



# *The Taxonomic Report*

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## A case of sympatric *Celastrina ladon* (Cramer), *Celastrina lucia* (W. Kirby) and *Celastrina neglecta* (Edwards) (Lycaenidae: Polyommatainae) in Northern Virginia, with additional records of *C. lucia* in Virginia

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**ABSTRACT.** A case of fully sympatric *Celastrina ladon*, *C. lucia* and early spring brood *C. neglecta* is documented at a site in northern Virginia. Observations indicate that all three species occupy the same habitat, fly during the same flight period and utilize the same hostplant with no evidence of hybridization. *C. ladon* and *C. lucia* are obligate univoltines while *C. neglecta* is multivoltine. A later flight (second brood) of *Celastrina neglecta* at the same site utilizes eriophyid mite-induced leaf galls on the very same host tree species. Additional Virginia records of *C. lucia* are documented.

**Additional key words:** sympatry, androconia, *Prunus serotina*, leaf galls, *Cornus florida*

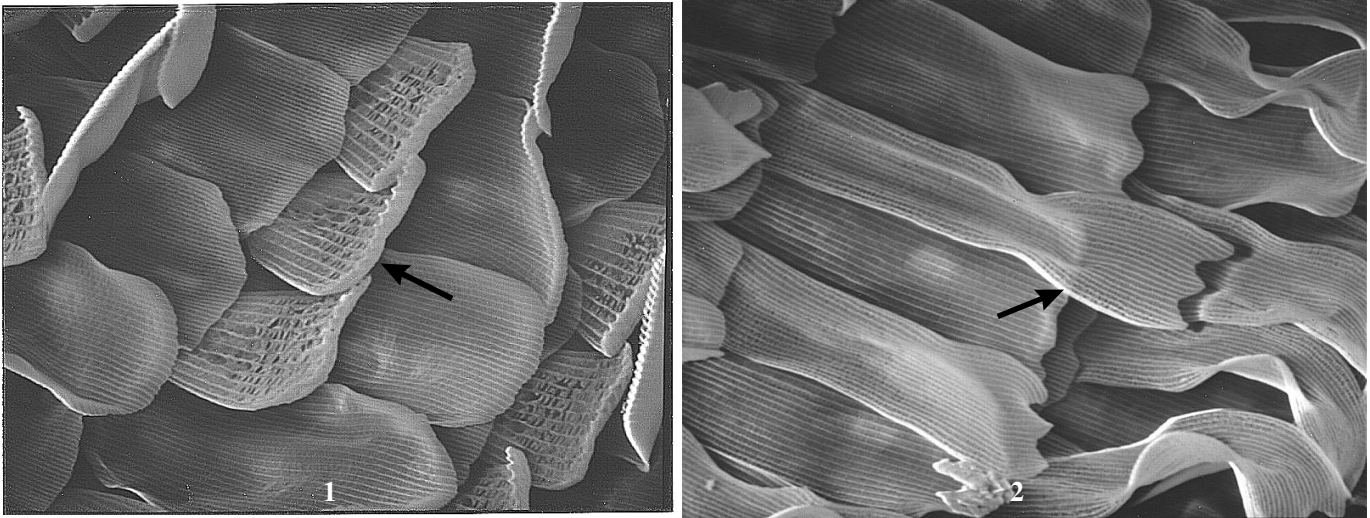
### INTRODUCTION

*Celastrina* systematics has long remained in flux. Following the separate descriptions of *C. ladon* (Cramer, 1780), *C. lucia* (W. Kirby, 1837) and *C. neglecta* (W. H. Edwards, 1862), the notion of how many species of *Celastrina* inhabit North America has fluctuated from author to author and has been a source of endless debate and confusion. Disagreement among checklist authors continues to the present day. For example, Pelham (2008) lists nine *Celastrina* species north of Mexico, thus adopting species-rank for the three species recorded in this study. On the other hand, the North American Butterfly Association's most recent checklist as of this writing (NABA, 2001), recognizes only three *Celastrina* species, relegating *neglecta* to subspecies status under *C. ladon*, and does not recognize *lucia* at any rank. Until the 1990's, most authors traditionally treated *neglecta* as a summer form of *C. ladon* (e.g. Iftner *et al.*, 1992). Since that time, the majority of newly published regional-level guides have treated *C. neglecta* at full-species rank. Wright and Pavulaan (1999) identified a unique primary dorsal wing scale character that differentiates *C. ladon* from *C. neglecta* and all other North American *Celastrina* (except *C. nigra*) as a full-species taxon (Figs. 1 & 2). This character breeds true within *C. ladon* from annual generation to generation without variation. It is also expressed in lab-produced "false summer generation" adults and never appears in lab-reared *C. neglecta*. This unique character is used as a convenient method to differentiate *C. ladon* from both *C. lucia* and *C. neglecta* at a northern Virginia site in the present study.

