

ALBERTA SWALLOWTAILS AND PARNASSIANS: NATURAL HISTORY, KEYS, AND DISTRIBUTION

FELIX A.H. SPERLING, Section of Ecology and Systematics, Corson Hall, Cornell University, Ithaca, New York, 14853-2701, and NORBERT G. KONDLA, 6415 - 95 Avenue, Edmonton, Alberta. T6B 1A6

In this article we provide pictorial keys, distribution maps, and natural history information for Swallowtails and Parnassians in Alberta. Except for introductory sections, only information that pertains to Alberta or is new is reported. More general treatments for species can be found in existing literature.⁷ Common names of host plants follow *Budd's Flora*.⁶ In collaboration with C.D. Bird, G.J. Hilchie, and E.M. Pike, we are preparing a book on the butterflies of Alberta, but it will be a few more years before this project is complete. By summarizing what we know now, we hope to encourage further work on these butterflies, particularly on the natural history of more poorly known species. Figure 1 shows Papilionidae for Alberta.

Parnassians

Distinguished by hairy bodies and wings with a white ground colour and semi-transparent border, Parnassians are also easily separated from Whites by their moderately large size (50-65 mm wingspan). Females are noticeably darker than males and have a spragus, a waxy structure attached by males to the end of the abdomen of females to prevent them from mating again with other males. Parnassians are found in mountainous temperate regions and are most diverse in Asia. Isolated populations within the same species often show minor differences.

1. Phoebus Parnassian - *Parnassius phoebus* (F.)

This species is characterized by: 1) narrow white rings around each segment of the antennae; 2) black wing markings, particularly on the dorsal forewing disk; and 3) a small, dark brown spragus on the end of the abdomens of females. Both sexes tend to be smaller and darker at higher latitudes and elevations. All populations in Alberta belong to *P. phoebus smintheus* Dldy.

At Frank, Alberta, we have found larvae on Lance-leaved Stonecrop (*S. lanceolatum*). Larvae are black, with dense short hairs and small yellow spots on each segment. There is one generation of adults. They have been reported from 2 June to 10 October. The main flight may begin as early as mid-June in the southern Alberta Rockies, but is not until August in the north. Males patrol slowly over open areas where the food plant grows, flying a metre above the ground, searching for females. Adults with darker wing bases appear to be able to warm up better in the sun.² Adults nectar on a variety of Composites.

The Phoebus Parnassian is found throughout the Rockies of Alberta in subalpine meadows and dry, south-facing mountain slopes. The species is common in valley bottoms in the southern mountains. There is an outlying population on the valley sides of the

(D=dorsal; V=ventral;
FW= forewing; HW=hindwing)

1a. Tailed hindwing.....*Papilio* 3.

1b. No tails.....*Parnassius* 2.

2a. White-ringed antenna; black spot in DFW disk...*P. phoebus*

2b. All-black antenna; grey bar across DFW disk.....*P. clodius*

3a. Striped center of HW.....4.

3b. Black or yellow HW center..6.

4a. 1-tailed HW.....5.

4b. 2-tailed HW..*P. multicaudatus*

5a. Ground color yellow or cream; stripes narrow...*P. canadensis*

5b. Ground color white; stripes wide.....*P. eurymedon*

6a. HW eyespot round and centered.....*P. zelicaon*

6b. HW eyespot connected to margin or low and oval...7.

7a. VFW disk mainly yellow and yellow hair under thorax...8.

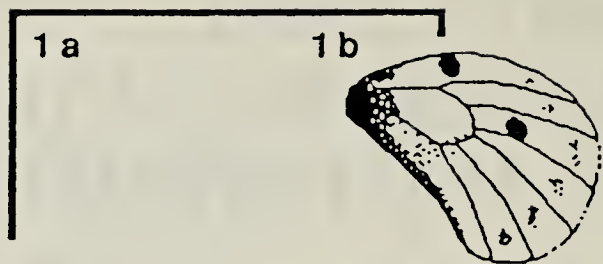
7b. VFW disk mainly black or black hair under thorax....9.

