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Zephyr Lilies: Simple Beauty Belies Complex Biology

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Zephyr lilies: simple beauty belies complex biology

I have vivid memories of three different species of zephyr lilies. My first memory dates back to childhood when a family friend gave my mother a pan planted with a pink-flowered species, perhaps *Zephyranthes grandiflora* or *Z. rosea*. It was an old and badly chipped enamel basin and, when given, it seemed to hold nothing more than ugly brown, shriveled, leaf bases scarcely rising above the otherwise bare soil. But within a few days of watering the gift, like magic, we were rewarded with a profusion of exquisite pink lilies.

I also recall a small colony of our native atamasco or Jamestown lily (*Z. atamasca*) growing on the base of a bluff along the James at the mouth of Flowerdew Creek. In this case, the moment was magic, the small white flowers swaying gently in the onshore breeze, illuminated by sun flecks passing through the not-yet-fully-developed tree canopy.

And just a few years ago, while strolling the Passeo Montejo in Merida, Yucatan, I came across a few plants of *Z. candida* at the edge of a street-side planting. It was the beginning of June and the first hard rain of the season had soaked the peninsula a few days before. A friend told me that, locally, the plants are called "brujito," which translates as goblin or little sorcerer, for the way they appear, like magic, following rain. In each case I was struck by how the perfect, elegant, beauty of these zephyr lilies conveyed a sense of effortless magic. It is often thus, the best in art appears effortless; the most compelling science, once understood, seems obvious. But talk at length with any artist or scientist and you will learn that what appears simple is actually the culmination of a great deal of work. Zephyr,

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Jamestown lily
Zephyranthes atamasca
Illustration by Nicky Staunton

INSIDE

Updates on VNPS Annual Meeting

There have been a few changes in the 2007 VNPS Annual Meeting, **Where the Land meets the Water**, scheduled for September 14-16 in Gloucester Point. The two most important changes are that the state annual meeting will be on Saturday night during the buffet / party, and the keynote speaker will be Dr. Jim Perry, a marine science professor at William and Mary's Virginia Institute of Marine Science (VIMS). All other previously published information concerning the VNPS annual meeting is the same.

The John Clayton Chapter and VIMS have lined up speakers and fieldtrips for Friday afternoon, including a kayak trip down Dragon Run led by Teta Kain, a talk and walk at Jamestown Island, a presentation by Wesley Greene, garden historian with the Colonial Williamsburg Foundation, and some wonderful VIMS presentations. Keynote speaker Dr. Jim Perry will

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• Zephyrs

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or Jamestown, lilies are like that, too. These seemingly simple flowers are merely the elegant end product of some very complex underlying biology, the details of which are imperfectly understood.

First, what is a zephyr lily? That is easy, up to a point. All zephyr lilies are New World members of Amaryllidaceae with bulbous rootstocks, one- (rarely two-) flowered scapes, and lacking the corona tubes that are so prominent in, for example, daffodils. At various times in the past, virtually all plants fitting that description have been named as members of the genus *Zephyranthes*. However, other classifications have been followed, with *Cooperia* distinguished by very short stamens and anthers attached at the base, and *Habranthus* characterized by stamens of four different lengths, leaving *Zephyranthes* (in a narrow sense) with relatively long stamens of subequal or just two different lengths.

A recent study based on cladistic analyses of DNA sequence data proved inconclusive on the taxonomic limits of these potential subgroups within the zephyr lilies at large (Meerow et al. 2000). In that study, *Habranthus* was found to occur nested within *Zephyranthes*, a result in direct opposition to the recent trend to recognize it as distinct. Even more perplexing, however, the remaining species of *Zephyranthes* (in the broad sense) sorted themselves into three distinct branches, none of which match the old distinctions between *Cooperia*, *Habranthus*, and *Zephyranthes*. Clearly, more study is needed to resolve relationships and classification of these plants.