The name *Celastrina lucia* has been applied to a broad grouping of phenotypically similar, though apparently distinct, *Celastrina* populations spanning the northern portion of the North American continent and extending southward in the Appalachian and Rocky Mountain regions. The taxonomic standing of these various populations is under current review and will likely be revised to include two or more sibling species once it can be determined precisely which population Kirby described as *lucia*. The Appalachian *lucia* population reported here is tentatively retained as a member of the *lucia* species-group until further

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research resolves the type locality issue and clarifies the relationship of continental populations currently treated as *lucia*. All references given here to the name *lucia* are tentative and follow the line of reasoning given above. [As an alternative, *lucia* in Virginia may be referable to as "*lucia* Auct." until its taxonomic standing can be resolved.]



**Fig. 1:** Scanning electron micrograph (SEM 640X) of dorsal forewing of *C. neglecta* showing androconia between blue scales. Specimen taken September 17, 1987, Harleysville, Montgomery Co., PA. **Fig. 2:** (SEM 640X) of dorsal forewing of *C. ladon* showing long overlapping scales and lack of androconia. Specimen taken April 23, 1992, Green Ridge State Forest, Allegany Co., MD. Photos by David M. Wright.

## DISCUSSION

A distinctive hilltop site known as Old Knob located near Gore, VA, Frederick County, was discovered in June, 2005. This hill (elevation 1,300 ft.) is not impressive by regional standards, but the summit area contains an exceptional array of butterfly species. During a multi-year study of the local colony of *Papilio* (*Heraclides*) *cresphontes* and summit stand of *Ptelea trifoliata* (Wafer Ash, Hop Tree), an unexpected assembly of sympatric *Celastrina* species (*ladon*, *lucia*, *neglecta*) was uncovered.

A substantial colony of *Celastrina neglecta* was first observed on the summit of Old Knob on June 6, 2006. It was noted that *Prunus serotina* (Black Cherry) comprised a significant portion of the forest understory. Many of these trees were infested with leaf galls formed by eriophyid mites, attributed to *Phytoptus cerasicrumena*. Several second-brood adult *C. neglecta* females were observed ovipositing on the leaf galls and many eggs were located, but not collected. Eriophyid mite leaf galls are the primary larval host of *C. serotina* throughout much of the northeastern United States (Pavulaan & Wright, 2005). Oviposition by *C. neglecta* on *P. serotina* leaf galls was previously observed in the area surrounding Big Meadows Recreational Area of Shenandoah National Park in Page County, VA in 1985. *C. neglecta* has been observed to utilize hosts from a broad range of plant families (Pavulaan and Wright, 2005), thus this behavior at Old Knob was not deemed unusual. At both the Old Knob and Big Meadows sites, mound-building ants were very common (Fig. 27); the ants built huge mounds and defended their turf against intruders rather aggressively. The ants at Big Meadows were of an unidentified type of large stinging ant, while the ants at Gore did not sting, but inflicted painful bites in large numbers as experienced by the author. Throughout the study the ants vigilantly guarded and protected larvae against predators in exchange for larval honeydew secretions. The presence of ant colonies likely contributed to the longevity of the associated *Celastrina* colonies in this region.