8a. On grassland or dry riverbanks..*P. m. pikei*

8b. Boreal/montane forest*P. m. hudsonianus*

9a. On grassland or dry riverbanks..*P. m. dodi*

9b. Forested habitat.....
P. zelicaon X machaon



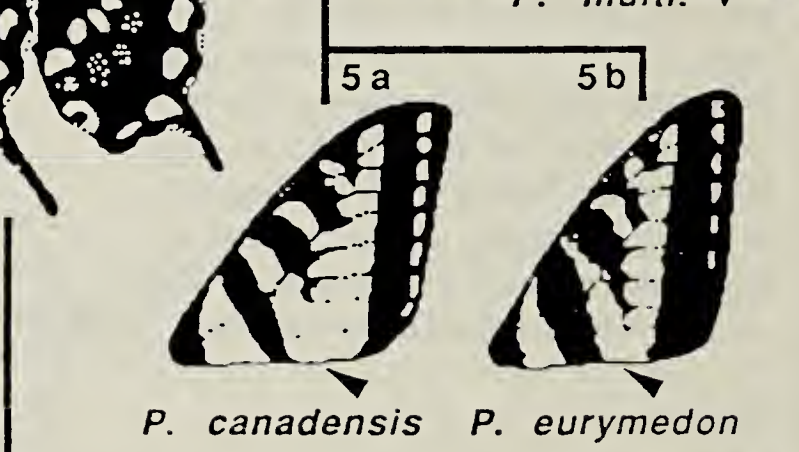
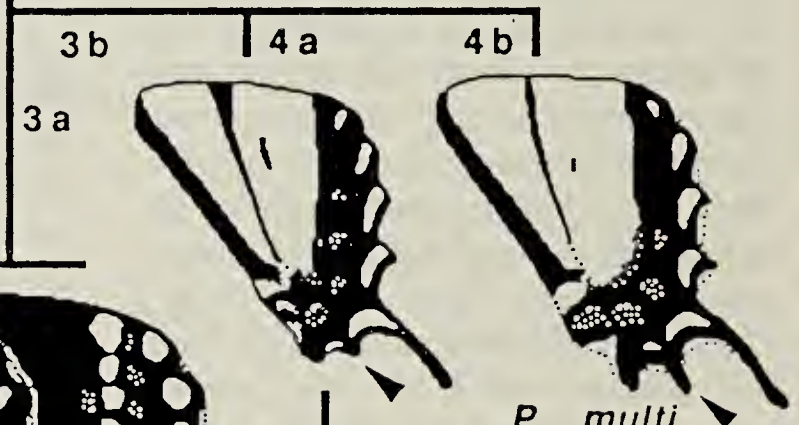
Papilio

Parnassius



P. phoebus

P. clodius



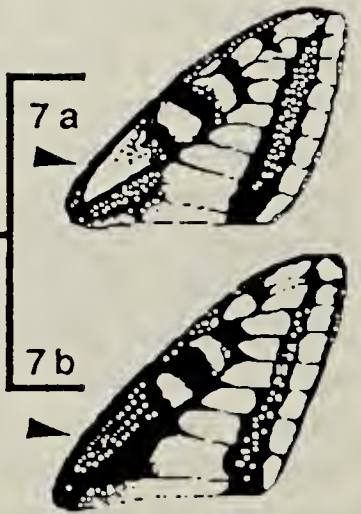
P. canadensis

P. eurymedon



P. zelicaon

P. machaon
and hybrids



7a

7b

Figure 1. Alberta Papilionidae.

Milk River north of Del Bonita. This may be the only strictly prairie-dwelling population in North America. It has been found on the Saskatchewan side of the Cypress Hills, but not yet on the Alberta side, though Stonecrop grows there.⁵ It is less frequently collected in the northern Rockies, where it occurs on alpine and upper subalpine rocky slopes.

2. Clodius Parnassian - *Parnassius clodius* Menetries

This species is unlikely to be encountered in Alberta except in Waterton National Park. The species is distinguished from the Phoebus Parnassian by its: 1) completely black antennae; 2) grey rather than black markings on the wing surfaces, especially in the dorsal forewing disk; and 3) a large, white spragus on the female. There are only two confirmed records for *P. clodius* in Alberta, from 1 and 12 August. They were collected by D. G. Wales at Bertha Lake (5800') and Goat Lake (6500') in Waterton National Park. Early stages are unknown in Alberta. The Clodius Parnassian is generally found in lush forest openings.

Swallowtails

Swallowtail butterflies of the genus *Papilio* L. are found worldwide. There are more than 200 species in 42 species groups; two of these groups have species in Alberta. Research on these large and beautiful butterflies has provided a great deal of support for conservation and insight into the process of evolution.¹ In Alberta, Swallowtails are distinguished from other butterflies by their large size (wingspan more than 75 mm), hindwing tails, and a bold black and (usually) yellow colour pattern. Like Parnassians, the larvae have osmeteria, which are fleshy, smelly tubes that larvae evert from just behind their head to discourage predators. Early instar larvae are black with a white patch in the middle and have spines with fleshy bases; they look like unappetizing bird droppings. The

eggs are spherical and green or yellowish. Pupae are held upright against twigs by a silk girdle, resembling leaves or broken branches. Pupae are either green or brown, depending on the background, and are the overwintering stage. They are often parasitized by large black Ichneumon wasps (*Trogus* spp.).

