

Dual host plant use by *Callophrys irus* (Godart) (Lycaenidae) larvae at a single site on the Maryland coastal plain

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Additional Key Words: frosted elfin; *Lupinus perennis*; *Baptisia tinctoria*; life history

Callophrys irus Godart (Lycaenidae) is rare throughout its range and listed as endangered in the state of Maryland (NatureServe 2013, Maryland NHP 2010), due in part to a scarcity of open, xeric habitats where its host plants can persist. Larvae are host plant specialists, restricted to feeding on one of two species, *Lupinus perennis* L. (Fabaceae) and *Baptisia tinctoria* (L.) Vent (Fabaceae) (Scott 1986, Allen 1997), throughout most of their range. At sites that harbor both plant species, *C. irus* larvae are reported to feed on one or the other but not both (Schweitzer 1992, NatureServe 2013). It has been suggested that *L. perennis*-feeding populations and *B. tinctoria*-feeding populations may represent distinct ecotypes (Schweitzer 1992); there is even speculation that they may not be conspecific (NatureServe 2013). Gatrell (1991) cited differences in the morphology of *L. perennis* and *B. tinctoria*-feeding adults, and differences among larvae have also been reported to a limited degree (NatureServe 2013). Differences in life history are also documented, with *L. perennis* feeders consuming flowers and pods (Schweitzer 1992, Swengel 1996, Pfitsch and Williams 2009, NatureServe 2013,) and *B. tinctoria* feeders consuming stems and leaves (Schweitzer 1992, Albanese 2007). A specialized feeding strategy involving stem girdling of *B. tinctoria* by *C. irus* has been documented by Albanese (2007). Further research is needed to determine whether differences in morphology and life history are a result of geographic separation or speciation.

In 2013 we documented use of both *L. perennis* and *B. tinctoria* by *C. irus* larvae at a site in Worcester County, Maryland on the Atlantic Coastal Plain east of the Chesapeake Bay. The site, hereafter referred to as the pine plantation, is underlain by relatively young (Tertiary and Quarternary) sediments of uniformly low relief (Schmidt 1993) and contains roughly 250 hectares planted to *Pinus taeda* L. (Pinaceae). Logging roads and harvest areas are the only openings in the dense pine canopy. Well-drained, sandy soils (Evesboro loamy sand, Typic Quartzipsamment; Soil Survey Staff 2011) provide habitat for *L. perennis*. *Callophrys irus* utilize the sandy roadsides where small patches of *L. perennis* persist, but their activity is concentrated in a 2.1 ha area that was clear-cut in 2004

and now harbors thousands of *L. perennis* stems. *Baptisia tinctoria* is also present, but no more than 25 stems have been encountered within the clearing (although a complete census has not been undertaken). To maintain suitable *C. irus* habitat, the clearing is currently managed to slow forest succession by mechanically clearing regenerating *P. taeda* and through the selective removal of hardwoods.

Callophrys irus has been surveyed at the pine plantation site annually since 2006. Females have been frequently observed ovipositing on *L. perennis* but never on *B. tinctoria*. During 2013 surveys, for example, we observed seven ovipositing females within a 3-day survey period, all of which oviposited on *L. perennis*. We surveyed for *C. irus* larvae in 2011-12, but not in 2013, by examining *L. perennis* stems for evidence of feeding damage to the seed pods. Larvae and evidence of feeding damage were present on *L. perennis* in both years. We have never targeted *B. tinctoria* for larval surveys because of the low density present in the clearing, and the few times we encountered it by chance in 2011-12 we found no larvae and no evidence of larval feeding damage.

On 18 June 2013, as part of a conservation seed collection effort at the pine plantation, we visited one of the logging roads that had not been monitored previously. Although *L. perennis* was not present, there were several *B. tinctoria* plants. We observed smaller, earlier-instar *C. irus* larvae feeding on *B. tinctoria* leaflets, petioles, and small stems, and late instar larvae girdling stems at or just above ground level as described by Albanese (2007). A census of the approximately 40 stems located along the 260 m stretch of road typically revealed one larva per occupied stem, although one stem hosted five earlier-instar larvae. Two of the stems had been killed presumably as a result of girdling, turning black and breaking at the girdle site. Alerted to the presence of *C. irus* larvae on *B. tinctoria*, we immediately examined the few *B. tinctoria* stems we could find in the 2.1 ha clearing. While we did not find larvae, two stems of 25 had been girdled; these two stems were separated by a distance of <6 cm.