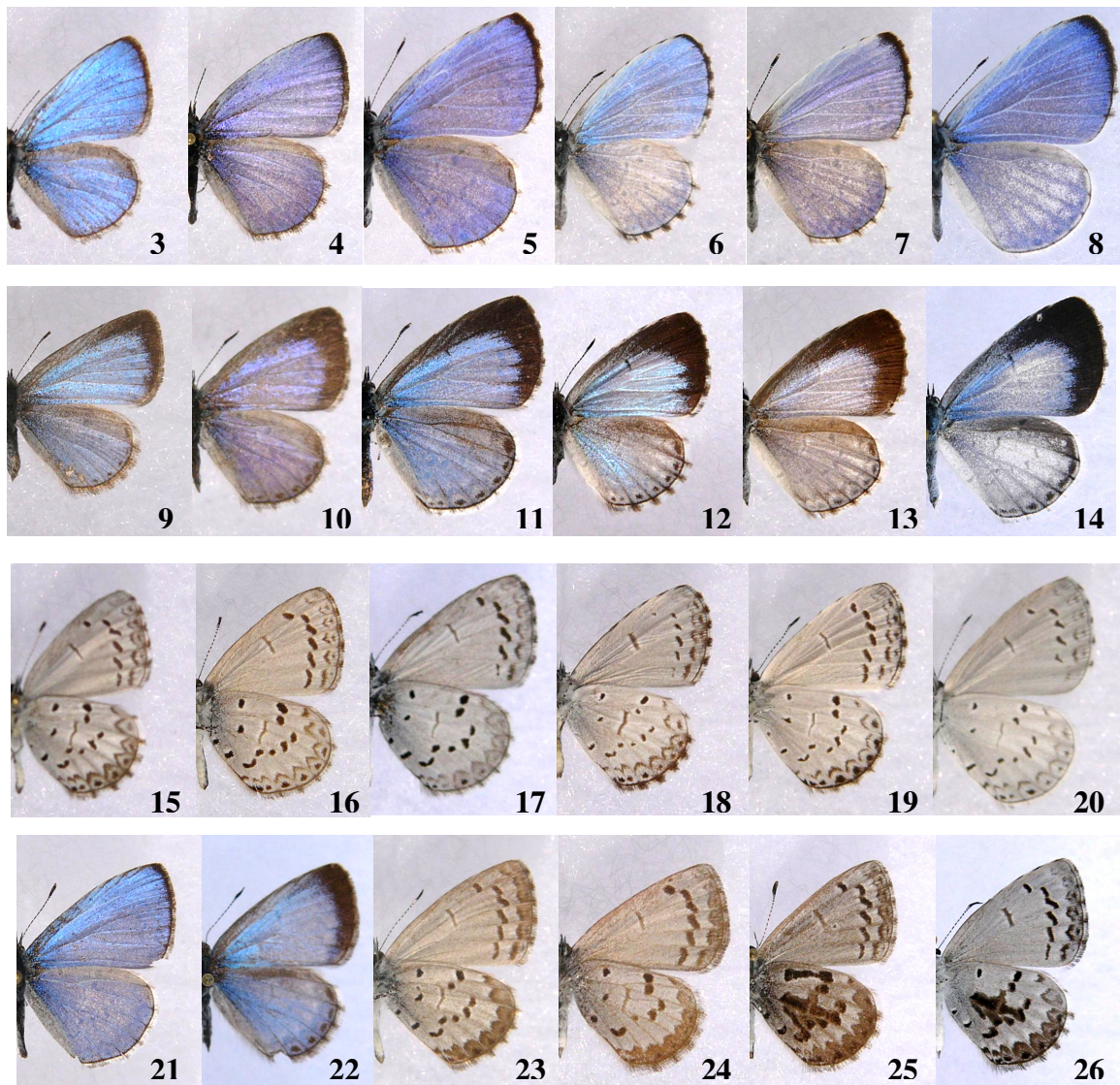
On April 23, 2007 adults of both the *Celastina lucia* (Figs. 3, 9, 15) and *C. ladon* (Figs. 4, 10, 16) populations were collected on the summit of Old Knob. No early spring brood individuals of *C. neglecta* were recorded on Old Knob in 2007. The *C. lucia* males were easily distinguished from *C. ladon* males by dissimilarity of their forewing scale characters (Figs. 1 and 2). Furthermore, it was immediately surmised that *C. lucia* and *C. ladon* resided in sympatry at this northern Virginia site without evidence of interbreeding and were capable of retaining their separate species-level identities. It was further observed that both species were found in close proximity to a potential host tree *Prunus serotina* and associated ant mounds. No attempt was made to obtain ova on this date. Further exploration demonstrated *C. ladon* was also found in considerable numbers on the south slope of the hill below the summit along Knob Road at approximately 700-860 ft. elevation. Despite the relatively short distance from the summit, no *C. lucia* individuals were found below the summit along Knob Road. This suggests that *C. lucia* may have a stronger inter-dependency on mound-building ants on the summit than *C. ladon*.