Old World Swallowtail Species Group

Members of this species complex, the *Papilio machaon* group, are found throughout most of the northern hemisphere. There are about six species in the group. Late instar larvae have black and green bands on each segment, interspersed by small yellow or orange spots. The ratio of yellow to orange spots varies geographically and can help to distinguish populations. Larvae feed on numerous species of Umbellifers, as well as a few Composites, both of which are unusual food plant families for Swallowtails.

The most common adult form in Alberta is predominantly yellow with black markings along the veins and outer borders. A dark morph, present in varying proportions, is characterized by a predominantly black pattern on the wings and yellow spots rather than a yellow band on the abdomen. Males of the Old World Swallowtail group usually patrol grassy or sparsely treed hill tops with good nectar sources and a panoramic view. Encounters by patrolling males lead to a short chase, while females are pursued until they land in a grassy spot and mate. Although species generally maintain their integrity when they meet, Swallowtails of the Old World group sometimes form inter-specific hybrid populations.^{8,9}

3. Old World and Artemisia Swallowtails - *Papilio machaon* L.

The Old World and Artemisia Swallowtails are best distinguished by the shape of the hindwing eyespot on upper side of the inner margin of the hindwing.



Papilio machaon dodi, Drumheller, Alberta.

Felix Sperling



3rd instar of *Papilio zelicaon* on *Heracleum lanatum*, Buck Mountain, Alberta.

Felix Sperling



5th instar of *Papilio zelicaon* on *Angelica* leaf.

Felix Sperling

This eyespot is club-shaped and connected to the margin, or at least oval and low in the area of red scales. Three subspecies occur in Alberta and, to reduce confusion, we refer to them by their Latin names. *P. m. dodi* McDunnough is found in southern Alberta and was named after F. H. Wolly Dod, an early lepidopterist in Alberta. *P. m. pikei* Sperling was recently discovered in the Peace River region and named after another Albertan, E.M. (Ted) Pike. *P. m. hudsonianus* Clarke occurs, as its name suggests, in the Hudsonian region of Canada. As Hooper later reported, Swallowtails originally identified as *P. bairdii brucei* Edwards in *The Butterflies of Saskatchewan* actually are the summer generation of *P. m. dodi*.^{4,5} Butterflies that Hooper referred to as Badlands Old World Swallowtails ("*P. machaon* ssp.") are the spring generation of *P. m. dodi*.⁴ Butterflies that Hooper referred to as Cypress Hills Old World Swallowtails ("*P. m. dodi*") appear to be a hybrid population between *P. zelicaon* (the Zelicaon Swallowtail) and one or more subspecies of *P. machaon*.⁴

Spring generation adults of *P. m. dodi* look much like *P. zelicaon*. Summer generation adults generally have more yellow scales and hairs. Dark morph adults comprise less than 2% of any population in Alberta. *P. m. dodi* also tends to have more pointed forewings and narrower hindwing tails than *P. zelicaon*. Both *P. m. pikei* and *P. m. hudsonianus* are distinguished by yellow hair extending around the underside of the thorax and by yellow scales at the base of the underside of the forewing. The latter two subspecies are separated by habitat and locality.

Larvae of *P. m. dodi* and *P. m. pikei* feed exclusively on Linear Leaved Wormwood (*Artemisia dracuncululus*), as do other subspecies of *P. machaon* found in the western United States. Not all pupae of *P. m. dodi* or *P. m. pikei* that are produced in the late summer of a

given year will emerge during the following year. A small proportion will wait an additional year or more to emerge, avoiding the kind of drought that scorches host plants such as the one that occurred in southern Alberta in 1985. The larval food plant of *P. m. hudsonianus* has still not been established. Judging from a photo of a late instar larva taken by Gary Anweiler in Saskatchewan, the food plant may be Palmate-leaved Coltsfoot (*Petasites palmatus*). It is possible that larvae of *P. m. hudsonianus* also feed on Umbellifers.

