Beaverhill Bird Observatory Butterfly Internship: Summer 2022

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Effects of hot dry conditions of the summer of 2021 on phenology and relative abundance of common species in 2022

Introduction

The Beaverhill Natural Area near Tofield, AB is a great place to observe many species of butterflies thanks to its diverse array of habitats, including deciduous forests, mixedwood, marshes, sloughs and open grasslands (Thormin 1977). Additionally, the lake is quite shallow and therefore its size can vary greatly from one year to the next (BB0 2022). This ebb and flow can have a drastic effect on which species are present as areas flood or dry out. The summer of 2021 was very hot and dry, so in 2022 I decided to study the effect on the phenology of some common species and the number of species seen.

Methods

From May 17th to August 17th, 2022 12 surveys were conducted along two predetermined routes as outlined in the BBO Butterfly Internship Handbook (Figure 1). The routes were originally designed to encompass a range of habitats to ensure proper representation of species with different ecological requirements. Any butterflies that could be identified were counted regardless of distance. Any individuals that could not be identified from afar were caught in a butterfly net for identification. Identification was performed using *Butterflies of Alberta* (Acorn 1993) or the *Butterflies of the Beaverhill Bird Observatory* field guide (Greenslade & Salouk n.d.). Photos of individuals that were hard to identify were sent to John Acorn for identification. A tally of number of individuals of each species observed was recorded on data sheets for both loops, as well as the time and date each survey was conducted. The temperature, wind as measured with the Beaufort scale, and cloud cover as a percentage were also recorded at the start of each survey. Surveys were only conducted on days where the temperature was above 15^{o}C with wind lower than 4 on the Beaufort scale, as these conditions are conducive to butterflies taking flight. Using the same approach as Anderson and Charron (2013), I took the number of individuals sighted for each survey conducted and divided by the total number of individuals of 4 common species for the entire survey period and multiplied by 100 to get a percentage of sightings for the survey data for 2019, 2021, and 2022. I used this data to generate Figures 2-5. The number of individuals sighted for each of the three surveys is included in Table 1. To study the number of species counted I created a table of total species counted and species per survey (Table 2).

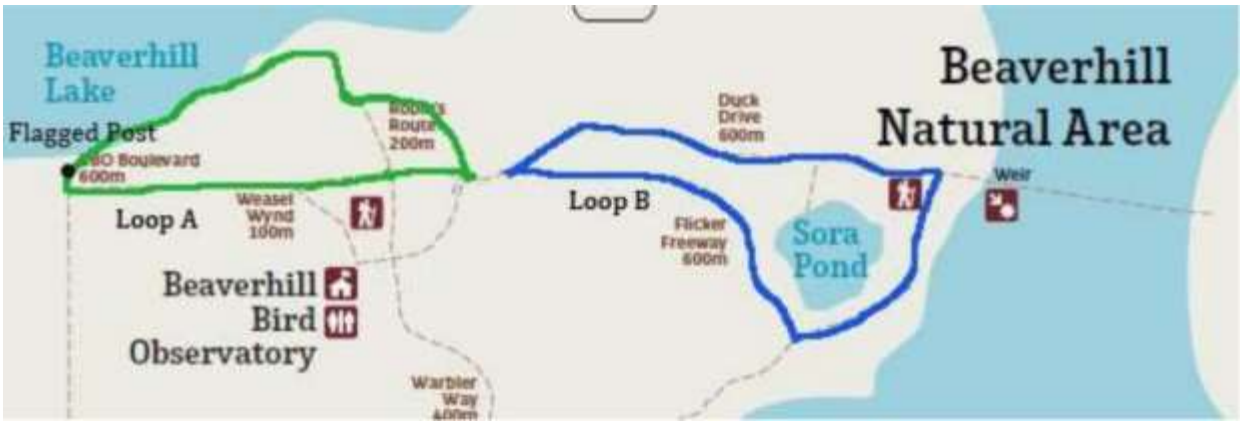

Figure 1. Map of the two survey routes. Loop A is highlighted green and Loop B is highlighted blue.