Subsequent early-spring surveys on Old Knob on April 11, 2008 and April 18, 2009 revealed the same pattern, with only *C. ladon* and *C. lucia* evident at the summit and only *C. ladon* along the roadway at lower elevations. In 2008, several ova were obtained from an unidentified female confined with *Prunus serotina* flower buds. The larvae were first reared on flower buds, but were later switched to eriophyid mite galls. These produced a “false (lab-induced) second generation” of *C. ladon* adults (Figs. 7, 13, 19) with all male specimens displaying the unique dorsal scale character of *ladon* forewings. It was subsequently observed that both *C. ladon* and *C. lucia* utilize *Prunus serotina* flower buds and eriophyid mite galls at the summit site.

On April 6, 2010 at the summit, several adults of what appeared to be spring form of *C. neglecta* (Figs. 5, 11, 17) were found flying with *C. ladon* and *C. lucia*, and also in close association with *Prunus serotina*. Several females of the three distinct phenotypes were confined with *Prunus serotina* buds in separate containers and many ova were obtained. Unfortunately, the eggs of only one female successfully emerged, while the rest failed to emerge. It is unclear why the remainder did not emerge; mold or fungal infection is suspected or the females may not have mated. The surviving larvae from the single female yielded typical summer form *C. neglecta* adults (males distinguished by typical *neglecta* dorsal forewing scale structure) (Figs. 8, 14, 20), which emerged over the period from May 20 to 29. An additional trip was made April 14, 2010, but no females were found. A trip to Old Knob on May 27, 2010 detected a second (summer) brood of *C. neglecta* was flying. This confirmed a spring flight (April) and subsequent late May flight of *C. neglecta* occurred at Old Knob. Both broods apparently utilized *Prunus serotina*. Even later summer broods of *C. neglecta* also occurred at Old Knob. These have not been studied other than the collection of specimens to confirm the presence of additional broods of *C. neglecta*.

On May 5, 2011, a worn female of an unidentifiable phenotype was collected on Old Knob and confined on developing flower buds of *Prunus serotina*. Several eggs were obtained and larvae were reared to maturity on both flower buds and leaf mite galls. Many larvae perished during the course of rearing due to cannibalism. Two “false second generation” adults of *C. lucia* (Figs. 6, 12, 18) eclosed on June 6, 2011. The male displayed a dorsal forewing scale structure identical to spring brood individuals.

The fact that three different *Celastrina* populations occupy the same ecological niche in Virginia without apparent hybridization or intergradation is strong evidence of reproductive barriers maintaining species-level distinctness. It is surmised that a small isolated *C. lucia* population on the summit of Old Knob would have been obliterated long ago by natural hybridization, if this were to have occurred. A fourth species, *C. neglectamajor*, was also recorded on Old Knob, but not at the study site. Two individuals were collected on the lower portion of Knob Road on May 12, 2009. Due to the close proximity of the *neglectamajor* colony, there is a high likelihood that stray individuals briefly traveled into the study site. The host plant (*Cimicifuga racemosa*) of *C. neglectamajor* (Pavulaan & Wright, 2001) was not present on the summit.



