



BUTTERFLY HOSTPLANT RECORDS, 1992-2005, WITH A TREATISE ON THE EVOLUTION OF *ERYNNIS*, AND A NOTE ON NEW TERMINOLOGY FOR MATE-LOCATING BEHAVIOR

Dr. James A. Scott, 60 Estes Street, Lakewood, Colorado 80226

Abstract. Hostplants of larvae, based on 1,014 records (including 474 records of ovipositions and 540 discoveries of eggs, larvae, or pupae in nature) from 1992 through 2005, are presented for butterflies (including skippers), mostly from Colorado, and some from Wyoming, Nebraska, and Minnesota. New life histories are given, including many notes on egg placement, overwintering stage, behavior, and ecology. Larvae and pupae of Colo. *Cyllopsis pertepida* can be either green or tan, and thus retain a seasonal polyphenism that is present in other *Cyllopsis* even though only one generation occurs in Colo. *Erebia magdalena* oviposits on large boulders. *Phyciodes picta* evidently eats an annual gummy aster in much of the northern part of its range. Still another bog butterfly has been found to be polyphagous (*Pyrgus centaureae*), adding to the many polyphagous bog butterflies previously known (many *Boloria*, *Colias scudderii*); *Speyeria mormonia eurynome* might be semipolyphagous as well, though conclusive evidence is unavailable. *Cercyonis (sthenele) meadii* oviposits in shade north of pine trees near its sedge host that grows in that shade. *Coenonympha tullia* has green and brown larval forms, and striped and unstriped pupal forms. *Erebia epipsodea* oviposits high on its grass hosts in the foothills, low on its grass hosts in the alpine zone, to moderate the temperature of the eggs. The pupa of *Chlosyne palla calydon* is black-and-white, versus brown in Calif. *C. palla palla*. *Thorybes pylades* and *Everes amyntula* specialize on tendril-bearing (pea "vine") herbaceous legumes. *Stinga morrisoni* is the only known butterfly that chooses large bunch-grasses (seven species) of many grass taxa. *Paratrytone snowi* eats only *Muhlenbergia montana*. *Erynnis icelus* oviposits only on seedlings. The evolution of *Erynnis* is discussed, using many new characters of larvae and pupae and valval flexion. Mature larvae of some Pyrginae (*Pyrgus communis*, *Pholisora catullus*) that diapause become reddish in color, whereas non-diapausing mature larvae remain greenish. An appendix provides new terminology for describing mate-locating behavior.

INTRODUCTION

This paper continues the hostplant studies of Scott (1992). For species with significant amounts of new information or new life histories, a full discussion and interpretation of the species' hosts/ecology/immatures are given. I have thousands of color slides of immatures, which cannot be published here because of the expense.

METHODS

Methods are those of Scott (1992). Scoli are named by prefixing B- (for branching spine) to the name of the nearest primary seta, thus BD1 is the scoli near seta D1. All times are given as 24-hour standard time.

Papilionidae, Parnassiinae

Parnassius phoebus smintheus Doubleday (= *sayii* W. Edw.). 2 mature larvae found, one resting on bare ground, other eating *Sedum lanceolatum* tiny plant, both where *S. lanceolatum* was thick; one larva popped out osmeterium when squeezed; both were placed in jar with wheat grains on bottom and plastic foam packing on top, and by May 18 both constructed a loose web between wheat and packing to form a loose cocoon (with holes in the webbing up to 2 mm wide), the spaces within cocoon for pupa were 25 X 15 X 15 mm and 25 X 13 X 13 mm; Tintytown, Jefferson Co. Colo., May 11, 1994. Oviposition 12:46 on horizontal dead grass blade in *Muhlenbergia montana* clump 2 cm from *S. lanceolatum*, Tintytown, Jefferson Co. Colo., May 28, 1998. Oviposition 13:50 on dead *S. lanceolatum* inflorescence 8 cm above ground, 2 cm from fresh *S. lanceolatum*, Tucker Gulch, Jefferson Co. Colo., June 29, 1998. Adults associated with *S. lanceolatum*, Falcon County Park, Jefferson Co. Colo., June 6, 1994. Male and *Sedum lanceolatum* found SW Steamboat Point, Sheridan Co. Wyo., Aug. 3, 1995. Adult seen near *S. lanceolatum*; Crazy Woman Creek., Johnson Co. Wyo., Aug. 3,

1995. **PUPA** bright brownish-orange, the wings translucent slightly-greenish slightly-orangish tan, heart area browner on abdomen, a subdorsal row of small yellow-orange spots, a supralateral row of larger yellow-orange spots (~3 per segment, the middle one smallest). In contrast, pupae of ssp. *hermodur* from Mt. Evans were reddish-brown with brown wings and orangish spots.

