Gentian Pinkroot Pollinator Field Survey Report

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Photo credit: All photos by Robert Gundy.

Executive Summary

Florida Natural Areas Inventory biologists surveyed populations of gentian pinkroot (*Spigelia gentianoides*) on five days between 11 May and 20 May 2021 with the goal of observing flower visitors and potential pollinators. A new method of surveying for arthropod visitors inside flowers was utilized with limited success. Flower phenology was documented as it related to pollinator accessibility to the interior of the flowers. Three species of halictid bees were documented visiting the interior of gentian pinkroot flowers. Two of these species were successfully collected and a third species was photographed.

Site Descriptions

Apalachee Wildlife Management Area

Four areas in Apalachee Wildlife Management Area (Apalachee WMA) were surveyed for the presence of gentian pinkroot. A quick survey was conducted along the southern border of the WMA where a recent prescribed fire had occurred. Very few plants were observed there. Another quick survey was conducted in an area between West Loop Road and Bonnet Pond. There were 788 plants counted in this area in 2017 (FNAI 2017). This area suffered tree loss during Hurricane Michael in October 2018. Subsequently, the area suffered major ground disturbance from the removal of timber. A temporary road was plowed through the area that was once the densest population known throughout the range of this federally endangered plant. Only several dozen plants were observed throughout the area. An area that previously only received shady, dappled sunlight reaching the ground now has virtually no canopy.

Two primary areas were chosen for repeated visits because these sites contained higher densities of flowering gentian pinkroot. One site chosen for repeated visits was just north of the agricultural field at the southwest corner of Fireline Road (Fireline Rd. site, hereafter). The other site chosen for repeated visits was just south of the junction between Sandy Field Road and West Loop Road (West Loop Rd. site, hereafter). Both sites are classified as upland mixed woodland with very nearly identical plant communities. The eastern edge of the West Loop Rd. site also contained some elements of sandhill habitat. Both sites contained a 25-50% canopy comprised primarily of sand post oak (*Quercus margarettae*) and longleaf pine (*Pinus palustris*), and were immediately adjacent to clearings with heavy ground disturbances. Common plants in the understory of both sites included wiregrass (*Aristida stricta*), eastern poison oak (*Toxicodendron pubescens*), oblongleaf twinflower (*Dyschoriste oblongifolia*), squarehead (*Tetragonotheca helianthoides*), soft greeneyes (*Berlandiera pumila*), wild blue phlox (*Phlox divaricata*), butterflyweed (*Asclepias tuberosa*), earleaf greenbrier (*Smilax auriculata*), New Jersey tea (*Ceanothus americanus*), winged sumac (*Rhus copallinum*), and thoroughworts (*Eupatorium* spp.).

Three Rivers State Park

Three areas in Three Rivers State Park (Three Rivers SP) were surveyed for the presence of gentian pinkroot. A quick survey was conducted near the western boundary of the park, just north of the entrance. The vegetation was thicker in that area, hindering the ability to see the short flowers of gentian pinkroot.

Two primary areas were chosen for repeated visits because these sites contained higher densities of flowering gentian pinkroot. One site chosen for repeated visits was approximately 150-180 meters south-southeast of a trailhead that begins where Three Rivers Park Road turns sharply northeast (trail site, hereafter). There was heavy ground disturbance and many large piles of discarded timber immediately northeast of the trail site. The other site chosen for repeated visits was approximately 350 meters west of the trailhead mentioned above and north of Three Rivers Park Road (roadside site, hereafter). The plant communities at both sites were nearly identical to each other and both Apalachee WMA sites. In general, there appeared to be higher densities of disturbance-related plant species at both Three Rivers SP sites compared to both Apalachee WMA sites.

Methods

Four sites were chosen for repeated visits, two each at Apalachee WMA and Three Rivers SP. Sites were chosen based on density of flowering gentian pinkroot, flower phenology, and ease of access for night surveys.