***Celastrina lucia*.** Fig. 3: ♂ (d), 4/14/2010, Old Knob, Gore, Frederick Co., VA. Fig. 9: ♀ (d), 4/6/2010, Old Knob, Gore, Frederick Co., VA. Fig. 15: typical spotted form ♂ (v), 4/6/2010, Old Knob, Gore, Frederick Co., VA. Fig. 6: lab-reared false second-generation “summer” form ♂ (d), ex-ova, em: 6/6/2011, Old Knob, Gore, Frederick Co., VA. Fig. 12: lab-reared false second-generation “summer” form ♀ (d), ex-ova, em: 6/6/2011, Old Knob, Gore, Frederick Co., VA. Fig. 18: lab-reared false second-generation “summer” form ♂ (v), ex-ova, em: 6/6/2011, Old Knob, Gore, Frederick Co., VA. Fig. 21: ♂ (d), 4/11/2010, George Thompson WMA, Markam, Fauquier Co., VA. Fig. 22: ♀ (d), 5/14/1987, Tanners Ridge (part of Blue Ridge), near Stanley, Page Co., VA. Fig. 24: f. *marginata* ♀ (v), 4/6/2010, Old Knob, Gore, Frederick Co., VA. Fig. 25: f. *lucia* ♂ (v), 4/18/2009, Old Knob, Gore, Frederick Co., VA. Fig. 26: f. *lucia* ♀ (v), 5/3/2014, Great North Mountain, near Hayfield, Frederick Co., VA. ***Celastrina ladon*.** Fig. 4: ♂ (d), 4/23/2007, Old Knob, Gore, Frederick Co., VA. Fig. 10: ♀ (d), 4/23/2007, Old Knob, Gore, Frederick Co., VA. Fig. 16: ♂ (v), 4/23/2007, Old Knob, Gore, Frederick Co., VA. Fig. 7: lab-reared false second-generation “summer” form ♂ (d), ex-ova, em: 5/27/2008, Old Knob, Gore, Frederick Co., VA. Fig. 13: lab-reared false second-generation “summer” form ♀ (d), ex-ova, em: 5/26/2008, Old Knob, Gore, Frederick Co., VA. Fig. 19: lab-reared false second-generation “summer” form ♂ (v), ex-ova, em: 5/27/2008, Old Knob, Gore, Frederick Co., VA. Fig. 23: margined form ♂ (v), 4/23/2007, Old Knob, Gore, Frederick Co., VA. ***Celastrina neglecta*.** Fig. 5: spring form ♂ (d), 4/6/2010, Old Knob, Gore, Frederick Co., VA. Fig. 11: spring form ♀ (d), 4/6/2010, Old Knob, Gore, Frederick Co., VA. Fig. 17: spring form ♂ (v), 4/6/2010, Old Knob, Gore, Frederick Co., VA. Fig. 8: lab-reared summer form ♂ (d), ex-ova, em: 5/20/2010, Old Knob, Gore, Frederick Co., VA. Fig. 14: lab-reared summer form ♀ (d), ex-ova, em: 5/27/2010, Old Knob, Gore, Frederick Co., VA. Fig. 20: lab-reared summer form ♂ (v), ex-ova, em: 5/20/2010, Old Knob, Gore, Frederick Co., VA. Dorsal = (d), Ventral = (v).

## COMPARISON OF *CELASTRINA* TAXA

A comparison of the three taxa including the summer form of *C. neglecta* is presented here. All three sympatric species display a similar phenotype to the naked eye during their early spring flight periods. Only *C. ladon* males are easy to distinguish from *C. lucia* and spring form *C. neglecta*.

***Celastrina ladon*.** Adults (Figs. 4, 10) at the study location are typically of the spotted ventral hindwing phenotype (Fig. 16), showing no tendency to develop darkened ventral hindwing margins or dark ventral hindwing discal patches, which are more frequent in the northern portions of the species' range. The spotted form is referred to as form "*violacea*" (W.H. Edwards, 1866), which is technically a species-level junior synonym of the name *ladon*. One individual of the dark-margined form [form "*marginata*" of authors] was collected here (Fig. 23). Males of *C. ladon* are easily distinguished from all other blue *Celastrina* species by their unique male wing scale structure (Fig. 2). Adults of *C. ladon* tend to be slightly more violet-blue in color than either *C. lucia* or *C. neglecta*, thus the name *violacea*.

*C. ladon* is univoltine throughout its range. In lab rearing, an artificial summer phenotype can be produced (Figs. 7, 13, 19), which bears the unique *ladon* male dorsal wing scale structure and has only a superficial resemblance to the natural summer form of *C. neglecta* (which does not bear the unique male dorsal wing scale structure). No adults resembling the lab-reared false summer form of *C. ladon* have ever been found at the study site.

