ECOLOGICAL STUDIES OF RHOPALOCERA IN A SIERRA NEVADAN COMMUNITY—DONNER PASS, CALIFORNIA. V. FAUNAL ADDITIONS AND FOODPLANT RECORDS SINCE 1962

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Ten years have passed since the publication of the last of a series of four papers (Emmel & Emmel, 1962a, 1962b, 1963a, 1963b) on the butterfly associations and distributional factors affecting some 74 species of Rhopalocera in a montane ecosystem of the Sierra Nevada in California. With further study since our initially reported observations, a number of additional butterfly species have been recorded for this Donner Pass region and subsequent intensive invesetigations of hostplant relationships have been carried out by the authors and other California workers. A total of 83 butterfly species are now known for this four-square-mile area, making it the richest montane fauna of any reported temperate-zone area of comparable size (Emmel & Emmel, 1963b, p. 99).

In the following report, species for which new hostplant information is known are listed by family name and the species number previously used in Emmel & Emmel (1962a). Some of the host identifications made in 1956 and 1960 in the Donner Pass region have been changed from the original botanical names given to the the authors, and listed in Emmel & Emmel (1962a), due to subsequent submission of voucher material to other botanical specialists. The butterfly species new to the previously-recorded fauna are also listed (with an asterisk) at the end of each family section, with numbers subsequent to those for species recorded originally for the family.

A. PAPILIONIDAE

1. *Papilio zelicaon zelicaon* Lucas. Previously recorded on "*Cymopterus terebinthinus*," this foodplant is now known as *Pteryxia terebinthina* (Hook.) C. & R. var. *californica* Math.

2. *Papilio indra indra* Reakirt. The change in host identification is identical to that for *P. zelicaon*.

4. *Papilio eurymedon* Lucas. The foodplant in this locality is now strongly suspected to be *Ceanothus cordulatus* Kell., from observations of females hovering around this particular species.

5. *Parnassius clodius baldur* Edwards. Females have been observed ovipositing

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on or near *Sedum obtusatum* Gray (Emmel & Emmel, 1962a); however, this *Sedum* is only one of several oviposition substrates and is not a foodplant, as the normal host for the larvae appears to be *Dicentra uniflora* Kell. (Fumariaceae) (J. F. Emmel, unpubl.), which is abundant right after snow melt on the slopes where *baldur* flies later in the summer (when the *Dicentra* plants are dried and shriveled, e.g. on 18 July 1970).

B. PIERIDAE

3. *Pieris occidentalis* Reakirt. All of our material previously called *P. protodice* is now referable to *P. occidentalis*, a sibling species as defined by Chang (1963).

5. *Euchloe hyantis hyantis* Edwards. The foodplant on the lower slopes of Mt. Judah is *Streptanthus tortuosus* Kell. var. *orbiculatus* (Greene) Hall (Cruciferae). Several females were observed (18 July 1969) to oviposit on the buds of this mustard.

6. *Anthocharis sara stella* Edwards. Name changed from *A. s. julia* Edwards. Two local food plants for this butterfly are *Arabis platysperma* Gray (females ovipositing 21 June 1970, and ova plus larvae found on 11 July 1971) and *Arabis lyallii* Wats. (ova on 21 June 1970).

*10. *Pieris protodice* Boisduval & LeConte. Shapiro (1974) took this species from 27 June to 28 September 1973 in the Donner Pass area.

*11. *Pieris beckerii* Edward. This species was recorded by Shapiro (1974) from 25 July to 24 August 1973 in the Donner Pass area.

D. SATYRIDAE

2. *Cercyonis oetus oetus* (Boisduval). Name change from *C. sthenele oetus* (see Emmel, 1969).

*3. *Oeneis ivallda* (Mead). The presence of this species was first called to our attention by Noel La Due (in litt., 7 August 1963). He found it on the north slope of Mt. Judah on 16 July 1963 in fair numbers. One of us (JFE) in company with Oakley Shields took *ivallda* on 15 June 1969, 18 July 1969 and 11 July 1971. (The same areas had been checked in 1970, with no adults seen.) Our previous Donner Pass collections were made in 1956 and 1960. Thus the *Oeneis ivallda* populations in the Donner Pass region seem to be synchronized to fly only in odd-numbered years (a two-year cycle is well known for *Oeneis nevadensis* Felder & Felder and *O. jutta reducta* McDunnough in California and Colorado). The suspected foodplant is *Carex spectabilis* Dewey, with which females have been observed to be closely associated. This locality, at 7200 ft. elevation, is the lowest altitudinal record known for *Oeneis ivallda.*

E. NYMPHALIDAE

9. *Phyciodes campestris montana* Behr. An egg mass of 118 eggs was found on the underside of a leaf of *Aster occidentalis* (Nutt.) T. & G. in a wet meadow near Lake Mary on 21 August 1971. This *Aster* species is probably the same species we referred to (Emmel & Emmel, 1962a) as *Aster integrifolius* Nutt.

