

STATUS OF JUNIPER HAIRSTREAK (*Callophrys gryneus* HÜBNER) POPULATIONS IN SOUTHWESTERN ONTARIO

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Abstract

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Populations of Juniper Hairstreak (*Callophrys gryneus* [Hübner]) at Point Pelee National Park (PPNP) and Pelee Island have declined over time and are at risk of extirpation. We monitored them in the Red Cedar Savannas of PPNP from late May–end August and on Pelee Island in early June. Two flights of adults occurred (maximum numbers observed daily in parentheses) from 29 May–12 June (4 at PPNP; 11 at Pelee Island) and 19 July–12 August (10 at PPNP) in and near intermediate-sized (mostly 5–7 m tall) junipers among the upper dunes of a small portion of the point's western shore and in one clearing on Pelee Island. The primary nectar resource used by the first brood was *Ptelea trifoliata* L.; the second brood nectared infrequently on several floral species.

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Introduction

The Juniper or Olive Hairstreak (*Callophrys (Mitoura) gryneus gryneus* (Hübner [1819])) (hereafter “hairstreak”) occurs in eastern Canada along the Frontenac Axis/Napanee Plain of eastern Ontario; in a single site on the Gatineau escarpment in Quebec; and in the western Lake Erie Basin (Layberry et al. 1998). First discovered in southwestern Ontario at Point Pelee in 1882 (Saunders 1885), the population there has declined over time and nearly disappeared between 1976–1984 (Layberry et al. 1998; Wormington 1999). In 1998, their numbers increased dramatically, with a record daily maximum of 139 individuals observed (Wormington 1999), but they have subsequently decreased markedly (Wormington, pers. comm.). On Pelee Island, the species was reported to be extirpated (Layberry et al. 1998), but a modest population was subsequently rediscovered (Hanks and Hess 1992). For the other islands of western Lake Erie, there is a published record of only one individual (Kelleys Island: Nault et al. 1989). The next closest populations are in southern Ohio and western Pennsylvania. Adults occur in two broods each summer, the first beginning in late May and the second in early to mid-July (Wormington, 1998).

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Except when nectaring, Juniper Hairstreaks are almost always observed perched or ovipositing on their larval host plant, the Eastern Red Cedar (*Juniperus virginiana* L.) (henceforth 'cedar'; Douglas and Douglas 2005). Males maintain territories on cedars but are sedentary, making them difficult to detect without disturbing the trees (Iftner et al. 1992; Douglas and Douglas 2005). Although most often reported in open stands of cedar 5–8 m tall (Iftner et al. 1992), *C. gryneus*, when abundant, can also be found on lone cedars (Glassberg, 1999). The species has been reported to have disappeared from some sites that have become overgrown or in which cedars have grown too large (Layberry et al. 1998).

Point Pelee National Park (PPNP) is located on the tip of a narrow peninsula that extends southward into Lake Erie and contains Lake Erie Sand Spit Savannah habitat that is exceptionally rare in Canada, existing only at PPNP, Rondeau Provincial Park, Long Point, and Pelee Island (Dougan and Associates 2006). Numerous rare plant and animal species are isolated on Point Pelee by water on two sides and by extensive farmland to the north (McLachlan and Bazely 2002). In PPNP, *C. gryneus* has historically been found in the savannah habitat that exists along the point's western shore (Layberry and Jones 2008; O'Neill, pers. comm.; Wormington, pers. comm.; C. Jones, pers. comm.). Its scarcity at Point Pelee and on the Lake Erie Islands coupled with its isolation from other populations renders it potentially at risk. PPNP personnel are considering the use of an ecosystem-based approach to conserve *C. gryneus* and the rare habitat in which it lives (Dougan and Associates 2007). A few patches of upper beach have already been cleared to improve habitat for *C. gryneus* and several other endangered species. The Nature Conservancy of Canada has begun habitat restoration on Pelee Island, including the planting of cedars, with the stated goal of increasing the *C. gryneus* population there (Nature Conservancy of Canada 2008). Because knowledge of the population size of *C. gryneus* and its habitat requirements is integral to future management initiatives, we monitored and observed Juniper Hairstreaks in the cedar savannah of PPNP from late May–end August, and on Pelee Island in early June, 2011.

Methods

Because *C. gryneus* is seldom observed far from host plants, PPNP reports (Dougan and Associates 2007) and staff were consulted in order to determine the distribution of cedars within the park. We focused on the three areas where cedars are abundant and the habitat may be suitable for this species: clearings along the entire West Beach Footpath, the small garden area north of the PPNP Visitors' Centre, and clearings at the north end of the DeLaurier Homestead Trail. We performed surveys from 11:00–16:00h on days when the temperature was $\geq 17^{\circ}$ C and there was no precipitation, climatic criteria consistent with published butterfly survey techniques (Pollard 1977; Wikstrom et al. 2009).