Parnassius phoebus hermodur H. Edw. Oviposition 12:00, she landed in area of common *Sedum lanceolatum*, and laid egg on near-dead basal leaf 15 mm above ground on 8 cm tall *Cerastium beeringianum* plant, 120 cm from nearest *S. lanceolatum*; Loveland Pass, Summit/Clear Creek Co. Colo., Aug. 20, 1997; Loveland Pass, Summit/Clear Creek Co. Colo., Aug. 20, 1997. Adults associated with *Sedum lanceolatum*, W Hoosier Pass, Park Co. Colo., Aug. 7, 1998. **NEW HOSTPLANT:** *Sedum lanceolatum*. **EGG** orangish-tan when first laid thus hard to spot, but egg turned white after one minute; egg remains white until hatching.

Papilioninae, Papilionini

Papilio zelicaon Lucas. Larva 1 cm long found on yellow-flowered umbel (*Musineon tenuifolium*), female reared emgd. Feb. 9, 1995, Sowbelly Can., Sioux Co. Neb., May 16, 1994. Preoviposition 14:00 yellow-flowered umbel (*M. tenuifolium*?), Sowbelly Can., Sioux Co. Neb., May 16, 1994.

Papilio polyxenes asterius Stoll. Mature larva on *Cicuta douglasii* inflorescence pedicel; Wheatridge, Jefferson Co. Colo., Aug. 30, 1995, pupated Sept. 7, 1995, male emerged Sept. 22, 1997 (two years later). Ovipositions 13:26, 13:27 on uns of 15-cm-tall *Conium maculatum* leaves; Lakewood, Jefferson Co. Colo., May 19, 1996. Ovipositions 9:50, 11:09, 11:10, 11:11, 11:12 on *Anethum graveolens* tender leaf segments, the eggs placed ~60 cm up on 130 cm flowering plants; Lakewood, Jefferson Co. Colo., Aug. 11-12, 1996. Nearly-mature larva on *Petroselinum crispum*, larva had eaten 2 whole leaves, in lab ate *Conium maculatum*; Lakewood, Jefferson Co. Colo., Aug. 23, 2000. Adults associated with *Pastinaca sativa* var. *sylvestris* (judging by the abundance of this plant in S Minn. & Iowa, this is the main host there); 2.5 mi. NE Conger, Freeborn Co. Minn., June 27, 2001, and reclaimed prairie 1/3 mi. W Hall of Humes Lake, Freeborn Co. Minn., June 27, 2001. **MATURE LARVA** in Colo. generally has pale-green ground color and yellow spots; the black dashes are usually small but sometimes are enormously enlarged making the larva mostly black. **PUPA:** Pupae hibernate.

Papilio indra indra Reakirt. Oviposition 11:50 on leaf of *Harbouria trachyleura* seedling; Tucker Gulch, Jefferson Co. Colo., July 9, 1995. Preoviposition 12:22 *Aletes acaulis*; Lookout Mtn., Jefferson Co. Colo., June 10, 1996. **EGG** shiny cream, round. **1ST-STAGE LARVA** black, with small cream spots along side of body and a cream spot on each segment near middorsal line, on top of middle of body is a cream patch on A4 and rear of A3 consisting of slightly larger small cream spots and a cream ring on base of subdorsal A4 scolus; many black scoli, including subdorsal ones (fairly long A9, a little shorter T1-A1 & A7-8, shortest A2-6), dorsolateral ones on thorax (a long scolus on T1 is anteroventrad of the subdorsal scolus, small scoli T2-3), small scoli near side on T1-3, tiny dorsolateral and lateral scoli are on abdomen; head black.

