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# Spicebush Swallowtail back in High Park, Toronto: more evidence of the effect of climate change?

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This large butterfly with a wingspan of 70-90 mm is a favourite. It has many unusual characteristics, but here we are concerned only with its occurrence in Toronto's High Park. Maps of the past distribution of Spicebush Swallowtail (*Pterourus troilus* L. 1758, previously *Papilio troilus*) in Ontario (e.g. Holmes *et al.* 1991: 59; Layberry *et al.* 1998: 90; Hall *et al.* 2014), indicate the northeastern limit to be Toronto in the approximate position of High Park. There is evidence for a large population in High Park in the late 1800s, then a period of absence and occasional presence over approximately 100 years, followed by a period of much stronger presence after the late 1990s, which became a continuous presence after 2006. Here we review the evidence for that trend and consider it with respect to a climate warming explanation.



Figure 1: Spicebush Swallowtail (male) in High Park. Photo by Bob Yukich on 3 Aug 2020.

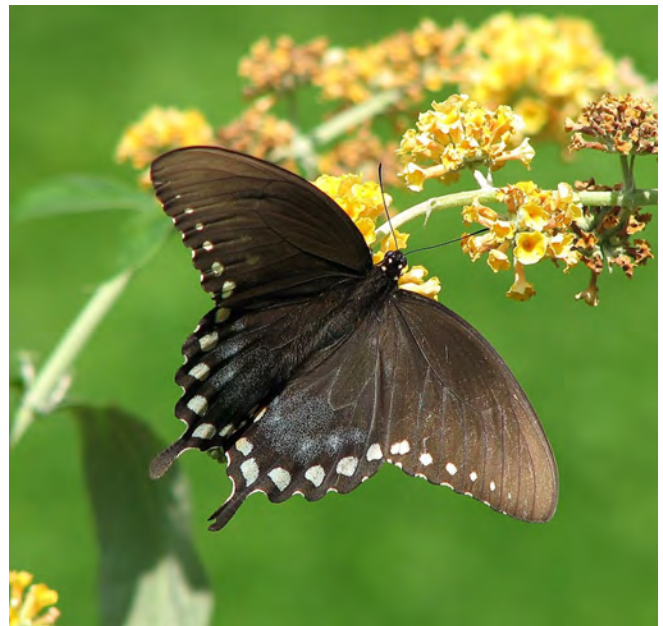


Figure 2: Spicebush Swallowtail (female) in High Park. Photo by Bob Yukich on 11 Aug 2008.

### Older literature reports

The first reference of interest is that of Bethune (1894: 41). He noted that Spicebush Swallowtail was “confined to the western peninsula of Ontario, where it is common”. He noted 8 localities but did not include Toronto. The oldest record for Toronto may be that of Gibson (1910) repeated by Gibson in the list published by Walker (1913: 296, 351). Gibson (1910: 42) reported that Spicebush Swallowtail was “generally common at Toronto”, noting it as “plentiful” in 1896, and “collected in fair numbers in 1898”. He also noted that he “found it chiefly in High Park”. Gibson also reported some other rarely seen southern species in High Park in 1896 including Zebra Swallowtail (*Eurytides marcellus* (as *Papilio ajax*)) and Southern Dogface (*Zerene cesonia*). Rare southern species were also recorded in High Park during the start of the re-occupation of High Park by Spicebush Swallowtail approximately 100 years later (see below).

Gibson's reports may be vouchered by poorly labelled (not including the location) specimens at the University of Guelph (U of G) and the Royal Ontario Museum (ROM). He collected Karner Blue (*Plebejus samuelis*), presumably at its only Toronto locality which was at High Park, and may have found Spicebush Swallowtail there on the same days (specimen of *P. samuelis* at U of G).