We conducted surveys every few days, from 25 May–26 June, 2011, for the first brood, and from 19 July–19 August, 2011, for the second brood. We stopped surveying only after failing to record hairstreaks on three consecutive surveys. Initially, in order to limit disturbance to the sensitive habitat, we shook all cedars (as described below) within 2.5 m of established trails. Upon encountering the first hairstreak of each flight period, we conducted more intensive surveys both on- and off-trails, during which we disturbed every

cedar tree by grasping and moving small trees or tapping and shaking taller trees with a stick at a height of 3.75 m. All flowers within clearings were inspected as well. This was performed along the West Beach Trail south of the PPNP Visitors' Centre (29, 30 May; 2, 8, 9, 12, 15, 18, 20, 24, 25 June; 9, 19, 22, 23, 31 July; 1, 4, 6, 12, 17, 18, 19 Aug.); West Beach Trail north of the PPNP Visitor's Centre (29 May; 15, 17, 25, 26 June; 1, 3, 5, 15 Aug.); in front of the PPNP Visitor's Centre (1, 8, 9, 20, 25 June; 9, 23 July; 4, 17, 19 Aug.); and along the DeLaurier Trail (1, 8, 14, 22 June; 3, 11 Aug.). Despite reports that the hairstreaks prefer small to medium-sized cedars (Layberry et al. 1998), we inspected cedars of all sizes to prevent bias in our survey.

For each hairstreak observed, we recorded GPS coordinates, habitat characteristics (cedar height, nearby flowering plant species, and estimates of vegetation density), and butterfly behaviour (flight height and pattern, perching, feeding behaviour, and oviposition).

Between 4–6 June, 2011, two observers surveyed at least once all sites on Pelee Island with sizeable Red Cedar populations. Five sites suggested to us by John Ambrose (pers. comm.) included the locations where hairstreaks have been seen in recent history (C. Jones, pers. comm.). Their coordinates are: N41.750° W82.647°, N41.757° W82.677°, N41.752° W82.631°, N41.809° W82.644° and N41.761° W82.645°.

Results

At PPNP, from 29 May–12 June, we had 9 sightings of hairstreaks of the first brood, with a daily maximum of 4 individuals recorded on 12 June. Individuals of the second brood were observed from 19 July–12 August (45 individuals; maximum daily count of 10 recorded on 4 August). All sightings were along the West Beach Footpath, from the trailhead west of the PPNP Visitors' Centre south to the end of the Tip Road. We observed no hairstreaks elsewhere, although one was reported outside the PPNP Visitors' Centre on 5 Aug. by park naturalist J. Brownlie. The sites occupied by hairstreaks were generally open sandy areas with grasses up to 0.5 m high, numerous cedars and many Common Hoptrees (*Ptelea trifoliata* L.). These clearings were either sheltered from the beach by vegetation or the hairstreaks were ≥ 30 m from Lake Erie.

Five hairstreaks of the first brood were observed feeding on the blossoms of Common Hoptree. They generally walked along branches from one inflorescence to another rather than flying between them. Other flowering plant species at this time were scarce, the most common being Hoary Puccoon (*Lithospermum canescens* (Michx.) Lehm.). The remaining 4 hairstreaks were perched 2–6 m above ground on mid-sized cedars (6–7.5 m tall). Most were sedentary until disturbed, at which point they made short flights to nearby trees or back to the original branch. Flights were weak and erratic, with many directional changes.

Forty-two of the 45 hairstreaks of the second brood that we observed were on cedars. Most were perched 5–7 m above the ground. Flight behavior was consistent with hairstreaks of the first brood. Two females were observed ovipositing at a height of ~3 m on 6–7.5 m tall cedars. Twenty-five observations were in a single clearing (Figure 1). Only three second-brood individuals were observed feeding, all on non-native species: Bouncing Bet



FIGURE 1. Clearing typical of habitat along West Beach Footpath where Juniper Hairstreaks were found. This particular clearing was the location of 25 (56%) of all second brood sightings.

(*Saponaria officinalis* L.), Queen Anne's Lace (*Daucus carota* L.), and White Sweet Clover (*Melilotus alba* Medik.). Despite extending its proboscis, the individual on *Saponaria* may not have successfully fed due to the long corolla length of the flower. Spotted Knapweed (*Centaurea maculosa* Lam.), a very common invasive species, was in bloom close to all observed hairstreaks, but we saw none feeding upon it. Other plants in flower nearby were Common Mullein (*Verbascum thapsus* L.), Rough-Fruited Cinquefoil (*Potentilla recta* L.), Staghorn Sumac (*Rhus typhina* L.), Wild Bergamot (*Monarda fistulosa* L.), and the endangered Eastern Prickly Pear Cactus (*Opuntia humifusa* (Raf.) Raf.).

