

Platanthera x canbyi: A naturally-occurring hybrid between *Platanthera blephariglottis* and *P. cristata*, in which we documented shared pollinators.



The Hunt for Orchid Pollinators

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Importance of Pollinators

Pollinators are critically important for plant reproduction and evolution. Orchids are pollinated by bees, wasps, flies, moths, beetles, butterflies, and sometimes birds. Many insect pollinators are specific to particular plant species, visiting only one or a small number of plant species. Decline of these species-specific pollinators is thought to be an important driver of orchid decline worldwide. In order to understand the threats to orchids, the North American Orchid Conservation Center (NAOCC) is focused on documenting the pollinators of all North American orchids and understanding how pollinator species vary among locations.

Orchid Distribution and Conservation Status

About 233 native orchid species have been documented in the U.S. and Canada, with 52 species native to Maryland. More than half of North American native orchids are threatened or endangered somewhere in their range, and many species have been declining precipitously in recent years. For example, botanists Wes Knapp and Richard Wiegand studied 21 species of orchids at 167 sites in Frederick County, Maryland, over 41 years. Starting in 1973, they monitored orchids annually at all of their sites and found that populations of 19 of the 21 species monitored had dropped significantly during that time (Knapp & Wiegand 2014).

Digital Documentation of Orchid Pollinators in Maryland

Pollinators for Maryland's native orchids are largely unknown. With funding from the American Orchid Society and Maryland Native Plant Society, we constructed day and night (infrared) motion-triggered video cameras to document and identify pollinators of



A Spicebush Swallowtail (*Papilio troilus*) with orchid pollinia on its head, pollinating White Fringed Bog Orchid (*Platanthera blephariglottis*).

orchid species. We set up 10 cameras to monitor pollinators at sites in Maryland, Pennsylvania, Virginia, North Carolina, and South Carolina. An additional goal was to document pollinators of three orchid species for which no pollinator information was available.

During the three years of this study (2021-2023), thanks to help from volunteers (including some MNPS members—thank you!), interns, and technicians, the cameras recorded over 8,000 hours of observations (5,500 in Maryland) of floral visitors to 22 orchid species and two natural hybrids. In order to expedite the process of reviewing videos, we employed a customized machine-learning algorithm to eliminate images not activated by pollinators. The cameras recorded 855 visits to 18 orchid species by 41 pollinator species.