Day Surveys

Daytime surveys typically took place 10 a.m. and 6:30 p.m. Two to four sites were visited per day. During initial and subsequent visits, flowers in optimal condition were marked with flags to facilitate revisits. Flowers were inspected by wandering to clusters of gentian pinkroot, peering down inside open flowers, gently squeezing the flowers to see inside, or watching from several feet away. Clusters of plants were monitored for up to approximately two hours at each site if flowers appeared to be at the right stages. Flowers were inspected numerous times during each site visit.

Night Surveys

Night surveys typically took place between approximately one hour before sunset to at least one hour after sunset. For each survey, flags with reflective tape were placed next to any flowers that appeared to be in the right stages for pollination. These were easily detected with headlamps or flashlights from at least 50 m away with a clear line of sight and were usually easily visible within 10-20 m even when down in vegetation. Plants in other stages were marked with non-reflective white flags to avoid stepping on them and to tell them apart from ones at the correct stages at a distance. Survey methodology was similar to daytime surveys, but with more reliance on candling, as it was difficult to see down inside flowers using a flashlight at night.

Candling Flowers as a Pollinator Survey Method

Flowers that were “cracked open” (see Results section) could be gently pinched, which separated the petals enough to peer inside for flower visitors. This method was effective, but also risked the escape of frightened flower visitors and/or damage to the flowers themselves. In an effort to see inside flowers with less disturbance, we tested the possibility of candling flowers during daylight and nighttime hours. A small, bright LED flashlight was held against flowers and pointed opposite or perpendicular to the observer. This brightened the interior of the floral tube and allowed us to see shadows of anything inside (see figure 10). This method was effective at any time of day and we were able to locate a single flower visitor, a thrips (Thysanoptera), during daylight hours.

Results

Notes on Flower Phenology

The earliest stage of flower development past the bud stage involved fully formed “closed” flowers where petal tips contact and no opening is visible (see figure 1). These flowers were considered inaccessible to pollinators because of the lack of openings and the likelihood of anthers being immature. The second stage that was present, the stage most predominant throughout the survey, showed flowers only slightly “cracked open” at the top of the flower. In this stage, the interior is not visible, but the space between petal tips is evident (see figure 2). Flowers in the “cracked open” stage were considered to be in their “prime” condition for pollination. Small arthropods could squeeze themselves into the opening and, in fact, we witnessed this behavior by sweat bees and found other small arthropods inside flowers of this stage. In the third stage that was present, flowers were “open”, but with petal tips still pointed vertically or inward. In this condition, yellow anthers were usually present at the base of the flower and visible from directly above (see figure 3). “Open” flowers were considered in “prime” condition for pollination. The fourth stage that was present involved “wide open” flowers whose petals reflexed outward away from each other (see figure 4). “Wide open” flowers often lacked yellow anthers at the base of the flower and were considered passed their “prime” condition for pollination. The final stage is a withering of petals (see figure 1) and eventually dehiscence of flower petals.

Flower phenology was not the same between sites even when visited on the same day and during the same timeframes. In general, flowers at the Apalachee WMA Fireline Rd. site appeared to be in more advanced stages than all other sites. At the beginning of the survey period, more flowers were “wide open” than at the other three sites. By the last survey day, there were significantly fewer flowers present on plants at the Fireline Rd. site. The West Loop Rd. site and trail site averaged about the same flower condition, with most being in the “cracked open” position throughout the survey period. Flowers at the roadside site were primarily in the “closed” position with a minority of flowers “cracked open”. By the end of the survey period, the roadside site consisted primarily of “cracked open” flowers with few in the “open” position and virtually none “wide open”.

Figure 1. A gentian pinkroot flower cluster showing three stages of flower development. The upper and left flowers are "closed", the lower flower "open", and the right flower dehiscent.

Figure 2. A “cracked open” gentian pinkroot flower.

Figure 3. An “open” gentian pinkroot flower.

Figure 4. A “wide open” gentian pinkroot flower.