During the Pelee Island surveys on 4–6 June, we encountered 9, 10, and 11 hairstreaks on 4, 5, and 6 June, respectively. All were sighted in a single sheltered clearing with scattered cedars in a forested part of the Richard and Beryl Ivey Conservation Area (N 41.757 W 082.677). As at PPNP, these hairstreaks were predominantly on Common Hoptree flowers, but one was observed feeding on Raspberry (*Rubus idaeus* L.) flowers. At times up to three were observed feeding on a single Common Hoptree inflorescence (Figure 2). Other flowers nearby included Hairy Beardtongue (*Penstemon hirsutus* L.) and Eastern Red Columbine (*Aquilegia canadensis* L.).



FIGURE 2. Two Juniper Hairstreaks feeding on Common Hoptree flowers.

Discussion

The *C. gryneus* populations we observed at PPNP and on Pelee Island were small. We did observe more individuals than have been reported in recent years (Layberry and Jones, 2009; C. Jones, pers. comm.); this may reflect in part our intensive surveying methods. The first brood of hairstreaks at PPNP is reported to be usually larger than the second (Wormington, pers. comm.) but this was not the case in 2011. The late spring and frequent rain in June may have negatively affected the size of the first brood or positively affected the numbers in the second brood. From our observations, Common Hoptree flowers were the primary nectar source for the first brood of *C. gryneus* both at PPNP and on Pelee Island, either by preference or from lack of suitable alternatives.

The absence of hairstreaks along the West Beach Trail north of the Visitors' Centre was likely due to the overgrowth of trees and shrubs (Figure 3), causing extensive shade and a low abundance of nectar sources (e.g., Common Hoptrees were absent). Sections of this path that were not overgrown were often quite exposed and beach-like, with no shelter from the lake and with fewer, often large (≥ 12 m tall) cedars that were likely too large to be suitable for oviposition (Layberry et al. 1998).



FIGURE 3. Overgrown Red Cedar Savannah typical of West Beach Footpath north of the Point Pelee Visitors' Centre, with a Red Cedar tree visible in the center of the photo. No Juniper Hairstreaks were observed in this habitat.

The clearings at the northern portion of DeLaurier Homestead Trail appeared very similar to sites where we observed hairstreaks except that Common Hoptrees were scarce. The absence of a suitable nectar source for the first brood may have contributed to the hairstreaks' absence from this otherwise apparently suitable habitat. Individuals of the second brood were infrequently observed feeding on only three species of flowers despite many other species being present. The lack of hairstreaks feeding on Spotted Knapweed was striking, particularly since Alan Wormington (pers. comm.) has observed *C. gryneus* nectaring on it in other years.

Unfortunately, we could not mark the hairstreaks due to the fragility of these small butterflies and concerns that we might harm them and further reduce their populations. However, because of our intensive search method for hairstreaks both on cedars and on flowers, their sedentary nature, and their tendency to return to the same site after disturbance, we are confident that we observed a high proportion of the hairstreaks that were present at both Point Pelee and Pelee Island. It is therefore likely that the populations at both sites consisted of less than 100 individuals. This is well below the effective population size that is generally considered critical for a population to maintain sufficient genetic variation for adaptive evolution to occur (Lynch and Lande 1998). Therefore, the efforts to open up overgrown cedar stands, as have already begun by the staff at PPNP and the NCC, and increasing the number of appropriate adult nectar sources would seem to be suitable first steps to hairstreak population recovery at PPNP and Pelee Island. The status of the Juniper Hairstreak on the other Lake Erie Islands is unknown: the only reports have been of three

individuals from Kelleys Island, in 1988 (Nault et al.1989), ~2000 (B. Coleman, pers. comm.), and as recently as 2010 (D. Horn, pers. comm).

The geographic isolation of the Lake Erie Basin metapopulation from other populations of Juniper Hairstreaks prompts questions regarding its genetic distinctness. It would be interesting to know the degree of genetic dissimilarity with *C. gryneus* from the three closest populations: Napanee, Ontario (~500 km to the east), southern Ohio/west-central Indiana (~260-400 km to the south and southwest), and western Pennsylvania (~300 km to the southeast). This species should be surveyed in other Red Cedar Savannah habitats at Rondeau Provincial Park, Long Point, and the Lake Erie Islands of Ohio.

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