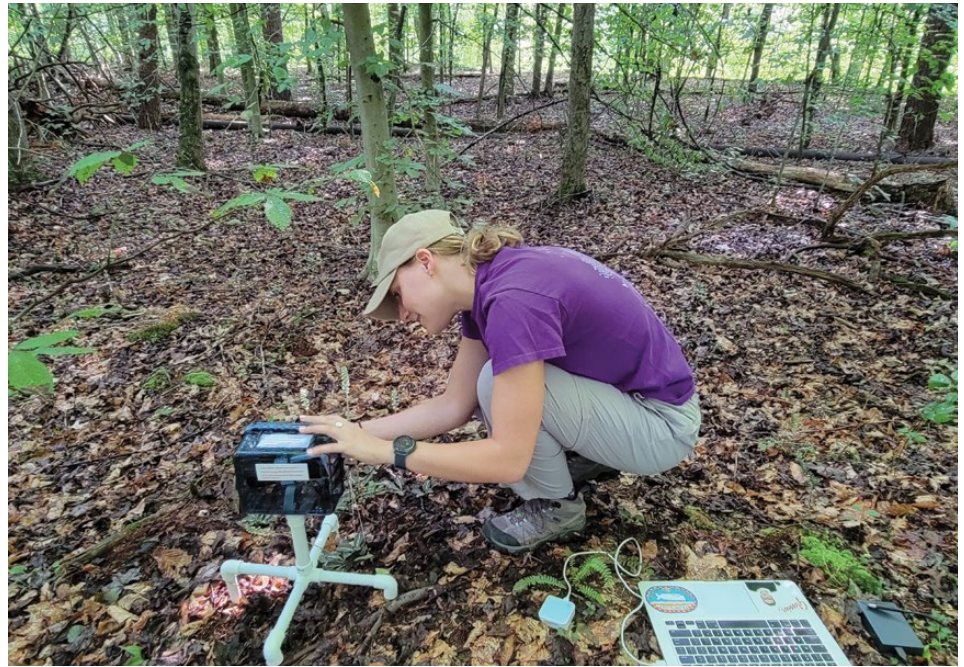
Our study included three species and

two naturally occurring hybrids of Fringed Orchids: White Fringed Bog Orchid (*Platanthera blephariglottis*), Crested Orange Bog Orchid (*P. cristata*), Orange Fringed Bog Orchid (*P. ciliaris*), and two hybrids (*P. x canbyi* and *P. x bicolor*). We found that the species and hybrids shared some pollinators at sites where they co-occurred, supporting our earlier findings that they hybridized at those sites (Evans et al. 2023). However, there was significant variation in pollinator visitation rates among sites for the *Platanthera* species. While there were some pollinators that visited more than one kind of Fringed Orchid, there were also differences in pollinator visits both among co-occurring orchid species and between the sites where the species grew. For

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example, flowers of the Orange Fringed Orchid () were pollinated mostly by Spicebush Swallowtail () in Maryland and Pennsylvania, and Palamedes Swallowtail () in North and South Carolina.

The cameras also recorded different dominant pollinators for three species of Lady's Tresses: Nodding Lady's Tresses (*Spiranthes cernua*), Slender Lady Tresses (*S. lacera*), and Atlantic Lady's Tresses (*S. bightensis*). In addition, we found that sites where Showy Orchis (*Galearis spectabilis*) produced seed, the orchids were pollinated by bumblebees, whereas at sites where the orchids rarely set seed, the orchids were visited by the day-flying Nessus Sphinx Moth (*Amphion floridensis*). The Nessus Sphinx Moth proboscis is too long to effectively pollinate the flower. Our efforts to capture evidence of possible pollinators of Little Club Spur Orchid (*Platanthera clavellata*), Autumn Coralroot (*Corallorhiza odontorhiza*), and Puttyroot Orchid (*Aplectrum hyemale*) were unfruitful. Over hundreds of hours of recording, we identified many floral visitors but were unable to demonstrate that any of these insects were effective pollinators for these species. It's possible that these three orchid species set seed by self-pollination. We plan to continue our recording efforts for these species.



Intern Gabrielle Brewer setting up a camera to record pollinators on Downy Rattlesnake Plantain (*Goodyera pubescens*).

Surprises

The cameras also recorded some unexpected visitors, including a Ruby-throated Hummingbird that visited and collected nectar from, but did not appear to pollinate, two species of *Platanthera*. A praying mantis was recorded capturing and eating multiple pollinators, a frog jumped up and ate a potential pollinator, and a green anole jumped on and broke an inflorescence.

Going Forward

We are currently upgrading our camera and infrared light systems and will continue these efforts in the future. We will also continue working to expand the number of sites and orchid species, hopefully, with more volunteers (like MNPS members!) to help place and operate the cameras.

REFERENCES

- Knapp W.D. and R. Wiegand. 2014. *Orchid (Orchidaceae) decline in the Catoctin Mountains, Frederick County, Maryland as documented by a long-term dataset*. Biodiversity and Conservation 23:1965-1976.
- Phillips R.D., N. Reiter, and R. Peakall. 2020. *Orchid conservation: from theory to practice*. Annals of Botany 126:345-362.
- Van der Voort, G.E., S.R. Gilmore, J.C. Gorrell, and J.K. Janes. 2022. *Continuous video capture, and pollinia tracking, in Platanthera (Orchidaceae) reveal new insect visitors and potential pollinators*. PeerJ 10:e13191.

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To learn more about NAOCC and this project, see northamericanorchidcenter.org/ and serc.si.edu/research/projects/orchid-pollinator-diversity.



Scan this image with your phone's camera and click the link that pops up to watch a butterfly pollinating an orchid



A clump of Yellow Lady's Slipper (*Cypripedium parviflorum*), a species that has been declining rapidly in Maryland.



Showy Orchis (*Galearis spectabilis*), a relatively common Maryland orchid.



Atlantic Lady Tresses (*Spiranthes bightensis*) being visited by Common Eastern Bumble Bee (*Bombus impatiens*). Orchid pollinia shown by red arrow.