***Celastrina lucia*.** Adults (Figs. 3, 9) at the study location are generally of the spotted ventral hindwing phenotype (Fig. 15), with some individuals displaying darkened ventral hindwing margins [described as form *marginata* (W. H. Edwards, 1883)] or rarely the dark ventral hindwing discal patch (form "*lucia*"), which is characteristic of *C. lucia* in northern latitudes. The ventrally-spotted form has been incorrectly referred to as form "*violacea*" of authors, however the name *violacea* technically applies only to the spotted form of *C. ladon*. Two interesting individuals are figured from here, one is form "*marginata*" (Fig. 24) and the other is form "*lucia*" (Fig. 25). Males of *C. lucia* are easily distinguished from males of *C. ladon* which bear the unique wing scale structure (Fig. 2). Adults of *C. lucia* tend to be noticeably more metallic blue in color than *C. ladon* when fresh, but have a peculiar tendency to become more violet when flight-worn with age. Males of *C. lucia* can be distinguished from males of spring form *C. neglecta* by the lack of very distinct white wing veins along the leading forward edge of the dorsal side of the forewing, which are characteristic of spring form *C. neglecta*. Also individuals of spring form *C. neglecta* bear clear hindwing fringes, while in *C. lucia* they are either darkened or checkered black and white. Females are generally difficult to distinguish, as both *C. lucia* and *C. neglecta* females tend to be very similar in appearance, both being noticeably lighter blue than females of *C. ladon*. In spread series, *C. lucia* females from the Appalachian region are noticeably smaller than *C. neglecta* females and have narrower black outer margins on the dorsal forewing.

*C. lucia* is univoltine throughout its range, and is thus presumed to be univoltine at the study site. In the lab, an artificial summer phenotype can be produced (Figs. 6, 12, 18), which bears no resemblance to the natural summer form of *C. neglecta*. No naturally occurring individuals resembling the lab-reared false summer form have ever been found at the study site.

***Celastrina neglecta* spring form.** Adults (Figs. 5, 11) at the study site are typically of the distinctly-spotted ventral hindwing phenotype (Fig. 17), showing no tendency to darkened ventral hindwing margins or dark ventral hindwing discal patches. The ventrally-spotted form has traditionally been referred to as form "*violacea*" by authors, but the name *violacea* technically applies only to the ventrally-spotted form of *C. ladon*. Males of *C. neglecta* spring form are easily distinguished from males

of *C. ladon* which have the unique forewing scale structure (Fig. 2). However, in all other respects, they are extremely similar to *C. ladon* and very difficult to distinguish by ventral markings alone. Adults of both sexes of *C. neglecta* spring form tend to be bluer in color than *C. ladon*, but similar in color to *C. lucia*. Males of *C. neglecta* spring form can often be distinguished from sympatric males of *C. lucia* by the presence of distinct white veins along the leading edge of the dorsal forewing. This character state is useful when examining fresh individuals, but is not always reliable as veins become subdued with age. Also *C. neglecta* spring form individuals have clear white fringes on the hindwing edge. In *C. lucia* these fringes tend to be darkened or checkered and in *C. ladon* they also tend to be darkened, but may appear light in some individuals. Females are generally difficult to distinguish from *C. lucia*, but in general they are larger and have broader black outer margins on the dorsal forewing.

***Celastrina neglecta* summer form.** The summer form of *neglecta* is uniquely different from the three spring phenotypes, in that the venter is very white, and dark markings are reduced to mere dashes and dots (Fig. 20). On the dorsum, the males and females both display characteristic distribution of white insuffusion on the hindwings, arranged in rays between the wing veins (Figs. 8, 14). This phenotype has been produced in reared offspring of spring form females throughout the range of *neglecta*.

The summer form of *C. neglecta* was recorded during surveys conducted on the following dates: June 6, 2006 and May 27, 2010 (associated with mite galls on both dates); June 7 & 23, July 1, and August 29 in 2010.

#### ADDITIONAL NOTES ON *CELASTRINA LUCIA* IN VIRGINIA

In addition to the Old Knob study site, *C. lucia* has been confirmed from six additional sites in Virginia, totalling four counties (Fig. 28). It is interesting to note that all of these populations are closely-associated with *Prunus serotina* with the exception of the Great North Mountain population:

Great North Mountain, near Hayfield, Frederick County, VA. A visit to the top of this ridge on April 21, 2014 found a colony of *C. lucia* flying in an area of remnant Pitch Pine/Scrub Oak barren at 2300 ft. elevation. Most of the forest canopy now consists of various Oak species with an understory of Scrub Oak (*Quercus ilicifolia*) and Mountain Laurel (*Kalmia latifolia*). Interestingly, unlike the other Virginia *C. lucia* sites, *Prunus serotina* was not observed to be a primary component of the ridgetop forest. Rather Blueberries (*Vaccinium* sp.) were very common everywhere especially along the roadside edges and are suspected to be the host. Five males were collected and an additional 15 individuals were observed in the same area, presumably all *C. lucia*. During a return trip on April 24, 2014, six males were collected and an additional 12 individuals were observed. A final trip on May 3, 2014, following several days of damp rainy weather, only found one worn male and three fresh females were found. One of the females was form “*lucia*” with the distinctive ventral hindwing patch (Fig. 26).