On 26 July 2013 we completed a census of *B. tinctoria* encompassing 1.7 km of logging roads (including the stretch of road surveyed on 18 June 2013) at the pine plantation.

Although *C. irus* larvae were no longer feeding at this time, stem scarring as a result of girdling was still evident. Of the 100 *B. tinctoria* stems encountered, 73 had evidence of stem girdling. The roadside *B. tinctoria* was not near the roadside *L. perennis* (separated by 95 m or more), nor was it near the *L. perennis* in the clearing (separated by 200 m or more). These distances suggest that the presence of larvae feeding on the roadside *B. tinctoria* was the result of host plant selection by adult female butterflies.

We are aware of only one other *C. irus* site that supports both host plants on the lower Coastal Plain, located approximately 7 km north of the pine plantation site. This site (herein referred to as the north site) is linear and appears to be confined to an approximate 3.5 km length of sand road. There are two small clusters of *L. perennis* along the road shoulder at opposite ends of the road, and approximately 200-300 *B. tinctoria* stems scattered along the road shoulder between the two *L. perennis* clusters. *Callophrys irus* adults and larvae have been documented using both *L. perennis* clusters along the road several times in the last five years, but areas with *B. tinctoria* were not targeted for survey work until 2013. Surveys at the north site in 2013 revealed *C. irus* feeding damage on *L. perennis* but no apparent damage to *B. tinctoria*. We surveyed *B. tinctoria* on three occasions: 13 June (all plants surveyed), 19 June (50 plants surveyed) and 19 July (all plants surveyed).

The use of both *L. perennis* and *B. tinctoria* by *C. irus* at a single site has not been documented prior to our report as far as we are aware. One possible reason for this may be that at most sites where both host plants are present, one is clearly dominant over the other and the less abundant host is simply overlooked or under utilized by adult female butterflies, and/or overlooked by the observer. This line of reasoning is consistent with our observations to date, as *L. perennis* is clearly the dominant host at the pine plantation site, outnumbering *B. tinctoria* by a factor of at least ten to one.

It is also possible that a female from a nearby *B. tinctoria*-feeding population of *C. irus* dispersed to colonize the pine plantation site, ovipositing on *B. tinctoria* encountered along the road. This would assume that a *B. tinctoria*-feeding population of *C. irus* occurs somewhere in the vicinity of the pine plantation site, which cannot be confirmed. All of the known, extant *C. irus* populations on Maryland's lower Coastal Plain feed on *L. perennis*. There is, however, one historic (1980's) *C. irus* site record that occurred in association with *B. tinctoria*. Also, whereas *L. perennis* is a state-threatened species (Maryland NHP 2010) represented by a few small and isolated populations, *B. tinctoria* is relatively common on the Coastal Plain and could potentially support one or more additional *C. irus*

populations. The stray-female hypothesis could explain why *C. irus* larvae were observed using both host plants at the pine plantation site but not at the north site in 2013.

We will continue to monitor adult butterflies and larvae at both sites to assess whether *C. irus* consistently use both host plants at the pine plantation site, and to assess whether host plant use remains restricted to *L. perennis* at the north site. We also plan to survey areas with abundant *B. tinctoria* in 2014 in an effort to determine whether any *B. tinctoria*-feeding *C. irus* populations remain on Maryland's lower Coastal Plain.

Acknowledgements

We thank Matt Sampson (The Forestland Group, LLC) and Larry Walton (Vision Forestry, LLC) for allowing us to conduct our research at the pine plantation site, Paula Becker (Maryland Department of Natural Resources [DNR]) for assisting with the *B. tinctoria* census and Chris Frye, Wes Knapp and Jim McCann (all of Maryland DNR) for reviewing an earlier draft of this note. This project was funded in part by a State Wildlife Grant administered by the US Fish and Wildlife Service.

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