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## Museum records

Early specimens of Spicebush Swallowtail were collected in Toronto in 1903, 1904, 1921, and 1925. They are all from High Park, but in the Global Biodiversity Information Facility (GBIF) database, no collector is given. We (PC) recorded these specimens in 1968 from the ROM collection, but there was also a 1920 collection at that time. This makes at least five different years between 1893 and 1925 that Spicebush Swallowtail was taken in High Park. Over that same period, the Karner Blue (*Plebejus samuelis*) was taken on 13 different years. The Karner Blue was last seen at High Park in 1926 (Holmes *et al.* 1991: 105), and last seen in Ontario in 1991. The limited occurrence of Spicebush Swallowtail in High Park collections compared to Karner Blue suggests that the Spicebush Swallowtail may not have been resident, as was the Karner Blue.

Unfortunately, some of the early specimen record databases (GBIF, ROM, etc.) are incomplete or corrupted (e.g. Cavasin & Macnaughton 2014, Macnaughton 2015). A number of collections in the databases with Toronto downtown coordinates may in fact be from High Park, which was either not on the collection label or not copied into the database. We can only go with what we have, which suggests that Spicebush Swallowtail was collected less often in High Park in the days of collecting between 1900 and 1921.

## Recorded observations and some additional literature reports

It is quite a jump but, in 1969, the Toronto Entomologists' Association began recording the observations of butterflies made by their members in its annual summary. The Lepidopterists' Society also had a yearly summary of butterfly observations that started in 1966. In 2012, the eButterfly platform commenced on the Internet, starting with butterfly observations from Canada, and has since gone global. After 2017, following collaboration with the California Academy of Natural Sciences and the National Geographic Society, the iNaturalist platform grew rapidly, including butterfly observations. These were additional sources to determine the distribution (and abundance) of butterflies. Annual sightings from these two online platforms are now included in the TEA's Ontario Butterfly Atlas.

The most important of these for High Park records may have been the local TEA summary. Here lepidoptera were reported in High Park for 16 different years between (and including) 1969 and 1998. For that period of 31 years, Spicebush Swallowtail was not reported from High Park, but for all years it was reported from widespread locations in the Carolinian Zone of Ontario to the south.

Spicebush Swallowtail was reported from 3 locations in Toronto in 1999 and from one location in the city in 2000 (Hanks 2000: 33, 2001:22). On August 5, 1999, a Spicebush Swallowtail was seen in High Park for the first time since Bob Yukich began observing butterflies there in 1994. Another was seen on August 8, a male that was distinctively damaged with its left tail missing. On the same day, another butterfly photographer who regularly visited the park noted that he had seen one or two fresh male Spicebush Swallowtails that day (August 8). His sightings were not reported to TEA. These fresh specimens may have emerged in High Park following the development of eggs from a gravid female that arrived earlier in the year. 1999 was an exceptional year for the occurrence of southern immigrant butterflies in Toronto. Little Yellows (*Eurema lisa*), Fiery Skippers (*Hylephila phyleus*) and Gray Hairstreaks (*Strymon melinus*) appeared in early July – and the latter two species bred. They were followed by Variegated Fritillaries (*Euptoieta claudia*) which may have bred, and two Funeral Duskywings (*Erynnis funeralis*), one apparently defending territory at Lambton Prairie.

A few literature reports relate to the limited number of observations between 1969 and 1999. Prideaux (1982: 23) for example, did not find Spicebush Swallowtail in High Park in 1980 and 1981 when he recorded 22 other species of butterflies there. It is not surprising that Harrison and Jones (1997: 9) gave Spicebush Swallowtail the status of “a very uncommon migrant” in the Toronto area, given the scarcity of records. Harrison (2007) gave it

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the status of “a very uncommon and partial migrant starting temporary or permanent colonies”, which is a better fit for the current situation.

After 2003 Spicebush Swallowtail has been recorded every consecutive year in High Park (Figure 2), with the highest numbers in 2013 and 2014. Since 2002, all but 12 of 204 Toronto records of *P. troilus* have been from High Park. The number of 204 is likely an underestimate because some records of “present = +” counted as “one” may be for more than one, and some indicated as “one+” counted as “two” may have been more than two.