Results

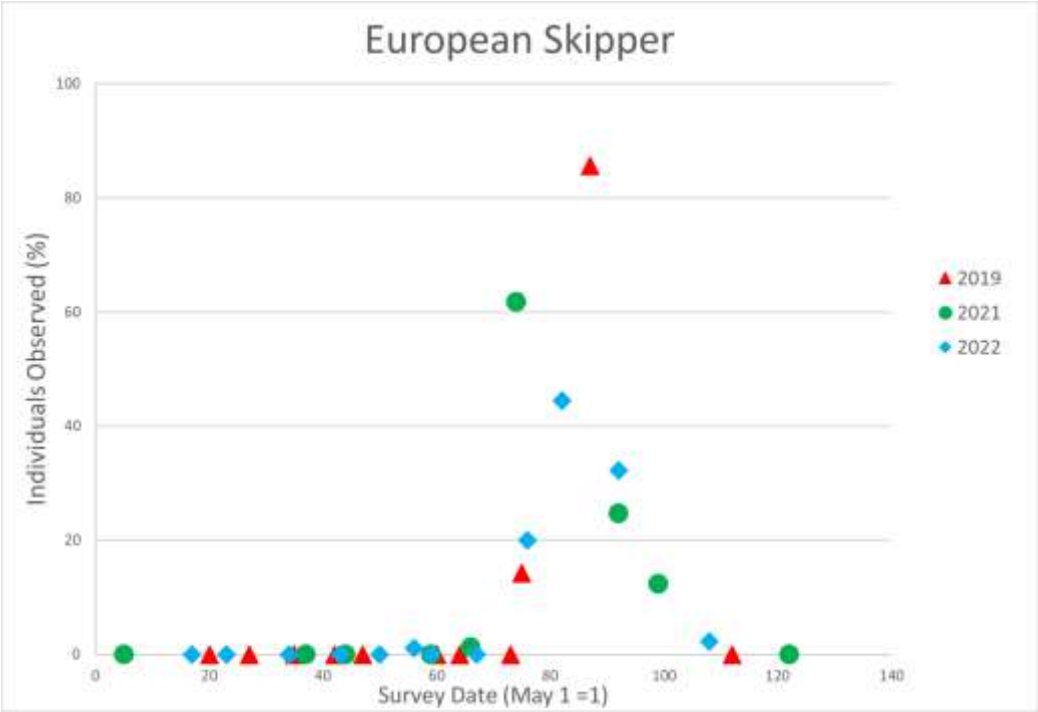

Figure 2. European Skipper observations at the BBO (2019: n=21, 2021: n=81, 2022: n=90).

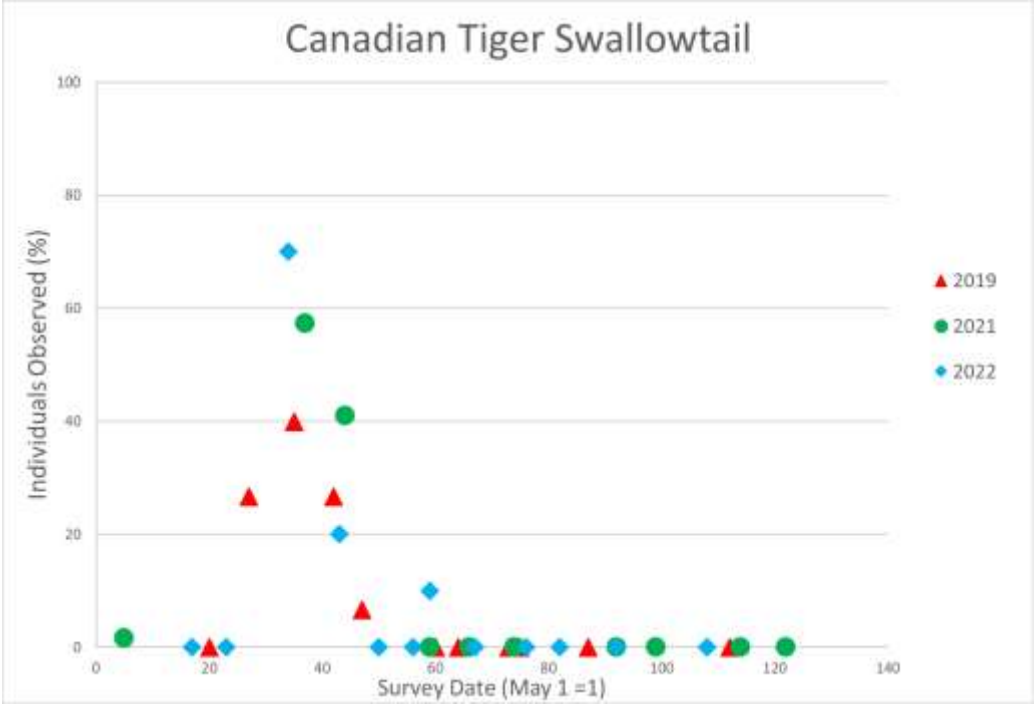

Figure 3. Canadian Tiger Swallowtail observations at the BBO (2019: n=15, 2021: n=61, 2022: n=10).

