

GENERAL NOTES

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NOTES ON *PARNASSIUS SMINTHEUS* DOUBLEDAY (PAPILIONIDAE) ON VANCOUVER ISLAND

Additional key words: British Columbia, Canada.

Parnassius phoebus guppyi was described by Wyatt (1969) with the type locality Mt. Arrowsmith, Vancouver Island, British Columbia, Canada. Since its description *P. phoebus guppyi* has been treated in the North American literature as a synonym of *P. phoebus olympianus* Burdick 1941, type locality Hurricane Hill, Olympic Peninsula, Washington, USA. I follow this treatment. Shepard and Manley (1998) have since demonstrated that the correct species name for most non-arctic North American "*phoebus*" populations is *Parnassius smintheus* Doubleday, the name used in this paper.

Only a small number of *Parnassius smintheus olympianus* have been collected on Vancouver Island, from a total of five populations. Additional specimens and habitat information will probably not be acquired rapidly because of the difficult access to the rugged mountains of northern Vancouver Island. All known localities, except the type locality, are within Strathcona Provincial Park (Fig. 1) where a collecting permit from BC Parks is required for any sampling.

The type series of *guppyi* consists of nine males and five females labeled as collected by Richard Guppy on Mt. Arrowsmith, Vancouver Island, British Columbia, Canada, 1500 m, 22 July to 31 August, 1961 to 1967 (Wyatt 1969). Richard Guppy, a few years before his death, told me that he had collected all of Wyatt's specimens on Mount Cokely rather than Mount Arrowsmith. Mount Cokely is frequently called "Mount Arrowsmith" in error, because it is the first summit on both trails to Mount Arrowsmith, and because hikers frequently end their walk at the summit of Mount Cokely rather than completing the strenuous ascent of the bedrock peak of Mount Arrowsmith. The type locality of *Parnassius smintheus guppyi* Wyatt is here corrected to Mount Cokely, elevation 1500–1600 m, Vancouver Island, British Columbia, Canada (49°14'30"N, 124°35'10"W). My own specimens were also all collected on Mount Cokely, and I suspect that most, if not all other, existing specimens are from Mount Cokely.

The summit of Mount Cokely (elev. 1630 m) is 1.8 air km north of the summit of Mount Arrowsmith (elev. 1819 m). A saddle (elevation 1500 m) connects the two mountains. Richard Guppy told me that the majority of the specimens came from the top of the west ridge of Mount Cokely immediately above the saddle connecting the mountains, and a few came from the south slope of the ridge down to the saddle. None came from Mount Arrowsmith itself, although *P. smintheus* occurs there. Richard Guppy said that at least one, and possibly two (he could not remember exactly), specimens of the type series were reared from nearly mature larvae found feeding on *Sedum divergens* Wats. (Crassulaceae). This is significant because the developmental environment of *Parnassius smintheus* can affect the adult phenotype (Guppy 1989). The *P. smintheus* on Mount Cokely and Mount Arrowsmith apparently comprise a single population, because I have observed females flying on the saddle (unsuitable habitat) between the two peaks.

The habitat of *Parnassius smintheus* on Mount Cokely and Mount Arrowsmith consists of barren rounded bedrock ridges and cliffs, with small ledges and slopes of scree. *Sedum divergens* grows in cracks in the bedrock and in the scree, and is the only *Sedum* species on Mount Arrowsmith and Mount Cokely. The saddle between the two peaks is gravel and dirt dominated by heather (*Cassiope* sp.) and lacks *Sedum*. *P. smintheus* is likely to occur on two western ridges of Mount Arrowsmith down to 1400 m, which is as far down as un-forested habitats and *Sedum divergens* occur, but I have not visited those ridges at the appropriate time of year. The habitat is subalpine to the summit of the mountains, with the lack of forest being the result of lack of soil on the bedrock areas rather than elevation.

Male *P. smintheus* patrol up and down the cliffs, and are easily netted when they reach the flat top of the west ridge of Mount Cokely. Females spend most of their time on the ledges of the cliffs where they are difficult to approach, and only rarely are found on the



FIG. 1. Known populations of *Parnassius smintheus* on Vancouver Island. 1, Hurricane Ridge, type locality of *P. smintheus olympianus* Burdick. 2, Mount Cokely, type locality of *P. phoebus guppyi* Wyatt. 3, Cream Lake, Flower Ridge, Hope Lake & Mount Albert Edward, and Mount Becher (west to east). SPP, Strathcona Provincial Park. VI, location of Vancouver Island.

flat ridge top because *Sedum* is sparse there. The flight period is from mid-July to mid-September, with yearly variation depending on weather and melting of the snowpack.