## A resident population?

Larvae feeding on Sassafras (*Sassafras albidum*) in High Park were recorded in 2013 and 2014, and TEA member Chao Fang has photographed the life stages of Spicebush Swallowtail in High Park. This does not mean that they overwinter successfully, but it is at least an indication that they could have become resident. More convincing evidence for residency is the fact that several “fresh” individuals have been reported at the start of both the early summer and mid-summer flights. Fresh specimens are more likely to have emerged recently and locally, rather than travelled from a distant location. The fact that 10 were observed at High Park in one day (23 August 2013) also suggests a resident population, as does the fact that Spicebush Swallowtail has been seen regularly in High Park, but in few other places in Toronto. High Park may now be an isolated outlier to a more continuous range extending to the south. Hess (1987: 20) suggested that Spicebush Swallowtail occurs in very local colonies in southern Huron County north of its traditional northern limit in the Pinery Park area, supporting the idea that High Park may also be a disjunct occurrence.

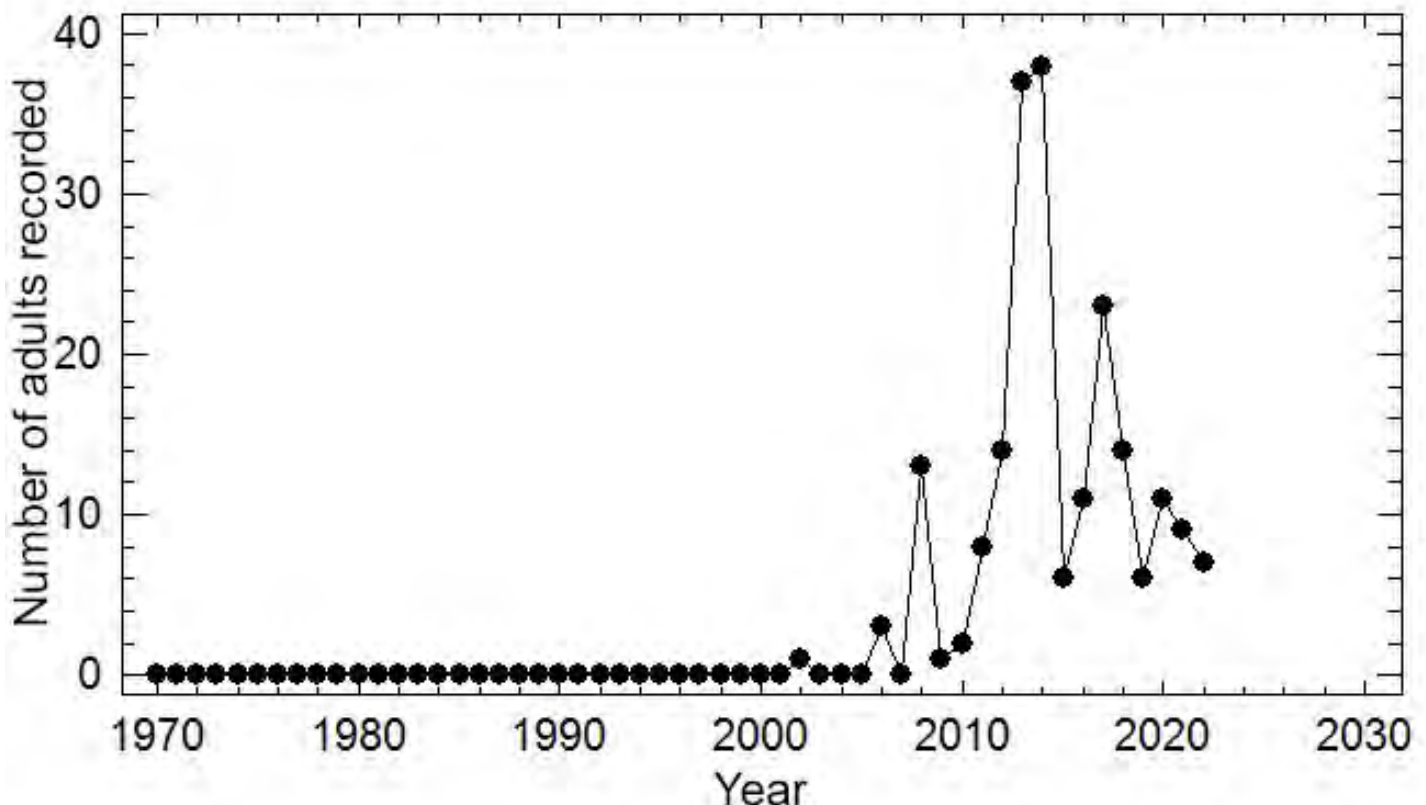


Figure 2. The numbers of Spicebush Swallowtails (*Pterourus troilus*) observed in High Park based on records in TEA seasonal summaries from 1969 onwards, in Lepidopterists' Society seasonal summaries, and more recently in eButterfly and iNaturalist. Many visits to High Park after 1969 did not reveal Spicebush Swallowtail. A resident population may have been established in High Park in 1999, a big year for southern migrant butterflies (see text). Spicebush Swallowtail was reported regularly in High Park after 2005.

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## Is the return due to climate change?

### (1) *Range shifts and local status changes*

Many past range shifts and local status changes in butterflies have been associated with new habitat and foodplant opportunities. Is the current increase in Spicebush Swallowtail in High Park a result of a recent increase in availability of its foodplant? In High Park, the only available larval foodplant for this species is Sassafras. This tree was recorded in High Park, and the adjacent Humber Plains as early as the 1890s, and continuously since that time (personal observation, Varga 2008: 12, Metsger 2020), and extensive oak savannah has long been present. Thus, the recent abundance of Spicebush Swallowtails in High Park is not explained by a recent invasion of a foodplant nor by the sudden availability of habitat.