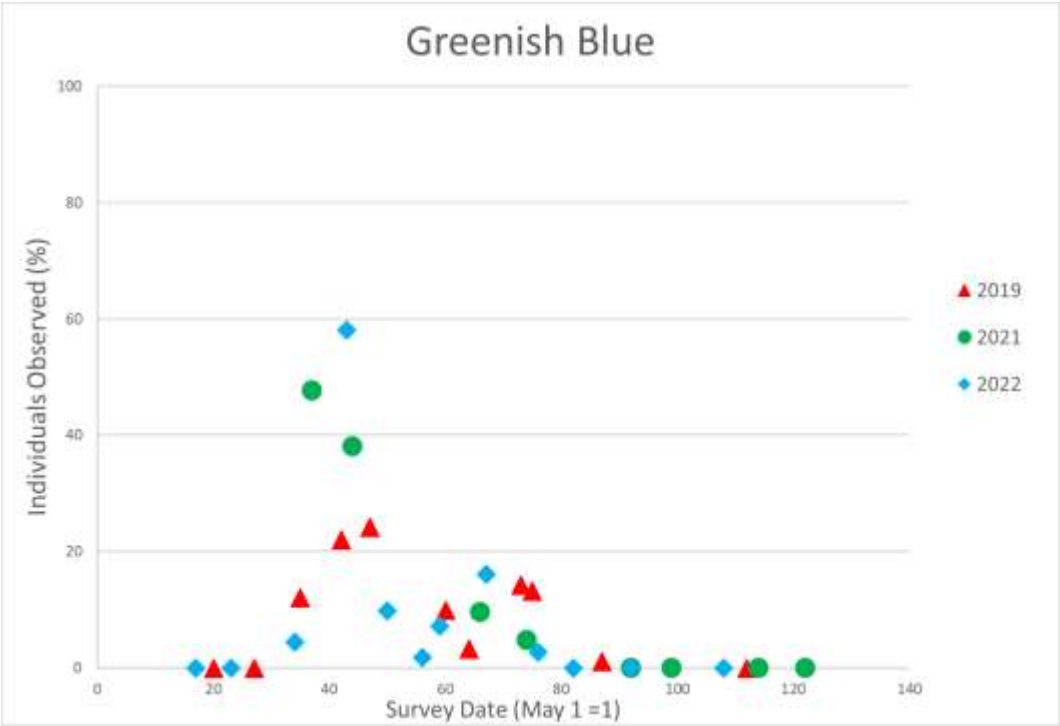

Figure 4. Greenish Blue observations at the BBO (2019: n=91, 2021: n=21, 2022: n=112).

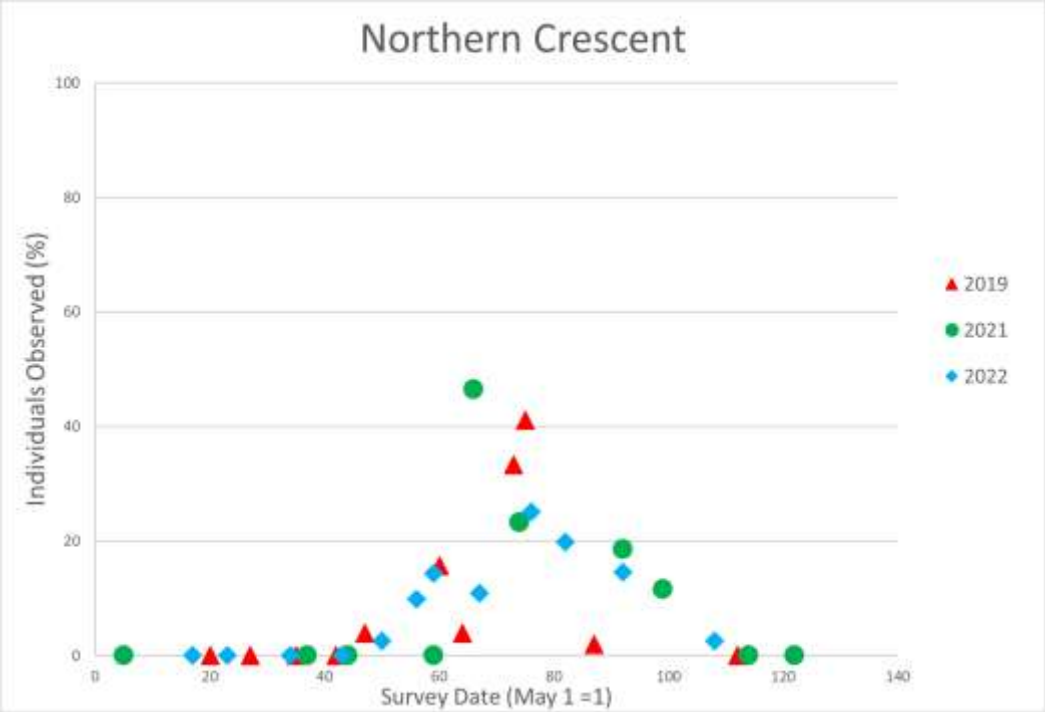

Figure 5. Northern Crescent observations at the BBO (2019: n=51, 2021: n=251, 2022: n=383).