Papilio glaucus rutulus Lucas. Mature larva swept from large *Salix lemmonii* bush, died when pupating; S Casper, Natrona Co. Wyo., Aug. 24, 1994. Oviposition 13:00 upperside of *Populus angustifolia* leaf, she fluttered a little while laying; W Idledale, Jefferson Co. Colo., July 8, 1995. Oviposition 11:07 green egg on top of leaf 7 cm long 2 cm from leaf tip on top (3 m above ground) of *Salix ligulifolia* bush about 4 m tall, she preovip. on about 5 other leaves of bush but maybe didn't lay eggs on those leaves; Wheatridge, Jefferson Co. Colo., July 7, 1998. Oviposition 13:30 on leaf ups of 70-cm-tall *Popula tremula tremuloides* bush, N-facing slope near hilltop, Crawford Hill, Jefferson Co. Colo., June 29, 1998. Intergrades between *glaucus* and *rutulus* became much more common during 1993-1994; most are closer to *rutulus* than *glaucus*, but some are closer to *glaucus*, and a few have mixed characters. Evidently the few *glaucus* that immigrate into the Denver area along the South Platte River encounter a wealth of suitable deciduous trees and lay eggs, and the F1 and backcross offspring usually mate with local *rutulus* because reproductive isolation is absent, resulting in progeny that are mostly nearer *rutulus* than *glaucus*, and some mixed specimens in which the various characters have become unlinked. The interbreeding between *P. glaucus*, *canadensis*, *rutulus*, and *alexiares* is sufficient to treat all these as ssp. of *P. glaucus*. **EGG** shiny leaf-green, with a translucent yellower-green patch on one side of egg. **1ST-STAGE LARVA** black, but T1 mostly dirty-cream, the top of T3 and A8 has a narrow transverse cream band, and a cream saddle on A3-4; a subdorsal scolus is on nearly every segment (longest T1, fairly long A8-9, moderate on T2-3 & A7, short on A1-6 [shortest on A2-5]), these scoli black except cream A3-4, a tiny dorsolateral scolus on T1-3; head black. **NEW HOSTPLANTS:** *Salix lemmonii* and *S. ligulifolia*. There is some evidence that *appalachiensis* Pavulaan & Wright is a distinct species, but I'm not impressed with the evidence that *glaucus* L. is a distinct sp. from *canadensis* Roth. & Jordan or that *rutulus* Lucas is a distinct sp. from *canadensis* (people accept that *alexiares* Hopffer is the same species as *glaucus*, yet *alexiares* has the wing pattern and valva prong of *rutulus*!).

Papilio eurymedon Lucas. Oviposition 11:31 on top of *C. fendleri* leaf of branch tip on middle of plant, she continued to flutter during oviposition; Mt. Falcon, Jefferson Co. Colo., June 27, 1995. Preoviposition 13:10-13:25 *C. fendleri* six times and *Prunus virginiana melanocarpa* once, Tinytown, Jefferson Co. Colo., June 17, 1992. Preoviposition 12:18 *P. v. melanocarpa*, Ralston Butte, Jefferson Co. Colo., June 10, 1994. Preoviposition 12:00 she ignored *C. fendleri* and landed on *Cercocarpus montanus* bushes twice, Tinytown, Jefferson Co. Colo., June 17, 1994. **EGG** olive-green, much later

developing rosy and dark-yellow areas on side and finally an orange-brown cast around side just before hatching. **1ST-STAGE LARVA** black, a cream saddle on rear 3/4 of A3 and all of A4, body has numerous subdorsal scoli (long T1, half the length T2-3 & A9, slightly shorter A8, shorter A1 & A7, small A2-6), small dorsolateral scoli are on T1-3, tiny lateral scoli T1-3, all scoli are black except the subdorsal scoli are cream on A3-4; head black. **2ND-STAGE LARVA** resembles bird dung, black mottled with a little brown, with cream saddle on middle of body, T1 mottled brown on top, a cream transverse band across rear extends forward as a dorsolateral tan band for several segments, various short tubercles (the longest a subdorsal on T1). **OLDER-LARVA** green (4th-stage a little smoky-green esp. on front of top)(4th-stage has a creamy wash--the remnant of the cream saddle of earlier stages--on A3-5), a long tan-cream subdorsal ellipse on T3 (containing a red-brown bump dorsally, a black ring with bluish-white center just above middle of ellipse, a red-brown bump in a brown ring, then a black transverse dash, a black ring with bluish-white center, and a small red-brown bump ventrally), a black transverse bar edged anteriorly by cream runs all across top of body on front of A2, T1 has subdorsal protuberance (remnant of scoli of earlier stages), a small subdorsal orange-brown cone on T2, (an orange-brown spot T3), A1, & A789, 3 rows (near-dorsal, dorsolateral, subspiracular) of small black-rimmed bluish spots, spiracles light-brown; head green.

Papilio multicaudata Kirby. Female bent abdomen to *Prunus virginiana* leaf 3X, Apex County Park, Jefferson Co. Colo., Aug. 1, 1992. Preoviposition 13:12 *P. virginiana*, Chimney Gulch, Jefferson Co. Colo., June 9, 1994. Female fluttering over *P. virginiana*, Tinytown, Jefferson Co. Colo., June 17, 1994. Preovipositions 10:30, 10:38 *Prunus amygdaloides*, female fluttered and bent abdomen on leaf ups four times 4-5 m above ground on this tree, but no eggs found (eggs could have been missed); Lakewood, Jefferson Co. Colo., July 15, 1996. Oviposition 11:32 *P. virginiana* leaf; Green Mtn., Jefferson Co. Colo., June 6, 1997. 2nd-stage larva resting on top of *Fraxinus pensylvanica* var. *lanceolata* leaf 1.7 m up on 3 m tree; Lakewood, Jefferson Co. Colo., July 22, 1997. **FIRST-STAGE LARVA** brownish-black, with a conspicuous white saddle-patch on top of middle of body, many dorsolateral scoli (the longest on front and rear), many tiny white spots on medial side and medial to the first thoracic scoli, a small white spot on anteromedial part of base of most scoli, and some tan areas on top of thorax. **SECOND-STAGE LARVA** similar, blackish with conspicuous cream saddle, the bottom of larva including prolegs dirty-white.