### (2) *Correlation suggests climate change*

Interestingly it was during a more rapidly warming period in the late 1800s that Giant Swallowtail (*Heraclides cresphontes*) also expanded its range in Ontario (and elsewhere), but then more or less stabilized its northern limit until 1998 when warming again proceeded more rapidly, accompanied by rapid range expansion and continuous presence (Catling 2021, 2024). This correlation of greater abundance of Spicebush Swallowtail in High Park during the same more rapidly warming periods in the late 1890s and after the late 1990s with continuously gradual warming between suggests that climate warming may be a major factor in the changes in its status as well. The warming climate of Toronto is illustrated in Catling (2024). There are few examples of the effect of climate change on a butterfly species in Canada that come from a single relatively small and urban site like High Park.

## Past and future

Thinking about the status of the Spicebush Swallowtail raises a number of related questions discussed below.

### (1) *High Park history – recent conservation successes*

There has been a history of serious depletion of insect diversity in High Park over the past 100 years. This included many examples such as the destruction of important habitat on the southeast side of Grenadier Pond in the 1920s which eliminated the Karner Blue, the massive poison ivy control programs in the 1960s where all vegetation was sprayed, nearly destroying an ecosystem and leaving only a dense turf of introduced grass, and the dredging of rich shoreline swamps.

In more recent decades the ecological significance of High Park has become recognized, with major portions being granted protected status at the provincial and municipal level and more enlightened vegetation management strategies being implemented. Management of protected terrestrial areas has focused primarily on vegetation, although some input has been provided by ecologists and entomologists in planning activities, such as designating insect refugia in sensitive areas when planning controlled burns.

### (2) *Could more be done in High Park?*

Some believe that insect diversity has not been sufficiently prioritized in management planning despite the fact that High Park offers some outstanding opportunities including an extensive savannah habitat, appropriate soil types, and a local population including volunteers who are naturalists and members of an entomology club. All one has to do is see some of the restoration in the degraded savannahs of New York State to be convinced of what could be done in High Park (Catling *et al.* 2023). Varga (1980: 27) noted that: “Lupine numbers have greatly increased over the past 20 years. If they continue to grow it may be possible to re-introduce the endangered Karner Blue”. This butterfly was established as the flagship

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species for the High Park Oak Woodlands and Savannah restoration launched in the 1990s. Restoration of an endangered species would be a very welcome achievement for a designated urban Area of Natural and Scientific Interest (ANSI).