Table 1. Number of sightings for selected common species for 2019, 2021, and 2022

Species	2019	2021	2022
European Skipper	21	81	90
Canadian Tiger Swallowtail	15	61	10
Greenish Blue	91	21	112
Northern Crescent	51	215	383

Table 2. Total number of species and species per survey for 2019, 2021 and 2022

	2019	2021	2022
Total # of species	18	28	19
Species per survey	5.00	7.78	4.45

The timing of sightings appears to be fairly consistent between years for each species. European skippers seem to emerge around mid-July, with numbers peaking near the end of July and falling to near zero by mid-August (Figure 2). The Canadian Tiger Swallowtail appears late in May, with numbers peaking early in June and declining into mid-June (Figure 3). Greenish Blue butterflies begin to appear in early June. There appears to be 2 separate peaks, one in mid-June

and the other in early to mid-July for 2019 and 2022 (Figure 4). Their numbers dwindle into late July. The Northern Crescent butterfly emerges around mid-June, with numbers peaking in mid-July and declining to near zero at the end of July (Figure 5). In 2022, however, there were appreciable numbers of Northern Crescents into mid-August. There were more European Skippers, Greenish Blue and Northern Crescents and less Canadian Tiger Swallowtails than in the previous surveys (Table 1). There was a significantly lower number of species observed in 2022 than 2021, with only 19 in 2022 and 28 in 2021 (Table 2). Species per survey was much higher in 2021 (7.78) than in 2022 (4.45).

Discussion

The consistency of the phenology is quite remarkable. I had expected that there would be much more inter-annual variation in timing of sightings. I had anticipated that the hot, dry weather would cause later butterfly emergences as poor growing conditions could delay the appearance of flowers that butterflies need to survive. A study by Beaubien and Johnson (1994) found that flower development times vary more as the season progresses due to accumulating differences in degree-days. This would imply that butterflies do not depend upon the timing of flower emergence in their own phenology. The sightings of Northern Crescents further into the year in 2022 was also interesting. 383 Northern Crescents were sighted in this year, which is far more than the 51 sighted in 2019 and 215 sighted in 2021 (Table 1). Perhaps having a large population allowed them to extend their season. Further research could be done into their increasing population size and date range of sightings. There is a significant difference between total number of species and species per survey between 2021 and 2022. The results in Table 1 also show higher numbers of European Skippers, Northern Crescents and Greenish Blue butterflies. This might be due to the hot, dry conditions of the previous summer. These conditions could have had an adverse effect on the survival of some different butterfly species and allowed the more common species to compete more effectively. One fascinating sighting was that of a Black Witch (*Ascalapha odorata*) at the BBO on August 17th, 2022. The bat intern team at the BBO also reported seeing one in 2021. This is a rare species to see here in Alberta and the fact that a Black Witch was spotted two years in a row in the same area is remarkable!

Some limitations of the study include the fact that the people conducting the surveys in the selected years have varying levels of experience in identifying and catching butterflies. Some discrepancies in the data are to be expected. Also, individuals were counted regardless of distance. While this does mean interesting or rare species are more likely to be recorded, this method compromises the analytical power that a standardized Pollard transect would have. A Pollard transect would allow for relative density of butterflies to be assessed. Furthermore, differences in eyesight and experience in identifying butterfly species mean that there is a greater chance of incorrect identifications or missed individuals. While I tried to space out my surveys as evenly as my schedule allowed, the variation in days between surveys means that some time periods have more data and others have less.

Literature Cited

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Figure 5. Photos of butterflies taken at the BBO by Dylan Perrott. Clockwise from top-left: Greenish Blue (*Aricia saepiolus*), Aphrodite Fritillary (*Speyeria aphrodite*), Northern Crescent (*Phyciodes cocyta*), two Greenish Blue (*Aricia saepiolus*) butterlfies mating.

Appendix – Raw Data

Table 3. Results of the 2022 butterfly survey at the Beaverhill Bird Observatory, near Tofield, Alberta.

	May 17	May 23	June 3	June 12	June 19	June 25	June 28	July 6	July 15	July 21	August 1	August 17	Total
European Skipper						1			18	40	29	2	90
Hobomok Skipper			1	1									2
Long Dash Skipper								1	1				2
Arctic Skipper				5									5
Canadian Tiger Swallowtail			7	2			1						10
Cabbage White		1	1								1	8	11
Western White												3	3
Clouded Sulphur			3									4	7
Grey Copper												6	6
Greenish Blue			5	65	11	2	8	18	3				112
Silver Blue						2	2						4
Aphrodite Fritillary											4		4
White Admiral								1	1				2
Mourning Cloak	2	1	3		1								7
Northern Crescent					10	38	55	42	96	76	56	10	383
Common Alpine				6									6
Common Wood Nymph					1					1	19	3	24
Common Ringlet						1				1			2
Red-Disked Alpine	18	17	7										42