Cacapon Mountain, north of Cross Junction, Frederick County, VA. A visit to the top of this ridge, literally within a few hundred feet of the very northern border of Virginia on May 3, 2014 produced a single male specimen of *C. lucia*. *C. lucia* occurs more commonly northward along the top of this same ridge on the West Virginia side of the border.

Lake Thompson area, lower east slope of Blue Mountain, George Thompson Wildlife Management Area, north of Markham, Fauquier County, VA. Few *C. lucia* adults have been documented at this location among thousands of spring-flying *Celastrina* individuals that were either collected, examined in-hand (net/release) or observed (resting only) at very close range. All *C. lucia* specimens have been collected toward the end of their flight period with most adults being faded from age, thus leading one to suspect they have flown in from some distance, likely from somewhere on Blue Mountain or along the Blue Ridge. All specimens were collected along woodland trails at the fairly low elevations of 970-

1200 ft. Interestingly, no *C. lucia* specimens have ever been collected on top of Blue Mountain. These specimens are based on adult phenotype (Fig. 21) and are a close match to *C. lucia* found to the north in central Pennsylvania or on the Allegheny Plateau in West Virginia. *Prunus serotina* is present in the woodlands here and is the only host tree on which ovipositions were observed. Blueberries (*Vaccinium* sp.) are uncommon in the dense mixed Appalachian woodland of Blue Mountain; thus they are likely not utilized. Collection dates: April 10, 1999; April 29, 2000; April 13, 2002; April 27 & May 3, 2003; April 17, 2004; April 11, 2005; April 13 & 14, 2006; May 17, 2008; April 17, 2009; April 11 & 23, 2010.

Tanners Ridge (part of the Blue Ridge), near Big Meadows Recreational Area, Shenandoah National Park, Page County, VA. A single female specimen of form "*marginata*" was collected at this location [under permit], just off Skyline Drive at an elevation of 3387 ft. In general, *Celastrina* are noticeably scarce along the top of the Blue Ridge, except in late May and early June when *C. neglectamajor* flies. *Prunus serotina* is common on the crest of the Blue Ridge and several sightings of unidentified *Celastrina* adults around *P. serotina* suggest this might be the primary host for *C. lucia* or other *Celastrina* species on the Blue Ridge. Blueberries (*Vaccinium* sp.) are also very common in open places at higher elevations, but apparently not utilized by *Celastrina*. Over several years (1985-2008), I have carefully scanned forest clearings, roadside edges and a power line cut in the forest around the Big Meadow, but have seen no *Celastrina* associated with *Vaccinium*. Collection date: May 5, 2001.

Tanners Ridge (part of the Blue Ridge), along Route 682, near Stanley, Page County, VA. Early in this study I explored a location on the west slope of the Blue Ridge just outside the National Park, where one could collect fairly high in elevation (up to 2884 ft.). Several female *Celastrina* were collected along this road in May, 1987, which for several years I kept in a papered series of *C. ladon* from the location. Only upon examination of these specimens, which were mounted for this report, did I discover three specimens with features distinctly those of *C. lucia*, i.e. very light blue dorsal color with narrow black dorsal forewing margins (Fig. 22). Collection dates: May 14 & 16, 1987.

Shenandoah Mountain, west of Briery Branch, Rockingham County, VA. Several individuals were collected along the upper portion of State Road 924 (at elevations of 2062 ft.-3467 ft.) and also along Forest Road 85 (approximately 3845 ft.) going north along the ridge top, which delineates the Virginia-West Virginia border. A female captured on April 29, 2001 was confined with *Prunus serotina* flower buds in a rearing container; eggs laid in confinement subsequently produced several "false summer brood" adults on June 1, 2001. These individuals resembled lab-produced false brood adults from *C. lucia* populations in West Virginia, Pennsylvania and New Jersey. Collection dates: April 29, 2001; May 4 & 6, 2006.