A series of books about Toronto biodiversity (butterflies – City of Toronto 2011) reflected an interest in biodiversity, conservation, and forward thinking. Conservation and restoration actions, as well as books are needed, and High Park is a place where this has happened. Toronto has a biodiversity gem in High Park that could be further developed in such a way as to feature the unique character and natural values of the city. The conservation achievements to date provide a good basis for continuing progress with community support and involvement in the future.

### (3) *Status of Spicebush Swallowtail*

The current status of the foodplant, the availability of habitat, and the continually warming climate suggest that the Spicebush Swallowtail will continue to thrive in High Park. The apparent recolonization of this butterfly in the park is similar to colonization of Giant Swallowtail in the Ottawa Valley in that the foodplant had been historically present (Catling 2021). However, further expansion of Spicebush Swallowtail is unlikely in the near future due to limited availability of its foodplants. The northern limit of Spicebush Swallowtail in Ontario will likely be outliers of disjunct Spicebush shrubs in the Brighton and Trenton regions at the northeast end of Lake Ontario (Catling *et al.* 2024), and outliers in the southern Georgian Bay region of Lake Huron (Soper & Heimburger 1985).

#### Acknowledgment

The pattern of status change and range expansion discussed here is particularly supported by recorded observations of members of the Toronto Entomological Association (TEA) that are available in the Ontario Butterfly Atlas database (Macnaughton *et al.* 2023). This resource that is available for monitoring butterflies as an aid to understanding environmental changes, especially in an urban area, is a very significant contribution for which the TEA and its members are to be congratulated.

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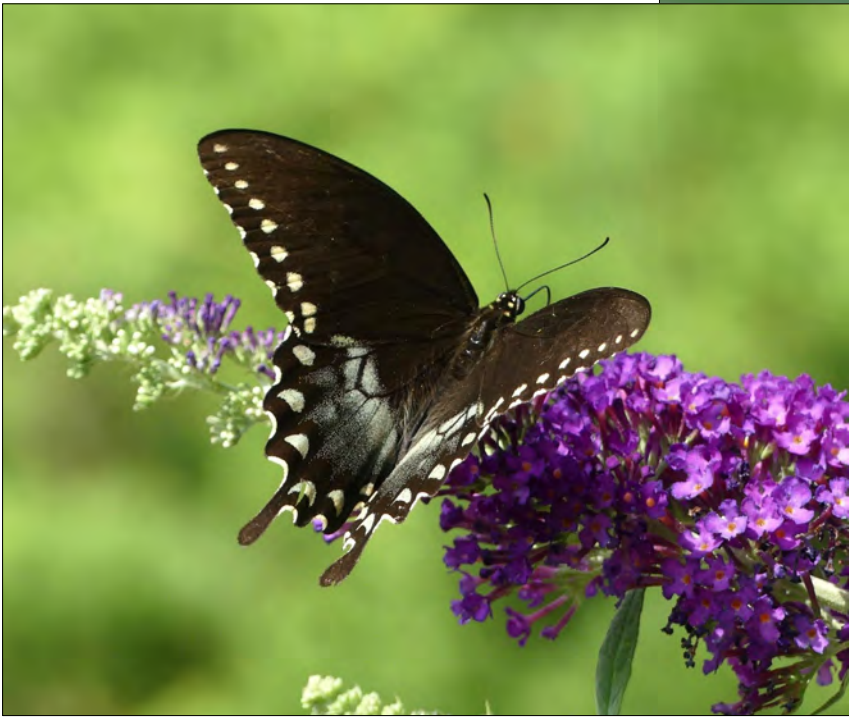
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**Spicebush Swallowtails**

**Photos by Bob Yukich  
(High Park)**



See:

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