Particular floral traits can act as exploitation barriers by discouraging the unwelcome visitors. In the genus *Penstemon*, evolutionary shifts from insect pollination to more efficient hummingbird pollination have occurred repeatedly, resulting in the convergent evolution of floral traits commonly present in hummingbird-pollinated flowers. Two of these traits, a reduced or reflexed lower petal lip and a narrow corolla, were found in a previous flight-cage study to affect floral handling time by bumble bees, therefore potentially acting as “anti-bee” traits affecting preference. To test whether these traits do reduce bumble bee visitation in natural populations, we manipulated these two traits in flowers of bee-pollinated *Penstemon* *strictus* to resemble hummingbird-adapted close relatives and measured the preferences of free-foraging bees. Constricted corollas strongly deterred bee visitation in general, and particularly reduced visits by small bumble bees, resulting in immediate specialization to long-tongued bumble bees. On the contrary, we found little evidence that bees were deterred by lipless flowers or that lip removal and corolla constriction act in conjunction to affect bee preference. We conclude that narrow corolla tubes in hummingbird-pollinated penstemons function as “anti-bee” exploitation barriers that prevent bee access to nectaries, while the reduction of the corolla lip cannot be seen as a deterrent against bumble bees. Our results emphasize the importance of performing field trials with naturally foraging pollinators to fully understand the potential role of floral changes in pollinator shifts.