Strathcona Provincial Park contains the other four known populations of *P. smintheus* on Vancouver Island. Three of the populations are connected by continuous alpine habitats. The distance between Mount Albert Edward and Cream Lake is about 21 air km, with a main alpine ridge running between the two sites. Flower Ridge is a spur ridge to the west of this main ridge. Mount Becher is to the east of Mount Albert Edward, with about 10 km of subalpine meadow and forest (unsuitable habitat) between. I estimate the flight period for these populations to be from late July to late September, with the exact period dependant on weather and the melting of the snowpack.

The habitat at Cream Lake is a small recent glacial moraine of hard packed gravel, and is steep and difficult to collect. The remainder of the area around Cream Lake is either bedrock, forest or subalpine heath. *Sedum divergens* is the only *Sedum* species present and is abundant, and I assume it is the larval hostplant. Most specimens collected at Cream Lake were fresh but a few were very worn, suggesting that a lower elevation popu-

lation with an earlier flight season is nearby. A likely location for such a population is southeast of Cream Lake on the south slopes of Mount Septimus and Mount Rosseau above Love Lake (el. 1231 m).

The habitat on Flower Ridge where I collected the one specimen was unsuitable sub-alpine heath. I assumed that the specimen came from the inaccessible slope below, which was a steep east-facing slope with abundant herbaceous vegetation. I did not see any *Sedum* species, but the habitat on the slope below appeared suitable for *Sedum divergens*.

The habitat on the east ridge of Mount Albert Edward is volcanic rock and pumice rubble and scree, with the south side of the ridge being a cliff with talus slopes at the bottom around Hope Lake. The *P. smintheus* on the ridge top and those near Hope Lake are undoubtedly one population, with movement up and down the cliff. The only *Sedum* present on the ridge and on the talus slopes around Hope Lake is *Sedum divergens*, which I presume to be the larval hostplant.

Mount Cokely/Arrowsmith is about 70 km southeast of Cream Lake, with no suitable habitat directly between until a few km south of Cream Lake. To the west the closest suitable elevation is Klitsa Mountain, which lacks *P. smintheus* and has only a small *Sedum divergens* population. The next closest mountain to the west is Nahmint Mountain (unsampled), 40 km from Mount Arrowsmith. A few unsampled summits south of Mount Cokely/Arrowsmith may have *P. smintheus* populations, but most of Vancouver Island south of Mount Arrowsmith is too low to include suitable habitat. The Mount Cokely/Arrowsmith population is therefore isolated from the populations to the north.

There are many other peaks in Strathcona Park which are likely to have populations of *P. smintheus*, and additional mountains occur further north on Vancouver Island. I believe that additional, undiscovered *P. smintheus* populations occur in Strathcona Park and the other mountains of Vancouver Island, but the total number of populations is likely less than fifty. The known populations and specimens are: **Mount Cokely, 1500–1600 m, 49°14'30"N 124°35'10"W**: Mt. Cokely, 5000 ft, 22 July 1951, J. R. L. Jones; UBC; 5 ♂. Mt. Cokely, 5000 ft, 30 July 1950, J. R. L. Jones; UBC; 1 ♂. Mt. Cokely, 1600 m, 13 August 1975, C. S. Guppy; JHS & CSG; 4 ♂, 1 ♀. Mt. Cokely, 1600 m, 12 August 1978; CSG; 4 ♂. Mt. Cokely, 11 August 1952, G. A. Hardy; RBCM; 1 ♂, 2 ♀. Mt. Arrowsmith, 1 August 1970, R. Guppy; CDF; 1 ♂. Mt. Arrowsmith, 17 August 1974, R. Guppy; CDF; 1 ♂. Mt. Arrowsmith, 29 July 1962; AMNH ex dos Passos Collection; 2 ♂. Mt. Arrowsmith, 22 July 1961, R. Guppy; AMNH ex dos Passos Collection; 1 ♂. Mt. Arrowsmith, Vancouver Island, British Columbia, Canada, 1500 m, 22 July to 31 August, 1961 to 1967, R. Guppy (Wyatt 1969). **Strathcona Provincial Park, Mount Becher on Forbidden Plateau, 1385 m, 49°39'00"N 125°13'30"W**: Forbidden Plateau, Courtenay, 20 August 1931, J. D. Gregson; AMNH ex dos Passos Collection; 1 ♂. Mt. Becher, 28 August 1957, G. A. Hardy; RBCM; 2 ♂. Mt. Becher, 10 August 1961, G. A. Hardy; RBCM; 2 ♂, 1 ♀. **Strathcona Provincial Park, Mount Albert Edward, east ridge, 1920–2094 m, 49°40'30"N 125°25'30"W and Hope Lake, west and north sides, 1530 m, 49°40'15"N 125°25'30"W**: Forbidden Plateau, Mt. Albert Edwards, 7000', 26 July 1931 (Gregson); AMNH ex dos Passos Collection; 1 ♀. Strathcona Provincial Park, Hope Lake, west and north sides, el. 1530 m 4 August 1989, C. S. Guppy (several males collected, specimens since misplaced). One female was observed flying on the top of the east ridge of Mount Albert Edward, el. 1920 m (above Hope Lake) on the same date. Mt. Albert [Edward?], August 23, 1953, L. S. Clark; RBCM; 1 ♂. **Strathcona Provincial Park, Flower Ridge, 1400m, 49°32'N 125°31'W**: Strathcona Provincial Park, Flower Ridge, central part, elev. 1400 m, 23 August 1987, C. S. Guppy; CSG; 1 ♂. Approximately 10 males were also observed flying on an inaccessible slope on the north side of the ridge at this location. **Strathcona Provincial Park, Cream Lake, 1400 m, 49°29'02"N 125°31'20"W**: Strathcona Provincial Park, Cream Lake, southeast corner of the lake, el. 1400 m, 22 August 1988, C.S. Guppy; RBCM & McKinnon; 13 ♂.

