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Don't Judge a Book by its Cover: The Curious Case of Wild Ginger Pollination

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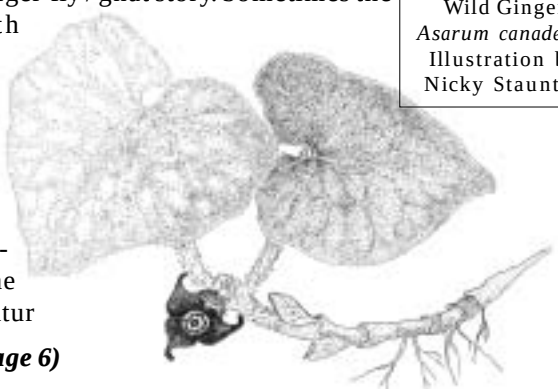
Conserving wild flowers and wild places

Don't judge a book by its cover
The curious case of wild ginger pollination

What pollinates wild ginger? This seems like an easy question. The inconspicuous little flowers are held close to the forest floor, often completely hidden by a dense canopy of ginger leaves above. Flower color is rather drab, dominated by brown and maroon hues. Wind pollination seems completely unlikely and flowers pollinated by bees, butterflies, moths, or hummingbirds are always much more showy and accessible to these flying creatures. Flies, however, given their natural inclination to seek carrion as a food source for their babies (i.e. maggots), are often attracted to brown and maroon flowers. And because their actual quarry, animal carcasses, would be located on the ground, visiting a wild ginger flower could easily be perceived to be consistent with routine fly behavior. It seems obvious: wild ginger flowers sure look like they ought to be cross-pollinated by flies of some sort.

In fact, I remember being taught long ago that fungus gnats, a sort of fly, pollinate wild ginger, and, I am embarrassed to admit that I have passed along that half truth (really, less than half true) to more than one class of students. The general idea of fly-based pollination for wild ginger was widely repeated in floras and accounts of natural history prior to 1940, and a study of wild gingers and fungus gnats was published somewhat later (Vogel, 1978). These alleged gnat and fly pollinator theories have dispersed widely and now can be found infesting the Internet. It is not difficult to locate on the Web multiple iterations of and variations upon the wild ginger-fly / gnat story. Sometimes the story is embellished with wonderfully elaborate details: flies newly emerged in early spring allegedly encounter wild ginger flowers while searching for the thawing bodies of small mammals that failed to survive the preceding harsh winter. Often the story is told with the imprimatur



Wild Ginger
Asarum canadense
Illustration by
Nicky Staunton

(See Wild Ginger sex, page 6)

Wild Ginger sex not as it seems

(Continued from page 1)

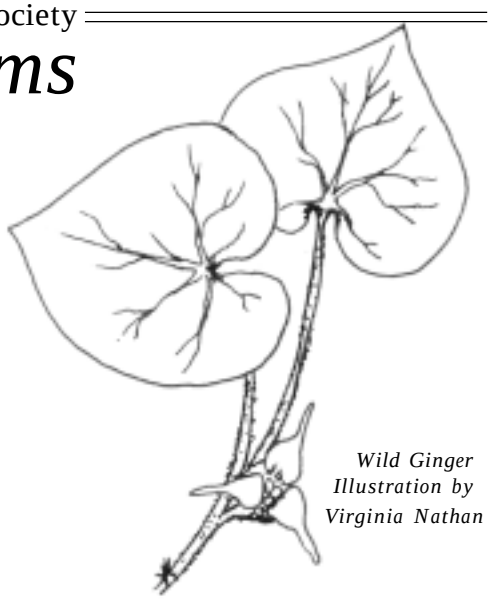
of authority, like a certain PowerPoint lecture that can be downloaded from a major university located somewhere in the Midwest (I'm not telling which, but it is not hard to find) in which the wild ginger of eastern North America *(Asarum canadense*) is a featured example of fly-mediated pollination. Flies and wild ginger make a great and convincing story, but it's not the whole truth!

Some of the first chinks in the wild ginger-fly story appeared in a 1940 article by Donald Culross Peattie titled, "How is *Asarum* pollinated?" Peattie's article summarizes earlier literature and recounts his own observations of multiple species of *Asarum* and *Hexastylis* in their native habitats in North Carolina and California. Peattie's main points are: 1) earlier published accounts of wild ginger-fly interactions are mere assertions not accompanied by data, 2) prior to 1940, at least two detailed studies, one in Europe and one in Alabama, failed to record any insect visitors to wild ginger flowers, and 3) wild ginger flowers emit no detectable odor at all, whereas bona fide fly-pollinated flowers are typically foul-smelling, sometimes in the extreme. Peattie ends with a plea for well-documented studies of wild ginger pollination.

Since Peattie's article, a few detailed studies of wild ginger have been published. The consensus emerging from several studies since the 1980s is that wild ginger flowers are self-pollinated (these are well summarized in Kelly 1997, 2001). The evidence is compelling: intact flowers that are carefully bagged to prevent access by insects set seeds at rates equivalent to untouched control flowers while flowers that are carefully emasculated (anthers removed before pollen is mature) but left uncovered (i.e., available to potential insect visitors) produce very few seeds. The evidence shows that self-pollination predominates and cross-pollination is rare.

In the case of *Asarum canadense* and closely related species, the details of self-pollination are fascinating. As soon as the flowers open, stigmas are receptive but the pollen is not initially located nearby because the stamen filaments (stalks) are bent to a position parallel with the base of the floral cup. Over a period of several hours to several days, filaments straighten, bringing the pollen-bearing anthers into proximity with the stigmas. Cross-pollination would be possible if an insect visitor brought pollen to a flower shortly after opening, but it seems that insect visits of any kind are rare, and most seeds form as a result of delayed autonomous self-pollination brought about by reorientation movements of the stamens. At present, documentation of a minor role for cross-pollination by gnats or flies rests with some of the western U.S. species of *Asarum*. *Asarum hartwegii* emits a faint musty floral fragrance (Mesler & Lu, 1993) and mushroom flies are reported to lay eggs in the flowers of several western species (Meeuse & Morris, 1984). But, our eastern wild ginger, *Asarum canadense*, seems to be overwhelmingly self-pollinated.

The story for the closely related wild gingers sometimes classified in the genus *Hexastylis* is a bit different. In these plants the stamens are short, their anthers are located well below the stigmas, and their filaments undergo



Wild Ginger Illustration by Virginia Nathan

no repositioning movements. The distance between anthers and stigmas is too great for easy direct self-pollination. For the few species studied, it seems that a variety of small insects visit flowers of *Hexastylis* and, while scrambling around inside, move pollen from anther to stigma, but these pollination events are overwhelmingly within the same flower, not crosses between different flowers (Otte, 1977).

So, things are not always as they seem. Wild gingers look like they ought to be cross-pollinated by flies but the best available evidence is that only some species are and then only some of the time; self-pollination, whether autonomous (in *Asarum*) or insect-assisted (in *Hexastylis*) appears to be the norm for these curious plants.

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