P. m. dodi has been collected from 3 May to 23 August. The peak for the first generation is the second half of May and the first half of June, while for the second generation it is late July and early August. *P. m. pikei* has been recorded from 9 June to 9 July. *P. m. hudsonianus* has been collected in Alberta from 31 May to 28 July, but most were collected in the second half of June. Males of *P. m. dodi* and *P. m. pikei* tend to fly along the upper edge of deep river valleys and accumulate at prominences. Males also patrol slopes well below valley edges, looking for females near larval food plant patches. Nectar sources include Groundsel (*Senecio* spp.), Sweet Broom (*Hedysarum* spp.) and Alfalfa (*Medicago sativa*). *P. m. pikei* and *P. m. dodi* occur in dry grassland habitats along eroding river banks, badlands, and road cuts near the larval food plant. Populations are patchily distributed along major river valleys and badlands. In contrast, *P. m. hudsonianus* is found in the boreal forest region, especially openings along roads, bogs or sparsely treed hill tops. It is infrequently collected in Alberta, but is distributed over a broad region.

4. *Papilio zelicaon* X *machaon*

Hybrid individuals are difficult to recognize. By definition they are normally rare and, if back-crosses are possible, hybrids can exhibit the full range

of character combinations between the parental species. *P. zelicaon* and *P. machaon* form hybrid populations in west-central Alberta and the Cypress Hills; Hooper refers to the Cypress Hills Old World Swallowtail hybrids.^{4,8} Hybrid adults look much like *P. m. dodi*, and are best distinguished by molecular characters and by habitat and locality. Most individuals from hybrid populations have a club-shaped eyespot, but have a rounded wing shape much more like that of *P. zelicaon*. The parental species seem to hybridize much less frequently in the southern Alberta prairies and in the Peace River region, as well as where their ranges overlap in the rest of western North America. Most hybrid populations occur in mixed forest, between 1000 and 2000 m elevation.

Larvae of hybrid populations are found on Heart-leaved Alexanders (*Zizia aptera*) in the area west of Calgary and on Cow Parsnip (*Heracleum lanatum*) in the moister areas north and west of Red Deer. At Bragg Creek, immediately west of Calgary, most larvae have yellow spots which distinguish them from the orange spotted larvae of *P. m. dodi* at Calgary and eastward. *P. zelicaon* X *machaon* hybrid Swallowtails have been collected in the Alberta foothills from 22 May to 2 August, with the main flight period in the first half of June. Sometimes typical *P. zelicaon* adults are collected at the same localities later in the summer; these may have dispersed from pure *P. zelicaon* populations in mountains to the west. Hybrid Swallowtails in the Cypress Hills have mostly been collected in late June and early July. Where hybrids are rare, most specimens are collected together with apparently pure *P. zelicaon* or *P. machaon*. The latest records for any Swallowtail in the southern Alberta prairies (28 September) and the Peace River region (22 July) were for hybrids.

The mating behaviour of *P. zelicaon* and *P. machaon* is very similar, and it is

easy to see how hybrids could occur. It is more difficult to understand why the species don't merge wherever they contact each other. The frequency of hybrids is higher in areas where contacting populations of the parental species have more similar habitat preferences. Thus the relative viability of hybrid individuals, rather than different mating behaviour, may determine whether hybrid populations will form. However, actual observations of natural matings are rare and the two species might also have mating barriers in dry land regions, in addition to staying out of each others' way as an indirect consequence of different habitat preferences.

5. Zelicaon Swallowtail - *Papilio zelicaon* Lucas

Adults of *P. zelicaon* are best identified by the round and centred anal eyespot on the upper side of the hind-wing. They usually have more black coloration than *P. machaon*, especially at the base of the ventral forewing and on the thorax and abdomen. The black adult "nitra" morph may comprise up to 10% of some populations in southern Alberta.

Larvae feed entirely on Umbellifers and will not feed on Narrow-leaved Wormwood. Eggs are laid on flower heads or leaves. In the Waterton area, larvae tend to occur on Lyall's Angelica (*Angelica arguta*), while in northern Alberta they tend to occur on Cow Parsnip. Larvae have also been found in Alberta on Mountain Parsnip (*Angelica dawsoni*), Kneeling Angelica (*Angelica genuflexa*), Mountain Wild Parsnip (*Lomatium dissectum*), Western Wild Parsley (*Lomatium triternatum*), Water Parsnip (*Sium suave*), and Heart-leaved Alexanders, as well as two cultivated Umbellifers, Garden Celery (*Apium graveolens*) and Garden Parsnip (*Pastinaca sativa*). The main larval food plant on the prairies of southern Alberta is unknown, though it seems likely to be a Prairie Parsley (*Lomatium* spp.).