Acronyms used above include: AMNH = American Museum of Natural History; CDF = Clifford D. Ferris; CSG = the present author; JHS = Jon H. Shepard; McKinnon = Betty McKinnon, deceased, location of her one specimen unknown; RBCM = Royal British Columbia Museum (all RBCM specimens except Cream Lake were apparently part of two drawers of *Parnassius* destroyed by dermestids in the late 1970s (R. A. Can-

nings, pers. comm.), and the data are from Jon H. Shepard's files); UBC = University of British Columbia. One male *P. smintheus* in the Canadian National Collection I consider to be erroneously labelled, "Victoria, BC, June 26, 1925, R.W. Hall."

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MISPLACED HOLOTYPE FROM THE A. E. BROWER COLLECTION

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The A. E. Brower collection was acquired by the National Museum of Natural History, Smithsonian Institution, Washington, D.C. from 1981–1994 (Davis & Hevel 1995). The last portion of this collection to arrive at the museum was that of the Nearctic *Catocala* (Noctuidae). The museum's *Catocala* collection (including Brower's material) has been curated and recorded in a database and is currently housed at the Museum Support Center in Suitland, Maryland.

Brower's collection was housed in a number of makeshift drawers and various sized cigar boxes. Nancy E. Adams (Dept. Entomology, Smithsonian Institution) found five of Brower's (1976) holotypes in one of these numerous cigar boxes, and brought this to my attention. I compared these specimens with the data and figures of the holotypes in the original publication and they all match. The data for these specimens are presented below, with each line of label data separated by a semicolon:

Catocala texarkana, Forestburg, Tex. 10–12 V 1940; L.H. Bridwell [hand written in india ink]. HOLOTYPE USNM; *Catocala texarkana* Brower [red printed label with black line border, species name hand written in india ink].

Catocala lincolnana, Lincoln Co. Ark.; 1 June 1937; L.H. Bridwell [hand written in india ink]. HOLOTYPE USNM; *Catocala lincolnana* Brower [red printed label with black line border, species name hand written in india ink].

Catocala erichi, Green Valley Creek, San Bernardino Mts.; emgd. 19–V-1966 Calif. [hand written in india ink]. HOLOTYPE USNM; *Catocala erichi* Brower [red printed label with black line border, species name hand written in india ink].

Catocala johnsoniana, Kernville Kern Co.; Calif. 17 June 1905; Erich Walter [hand written in india ink]. HOLOTYPE USNM; *Catocala johnsoniana* Brower [red printed label with black line border, species name hand written in india ink].

Catocala californiensis, Valyermo, L.A. Co.; 27 June 1957 Calif.; Noel McFarland [hand written in india ink]. HOLOTYPE USNM; *Catocala californiensis* Brower [red printed label with black line border, species name hand written in india ink].