Flower Visitors

While countless invertebrates were observed visiting other flower species, observations of flower visitors at gentian pinkroot were rare. No flower visitors were documented at night. A total of 10 flower visitors that entered flowers, wholly or in part, were documented. Flower visitors that entered the floral tube included seven bees (Halictidae), three ground beetles (Carabidae), and multiple (numbers not recorded) thrips (Thysanoptera). The halictid bees were the only likely pollinators, as they were observed inside the flowers and pollen was clearly visible on all specimens that were closely examined. Two halictid bee specimens were collected at Apalachee WMA and have been identified to genus *Lasioglossum*, subgenus *Dialictus*, but identification below that is proving difficult. The specimens are ca. 4 mm and 7mm, respectively and it appears that between them and specimens that were only photographed, at least three species were documented.

Flower visitors that remained wholly outside the flower included white-banded crab spiders (*Misumenoides formosipes*), other crab spiders (Thomisidae), katydids (Tettigoniidae), an ambush bug (Phymatinae), and a twin-spot skipper (*Oligoria maculata*). In addition, petal herbivory was noticed on multiple flowers. Holes were chewed through the mid-sections of petals, but rarely, if ever, occurred along petal margins. No herbivores were observed creating, entering, or exiting these holes.

Figure 5. A sweat bee (Halictidae) specimen collected from the interior of a gentian pinkroot flower.

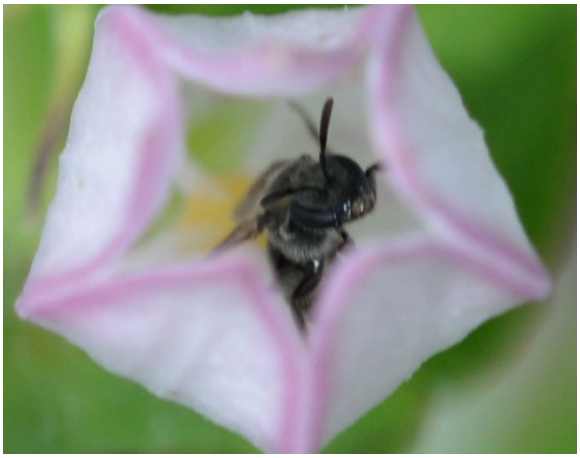

Figure 6. A sweat bee (Halictidae) visiting an “open” gentian pinkroot flower at Apalachee WMA.

Figure 7. A different sweat bee (Halictidae) visiting an “open” gentian pinkroot flower at Apalachee WMA. Pollen can be seen along its legs.

Figure 8. A sweat bee squeezing out of a "cracked open" gentian pinkroot flower. Photograph taken during a 2017 survey for gentian pinkroot at Apalachee WMA.

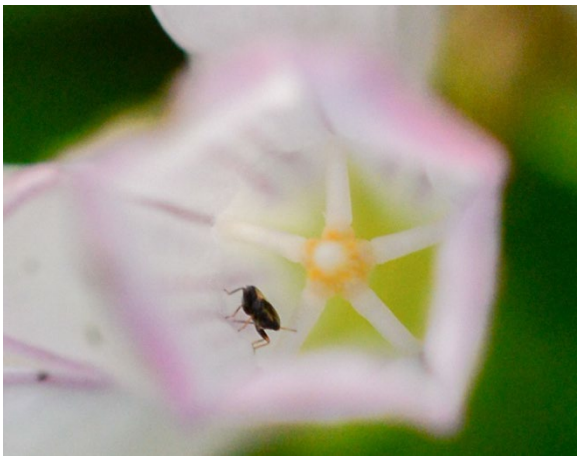

Figure 9. A thrips species (Thysanoptera) inside a "wide open" gentian pinkroot flower.

Figure 10. A thrips species (Thysanoptera) visible as a faint dot on the left flower while candling during daylight hours.

References

Florida Natural Areas Inventory. 2017. Drift Fence Animal Survey of Apalachee Wildlife Management Area, Jackson County. Florida Natural Areas Inventory report to the Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.