Part of the problem in untangling relationships among the zephyr lilies is that various species in the group have probably undergone hybridization. Hybridization always presents a problem for cladistic analysis of relationships. To understand why, it is important first to realize that cladistics aims to reconstruct the most probable sequence of dichotomous branching within the evolutionary tree that gave rise to the organisms under study. Hybridization, however, represents a sort of confluence or fusion of once-separate lineages, resulting in a reticulated pattern of relationships. Presence of reticulated connections wreaks havoc with a technique designed strictly to detect and sort out patterns of dichotomous branching. In principle it is advised to remove obvious hybrids from data sets before running cladistic computations. Unfortunately, hybrids, especially those that may have formed in the distant past, are not always easy to recognize.

Further, it is reasonably certain that some level of interspecific hybridization has occurred in the relatively recent past. For example, *Flora of North America* notes that *Z. refugiensis* from coastal Texas is probably a natural hybrid of *Z. pulchella* and *Z. jonesii*. And horticultural sources note the presence of *Z. X ajax,* a hybrid of unknown parentage. Plant groups that hybridize often exhibit various chromosome anomalies and zephyr lilies are no exception.

There is published information on reproductive biology for only two species of zephyr lily. Those two species include our local atamasco lily, *Z. atamasca*, and *Z. texensis* (syn: *Habranthus tubispathus*). Both of these species have chromosome counts of 2n = 24, so neither is particularly extreme in that regard, yet the two show remarkably different modes of reproductive biology. Atamasco lilies seem reasonably straight forward. Broyles & Wyatt (1991) established that *Z. atamasca* is capable of producing seeds both by self-pollination and by outcrossing with other individuals of the species. Because the styles project beyond the anthers, however, self pollination in nature is probably less frequent than outcrossing in *Z. atamasca*. In contrast, Brown (1951) conclusively documented a process of asexual seed production (apomixis) in *Z. texensis*. This species seems to make pollen in the usual fashion and seed production requires transfer of pollen to the stigmas, BUT the seeds produced are NOT the product of a sexual process. Ovules of *Z. texensis* produce embryos without any cells ever undergoing meiosis and without fusion of sperm and egg, the two hallmarks of sexual reproduction in seed plants. So, whereas the seeds of most plant species (and our atamasco lilies) are produced by sexual processes and bear a shuffled allotment of genes from both parents, the asexual seeds of *Z. texensis* are all genetically identical to the parent plant from which they were produced. The reproductive biology of *Z. atamasco* and *Z. texensis* could hardly be more different. Since apomixis and other perturbations of sexual reproduction tend to be accentuated at the high end of polyploid series, one has to wonder what other peculiar details of reproductive biology wait to be discovered among the large number of zephyr lily species still unstudied in this regard.

Clearly, much remains to be learned about zephyr lilies. But that, too, seems to be part of their magic. How could these little flowers be any simpler? How could they be any more elegant? But what is going on, unseen, in the depths of their cells, to deliver these fleeting visions of beauty for us to enjoy after the gentle rains of spring?

Literature cited: (Brown, W. V. 1951. Apomixis in Zephyranthes texana. Amer. J. Bot. 38: 697-702; Broyles, S. B. & R. Wyatt. 1991. The breeding system of Zephyranthes atamasco (Amaryllidaceae). Bull. Torrey Bot. Club 118: 137-140; Meerow, A. W., C. L. Guy, Q-B. Li, & S-L. Yang. 2000; and Phylogeny of the American Amaryllidaceae based on nrDNA ITS sequences. Systematic Botany 25: 708-726.)

W. John Hayden, VNPS Botany Chair

Volunteers needed

Black cohosh (*Actaea racemosa*, syn. *Cimicifuga racemosa*), a plant of the Appalachian Mountains, is widely sought as a medicinal plant used to treat menopausal symptoms. Each fall the root is harvested for the commercial market, nearly all of it from the wild. While NatureServe currently gives the plant a secure ranking, increases in harvest and the potential effects have prompted a study by the U.S. Forest Service on the sustainability of the black cohosh harvest. The Medicinal Plant Working Group, the Garden Club of America and the U.S. Fish and Wildlife Service have joined these studies. Groups of 15 volunteers are needed at Reddish Knob on June 24-26 and Mt. Rogers on August 26-28. The weekend begins with a training session,then two days of field work. Participants need to provide their own accommodations. Information can be obtained at the VNPS office, or RSVP after April 15 to USDA's Jim Chamberlain 540-231-3611, jachambe@vt.edu ; jchamberlain@fs.fed.us.