11. *Polygonia zephyrus* Edwards. Correct name for foodplant is *Ribes cereum* Dougl. rather than *R. viscosissimum* Pursh.

18. *Cynthia annabella* Field. Name change from *Vanessa carye* Hübner. Host-plant here is *Sidalcea glaucescens* Greene (Malvaceae).

*21. *Speyeria egleis egleis* (Behr). This species is about as abundant as the phenotypically very similar *Speyeria mormonia arge* (Strecker) throughout the Pass area. Observations during July 1969 showed that *S. egleis* prefers dry meadows and montane slopes while *S. mormonia* prefers forest edges.

*22. *Adelpha bredowii californica* (Butler). On 21 June 1970, three females

were collected on the slope between Donner Pass and Mt. Judah at elevations between 7200 and 7500 feet (perhaps a new altitude record for this subspecies). One of these females was observed to oviposit on a leaf tip of *Quercus vaccinifolia* Kell. *Adelpha* has not been observed previously in the Pass region, and this 1970 record may represent merely an occasional high-altitude invasion by a predominantly lowland species.

F. LYCAENIDAE

3. *Satyrium saepium* (Boisduval). This hairstreak feeds on a small-leafed *Ceanothus* (unidentified), previously erroneously identified for us as *C. velutinus* Dougl. ex Hook.

4. *Satyrium behrii* (Edwards). The foodplant in the Donner Pass area is *Purshia tridentata* (Pursh) D.C., which grows on the ridge and upper slopes of Mt. Judah.

5. *Satyrium fuliginosum* (Edwards). On 15 June 1969, seven mature larvae were collected in debris and soil at the base of plants of *Lupinus arbustus* Douglas on the summit of Mt. Judah.

8. *Mitoura nelsoni nelsoni* (Boisduval). On 18 July 1970, a worn male was taken in association with *Juniperus occidentalis* Hook. on the north slope of Mt. Judah (at lower elevations this butterfly is commonly associated with *Calocedrus decurrens* Torr., which is absent from Donner Pass). We suspect this *Juniperus* to be the food plant of *M. nelsoni* at Donner Pass.

11. *Callophrys lemberti* Tilden. Name change from *C. dumetorum perplexa* Barnes & Benjamin. Suspected foodplant is *Eriogonum marifolium* Torrey & Gray, with which the adults are very closely associated on the slopes of Mt. Judah.

12. *Lycaena arota virginiensis* Edwards. The previously misidentified host species is actually *Ribes roezlii* Regel, not *R. montigenum* McClat.

13. *Lycaena editha* Mead. Two females were observed to oviposit in ground litter near *Rumex acetosella* L., near Lake Mary on 21 August 1971. This introduced dock is common throughout the Donner Pass meadows.

14. *Lycaena nivalis Boisduval.* The foodplant is *Polygonum douglasii* Greene in other Pacific montane areas (Newcomer 1911, 1964); since this plant grows in the Donner Pass area, it is very probably the foodplant here.

15. *Lycaena cupreus* (Edwards). The host plant is *Rumex acetosella* L. in the Lodge Meadow and Lake Mary areas. Previous recordings of unreared larvae on *Calyptridium* are almost certainly not this copper, but more probably larvae of *Strymon melinus* Hübner.

18. *Lycaeides argyrognomon anna* (Edwards). On 18 July 1969 a female was observed to oviposit on a *Lupinus* species on the north slope of Mt. Judah; the plant lacked flowers or fruit and could not be identified as to species.

2. *Plebejus shasta* (Edwards). On 15 June 1969 six mature larvae were found on flowers of and at the bases of plants of *Astragalus whitneyi* Gray on the north slope of Mt. Judah.

23. *Plebejus lupini* Boisduval. Goodpasture (1973) has raised this taxon to specific level (name change from that used in Emmel & Emmel (1962a)). Adults are closely associated with *Eriogonum umbellatum* Torrey, the suspected foodplant at Donner Pass.

24. *Agriades glandon podarce* Felder & Felder. The foodplant at Donner Pass is apparently *Dodecatheon* speices (Primulaceae), based on close association of adults with these plants.

25. *Glaucopsyche lygdamus columbia* Skinner. Name change from *G. l. behrii* (Edwards) (after Langston, 1969).

27. *Philotes battoides intermedia* Barnes & McDunnough. The adults are closely associated with *Eriogonum umbellatum* Torrey, the probable foodplant.

*29. *Incisalia fotis windi* Clench. On 10 July 1971 three first-instar and six fourth-instar larvae were found feeding on flowers and leaves of *Sedum obtusatum* Gray near Lake Mary. No adults had been previously recorded for the area.