## HISTORICAL RECORD

In **The Butterflies of Virginia**, under *Cyaniris argiolus pseudargiolus*, Clark & Clark (1951) wrote: "We have taken the form *lucia* only in western Frederick County in Virginia." It is presumed that the authors were referring to the ventral hindwing dark-patched form. However, since the patched form has been recorded in all *Celastrina* species in the eastern region of the United States, it is not known whether the authors collected *C. lucia*, *C. ladon* or *C. neglecta*. Assuming they did have a specimen of *C. lucia* in hand, that would be the first record of *C. lucia* in Virginia. The present study would corroborate the older Frederick County record.

## A NOTE ON HOSTPLANT ACCEPTANCE BY *CELASTRINA NEGLECTA*

As an extension of this study, an effort was attempted to corroborate previous host intolerance findings, specifically that spring *Celastrina neglecta* females do not oviposit on and neonate *C. neglecta* larvae do not utilize *Cornus florida* (Flowering Dogwood), a common *C. ladon* host. On April 21, 2014, a survey of the Old Knob study site found no *C. lucia*, but two females of *C. ladon* and one female of *C. neglecta* were captured. These females were separately confined in containers with cuttings of *C. florida* flower buds. The two *C. ladon* females readily oviposited on *C. florida* within the first day, whereas the *C. neglecta* female refused to oviposit on the same plant under identical conditions. On the third day of confinement, cuttings of *Viburnum prunifolium* (a documented *C. neglecta* host in this region) were added to the container containing the female *C. neglecta*. She immediately oviposited approximately 50 eggs on *V. prunifolium* within 24 hours, while still ignoring *C. florida*. Subsequently, individual flower buds containing *C. neglecta* eggs were removed and strategically placed onto cuttings of *C. florida* flower buds so that newly-hatched larvae would have the direct choice of feeding on *Cornus florida*. Newly hatched larvae were also transferred from the *V. prunifolium* buds to *C. florida*, thus leaving them no choice but to feed on *C. florida*. By May 3, 2014, most of the *C. neglecta* larvae had hatched and ignored the *C. florida*, subsequently starving and leaving only shriveled corpses on the container sides. A few remaining larvae attempted to feed on *C. florida*, not on the flower buds but rather boring into the base of the underside of the white bracts or into the basal portion of the flower buds. By May 8, 2014, all *C. neglecta* larvae had died. A previous attempt in 2013 at getting *C. neglecta* larvae to accept *C. florida* similarly failed, with all larvae preferring to starve rather than to eat *C. florida*. An earlier 2012 observation of ovipositional behavior by captive females also found that *C. neglecta* females refused to lay eggs on *C. florida*. This finding demonstrates that *Cornus florida* is not acceptable to *C. neglecta*, and the plant likely has toxic properties to certain *Celastrina* species.

### CONCLUSION

Based on observations made during this study and reported here, the following statements are presented as clear succinct conclusions:

- (1) The three taxonomic entities *Celastrina ladon*, *C. lucia* and *C. neglecta* behave as distinct full species in sympatry in northern Virginia.**
- (2) The following species arrangement is hereby confirmed:**

*Celastrina ladon* (Cramer, 1780)

*Celastrina lucia* (W. Kirby, 1837)

*Celastrina neglecta* (W. H. Edwards, 1862)

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### LITERATURE CITED

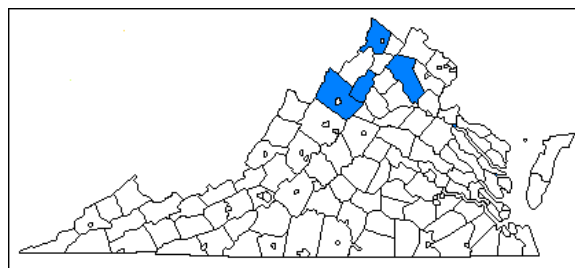
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**Fig. 27:** Ant mounds and young *Prunus serotina* trees on summit of Old Knob (elev. 1300 ft.), near Gore, VA. Photo taken on April 6, 2010 shows very early spring vegetative progression, with only *Prunus* showing flower bud development, necessary for oviposition activity by *Celastrina*.



**Fig. 28:** Map showing known county distribution of *Celastrina lucia* in Virginia, as of June 16, 2014.

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