There is almost always a single generation per year for *P. zelicaon*. The main flight period is variable, with adults generally emerging later in cooler habitats, especially in the mountains. Adults have been collected in Alberta from 23 April to 19 August, though the main flight period varies from the second half of May in the Wintering Hills south of Drumheller, to the first half of July, in Waterton National Park. A few fresh adults have been collected near Drumheller in early August. A common nectar source for hill-topping male *P. zelicaon* is dandelion. *P. zelicaon* is generally found in moist meadows in forested areas, but in Alberta it can also be found in habitats ranging from parkland and prairie hill tops to subalpine meadows. Adults occasionally hill-top even on alpine peaks. Whenever males of both colour morphs occupy the same hill top, it seems that the black ones occupy the choice spots on the very peak of the hill. Very little data has been collected on the mating behaviour of these species, however, and this very interesting situation awaits someone with a little time and patience to study it.

The Tiger Swallowtail Species Group

This species complex, the *P. glaucus* group, is the only species group of Swallowtails that is restricted to North America and adjacent Central America. Like the *P. machaon* group, the *P. glaucus* group is most diverse in western North America. Six species are currently recognized, and most of these hybridize occasionally where their ranges meet or overlap. Late-instar larvae have a distinctive pattern, with large eyespots on the thoracic segments, followed by a single band and a smooth green background. They feed on the foliage of a wide variety of trees and shrubs. Pupae are similar to those of the *P. machaon* group, but are slightly narrower and less bent. Adults have a distinctive pattern of black stripes on a yellow or white background – hence their common name.

6. Canadian Tiger Swallowtail - *Papilio canadensis* Rothschild and Jordan

Previously considered a subspecies of the Eastern Tiger Swallowtail (*Papilio glaucus*), the Canadian Tiger Swallowtail has recently been given species status on the basis of a number of genetic differences and the relatively narrow hybrid zone it forms with *P. glaucus*.³ It is the only member of the species group that occurs in central and northern Alberta. The ground colour of males is always yellow when they are fresh, but females may be either a lighter cream-yellow or a more orangy-yellow than the males. The wingspan is 8.5 to 10 cm in Alberta, and there is only one tail per hindwing. The Western Tiger Swallowtail (*Papilio rutulus*) sometimes hybridizes with the Canadian Tiger Swallowtail in southern British Columbia. Apparently the only difference in adult colour pattern is that Western Tiger Swallowtail has no orange marginal spots on the underside of the hindwing.⁷

Larvae have been collected on Aspen Poplar (*Populus tremuloides*), Willow (*Salix* sp.) and Domestic Crabapple (*Malus* sp.) in Alberta. Eggs are laid on the middle of the upper side of small leaves, about 1 mm from the central vein. The egg is bright green when laid, and has a deep yellow ring of cement at the base, which dries clear in about 5 minutes. Larvae spin a silk mat on the leaf on which to rest when they are not feeding.

Adults have been collected from 12 May to 12 August, with the main flight in June. Adults are common along trails through mixed forest, or along the edges of aspen parkland. Males tend to patrol along streams, forest edges and trails, but also accumulate on hill tops or congregate on wet soil. Females fly in the same habitats, but have a faster and more circuitous flight than males, as they search for leaves on which to lay their

eggs. Both sexes nectar at a variety of flowers, especially dandelions. The Canadian Tiger Swallowtail can be found commonly throughout most of Alberta except the southern grasslands, where it is uncommon and local.

7. Two-Tailed Swallowtail - *Papilio multicaudatus* Kirby

This species looks much like the Canadian Tiger Swallowtail, but has a second, smaller tail on each hindwing. Its wing stripes are also a bit narrower and its wingspan is usually more than 10 cm. Its background colour is the same yellow shade as in male Canadian Tiger Swallowtails. There are no larval records yet for Alberta.

Adults have been collected from 7 June to 2 September, and most are from late June. The Two-tailed Swallowtail is found only on the U.S.-Alberta border, at Waterton National Park, along the Milk River (especially at Police Coulee) and rarely north to Lethbridge. It flies along coulees and the edges of riverine forest. The large wingspan of this butterfly makes it a particularly fast flier and well suited to soaring. It commonly nectars on thistles (*Cirsium* spp.).

8. Pale Swallowtail - *Papilio eurymedon* Lucas

This species has the black wing stripes shared by other species in the Tiger Swallowtail group, but its background colour is pale white, without any yellow. The wing bands are wider than the other species and are usually substantially wider than the white areas between them. There is only one tail on each hindwing, and the wingspan is 9 to 10 cm in Alberta.

Immatures of the Pale Swallowtail have not been recorded yet in Alberta. The species is found in the southwestern corner of Alberta, north to the Crowsnest Pass and east to Police Outpost. Many Waterton records may represent strays

from British Columbia. In Alberta it has been collected from 23 June to 1 August. It is found in dry, montane forest and the species is our rarest Swallowtail in Alberta.

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