*30. *Lycaena mariposa* Reakirt. On 17 July 1963 Noel La Due took three adults on a north-facing slope near Lake Mary.

*31. *Apodemia mormo* (Felder & Felder). On 17 August 1973, Shapiro took this species at Donner Pass. Details on its habitat will be published by him in a future paper. We had previously noted its suspected Sierran foodplant, *Eriogonum wrightii* Torr. ex Benth., to be abundant on the granite rock slopes at Donner Pass.

G. HESPERIIDAE

1. *Thorybes nevada* Scudder. This skipper is closely associated with a *Trifolium* (Leguminosae) species, the suspected foodplant.

4. *Erynnis propertius* (Scudder & Burgess). Determination change from *E. juvenalis* (Fabricius) (C. D. MacNeill, in litt.). The foodplant at Donner Pass is strongly suspected to be *Quercus vaccinifolia Kell.*

5. *Erynnis persius* (Scudder) complex. Determination change from *E. afranius* (Lintner) (Burns 1964).

*11. *Ochlodes sylvanoides* (Boisduval). Shapiro has taken this species in the Donner Pass region (17 August–5 October 1973) and will publish detailed data on its ecological associations in a future paper.

H. POSSIBLE FUTURE ADDITIONS TO THE BUTTERLY FAUNA OF DONNER PASS

1. *Parnassius phoebus behrii* Edwards. Specimens of this species were seen on Mt. Anderson and Tinker Knob in 1960, south of the Donner Pass area; the ridge connecting these peaks also extends to Mt. Lincoln, just inside the study area delineated in our 1962a paper. Because Mt. Lincoln is similar in habitat and flora to these peaks south of it, it is probable that this *Parnassius* will be eventually be taken there, also.

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ONE NEW SPECIES AND TWO RANGE EXTENSIONS FOR BRITISH COLUMBIA BUTTERFLIES

During the summer of 1972 the second author was collecting butterflies in northern British Columbia. Among the many extensions of butterfly distribution noted, three were of uncommon interest. These were all collected at one locality and in one day: Mt. Hoadley, near New Aiyansh, British Columbia, 55° 128° SW, 19 July 1972. One female of *Parnassius eversmanni* Ménétriés was collected. Males were observed but not collected. This represents a new species for British Columbia. It also represents a 430-mile southern extension of the species' known range in Mt. McKinley National Park and Eagle Summit, Alaska. It is not clear from the single female if this population is referable to *P. e. thor* Hy. Edwards.

Boloria epithore chermocki Perkins and Perkins (two males, two females) and *Erebia vidleri* Elwes (two females) were also collected. *Erebia vidleri* was not previously known north of Vancouver, British Columbia on the coast and Lillooet, British Columbia in the interior. Except for doubtful records from central Alaska (which have not been confirmed by the Alaska Lepidoptera Survey) and doubtful records for Smithers and Chilcotin, British Columbia, *B. epithore* was known positively only south of Lillooet, British Columbia. Thus the known range for *B. epithore* and *E. vidleri* has been extended 400 miles to the north.

Parnassius eversmanni was taken above timberline (6400 ft.) and replaced *P. phoebus* Fabricius which was just at timberline (5000 ft.). *Boloria epithore* and *Erebia vidleri* were taken at 5500 ft. elevation. At the lower elevations, *Plebejus saepiolus* (Boisduval), *Pieris napi* (Linnaeus), *Speyeria mormonia* (Boisduval), *S. hydaspe* (Boisduval), and *Papilio zelicaon* Lucas were also taken. This is a common species association for *Boloria epithore* and *Erebia vidleri* at more southern coastal localities.

In addition to the above records, one female of *Boloria epithore* was recorded at the following, more inland, locality: Hudson Bay Mountain, Ski Hill, near Smithers, British Columbia, 26 July 1972. The other two species were not seen here. This locality is near that for a doubtfully accurate record of *Parnassius eversmanni* that has been overlooked or ignored by other authors (Jones 1951, Entomol. Soc. Brit. Columbia, Occ. Pap. 1, 148 p.). Gunder (1932, Pan-Pac. Entomol. 8: 123–127) recorded *Parnassius eversmanni* as follows: Babine Range above Smithers, British Columbia, 20 July 1931, J. F. May, one female. The Smithers record for *B. epithore* (Perkins & Meyer 1973, Bull. Allyn Mus. Entomol. 11: 1–23) is the same as *Parnassius eversmanni*. Since the species *Melitaea mayi* Gunder from the same locality is of doubtful existence anywhere in North America, it was assumed that the *Parnassius eversmanni* and *Boloria epithore* were similarly mislabeled.

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