

THE ROMANCE BETWEEN FLORA AND FAUNA

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Imagine if you will a fly within a field of flowers. Not a pesky house fly that wants nothing more than to digest the food on your plate. This fly is looking for love. Amongst the bright yellows and oranges that is the splendour of Namaqualand in springtime it sees an enticing black shape. Resting on the petals of a beetle daisy a lone female is making her presence known. As our hopeful male approaches she shows no intention of fleeing. Love, apparently, is in the air. The male lands on her back and attempts to mate with her. He pivots around like a spinning top as he tries to lock onto her, but something is wrong. This female is unlike any he's seen before. She seems to be fixed to the flower and is unresponsive. Slowly he starts to realize that he's been fooled, for this fly is utterly lifeless. Disgruntled our male flies away, but wait, on a nearby flower another female seems to be waiting to catch his eye...

What our imaginary fly experienced is not an insect version of playing hard to get, but rather the result of sexual deception. Few phenomena in the plant kingdom are as wonderful and strange as that of sexual deception. So far only discovered in Orchids, it entails certain floral structures that imitate the females of their insect pollinators. They can do this to such an incredible degree that males are often unable to distinguish between female and flower, and regularly favour the latter.

Plants can use an entire arsenal of stimuli to achieve this deceit. Most common, at least within the Orchid plant family, is the exploitation of scent. Female insects produce species specific sex pheromones when they are ready to be mated. Males are very sensitive to these compounds and can detect them over long distances. The odour producing flowers of sexually deceptive plants have emulated these highly effective pheromones and produce them in much higher quantities than the actual female pollinators. Researchers at the Geobotanical Institute in Zurich, Switzerland, have shown that the flowers of some sexually deceptive Orchids produce 10 times more of these sex pheromones than are released by genuine females¹. They also showed clearly that males preferred larger quantities of these sex pheromones and therefore will be more attracted to these flowers than their own females.

Although scent attracts males over long distances, resembling the female pollinator visually can also play an important role over shorter distances. Some plant species have produced incredibly lifelike replicas of their female pollinator's body. To an insect's compound eye, with only about a hundredth of the resolution of the human eye², these can be near impossible to tell apart.

Males that are tricked will vigorously gyrate around these floral structures and inadvertently get pollen all over their bodies. Once they realize their mistake and depart this pollen is conveniently delivered to the next flower that manages to fool them. Pollination has never been so delightfully devious.

While sexual deception within the Orchids is well documented, the beetle daisy *Gorteria diffusa* which grows all over Namaqualand represents the first confirmed case of it outside the Orchid plant family. What is more, this daisy exhibits extreme floral variation between different localities within the landscape and 14 distinct forms have recently been described³. Could it be that these different forms reflect the different preferences of males within each locality? That is one of the questions we are trying to answer at Stellenbosch University's Cape Flora Research Group.

By conducting one of the first genetic investigations into a pollinator's evolutionary history within South Africa, we can determine the potential for different preferences to develop in different localities. Experiments with live male flies in controlled environments will verify these notions and help us to understand how such incredible interactions originate.

Evidently things are not always as they seems, as any of these flies will tell you. So next time you take a trip to Namaqualand and its vast spring flowering displays, remember to keep an eye out for these fast flying fools around a patch of daisies and take a moment to appreciate the wondrous ingenuity of our natural plant life.



Figure 1. The beefly *Megalopus capensis* on the Springbok form of the beetle daisy *Gorteria diffusa*.

References:

¹Schiestl, F. P. 2004. Floral evolution and pollinator mate choice in a sexually deceptive orchid. *Journal of Evolutionary Biology*. 17: 67-75.

²Chittka, L & Raine, N. E. 2006. Recognition of flowers by pollinators. *Current Opinion in Plant Biology*. 9: 428–435.

³Ellis, A. G. and Johnson, S. D. 2009. The evolution of floral variation without pollinator shifts in *Gorteria diffusa* (Asteraceae). *American Journal of Botany*. 96: 1–10.