PIERIDAE, Coliadinae

Colias meadii meadii W. Edw. Oviposition 10:40 *Trifolium nanum* leaf top, Loveland Pass, Summit Co. Colo., July 27, 1994. Oviposition 9:21 on *Trifolium dasyphyllum* leaf top; W Hoosier Pass, Park Co. Colo., Aug. 7, 1998. 2 cm larva found (green, with cream lateral & subdorsal bands, the upper a little wavy), pupated (pupa yellowish, with browner lateral band, tiny midventral brown dots) and adult emerged, Loveland Pass, Summit Co. Colo., Aug. 7, 1995.

Colias alexandra alexandra W. Edw. Ovipositions 14:11, 14:12 on top of *Thermopsis divaricarpa* leaves (2nd leaf was rather dry and curled with very crinkled margins), Falcon County Park, Jefferson Co. Colo., July 9, 1992. Oviposition 13:00 *T. divaricarpa*; Tinytown, Jefferson Co. Colo., July 1, 1996.

Colias edwardsii (alexandra?) altiplano Fisher & Scott. Female landed on *T. divaricarpa*, Sowbelly Can., Sioux Co. Neb., June 25, 1994.

Colias eurytheme Bdv. Oviposition 11:55 *Astragalus flexuosus* leaf top, SW Greenwood, Custer Co. Colo., July 16, 1993. Oviposition 14:37 *A. flexuosus* leaf top, Tinytown, Jefferson Co. Colo., July 25, 1994. Oviposition 14:37 *A. flexuosus* leaf top, Tinytown, Jefferson Co. Colo., July 25, 1994. Oviposition 10:53 *A. flexuosus* leaf top; oviposition 13:05 *Thermopsis divaricarpa* leaf top; Tinytown, Jefferson Co. Colo., July 9, 1994. Ovipositions 12:21, 13:51, on top of leaves of *T. divaricarpa* seedling, Falcon County Park, Jefferson Co. Colo., July 9, 1992. Ovipositions 12:21, 13:51, on top of leaves of *T. divaricarpa* seedling, Falcon County Park, Jefferson Co. Colo., July 9, 1992. Oviposition 13:16 *T. divaricarpa* leaf top, Indian Gulch, Jefferson Co. Colo., July 15, 1993. Ovipositions 12:58, 13:04, 13:06 *Trifolium hybridum* leaf tops after ignoring *Trifolium repens* 10X; Wheatridge, Jefferson Co. Colo., July 25, 1993. Mature larva found near *Trifolium fragiferum* (*Medicago sativa* rare), female emerged Sept. 18; Barr Lake, Adams Co. Colo., Sept. 3, 1993. Female landed on *Vicia americana* but left & no egg found, 5 mi. N Boulder, Boulder Co. Colo., June 8, 1994. Oviposition 10:30 *Lupinus argenteus* (blue flowers) leaf ups, ovipositions 10:35 & 10:37 *Astragalus flexuosus* leaf ups, ovipositions 10:39 & 10:39 *Astragalus crassicaarpus* leaf ups; Cherry Gulch, Jefferson Co. Colo., June 21, 1994. Oviposition 10:33 *Glycyrrhiza lepidota* leaf top, then landed on *Melilotus officinalis* but did not lay; Wheatridge, Jefferson Co. Colo., Aug. 27, 1994. Ovipositions 9:59, 9:59 on *G. lepidota* leaf tops; Wheatridge, Jefferson Co. Colo., July 7, 2001. Oviposition 10:41 *Melilotus alba* leaf top; Julesburg, Sedgwick Co. Colo., July 15, 1997. Ovipositions 12:37, 12:38 on *Astragalus flexuosus* leaf tops; Mt. Zion, Jefferson Co. Colo., Aug. 28, 1997. Ovipositions 11:50, 11:53 *Lotus corniculatus* young leaves; 1 mi. N Ankeny, Polk Co. Iowa, July 23, 1999. Oviposition 16:20 *Trifolium repens* leaf top; 2.5 mi. NE Conger, Freeborn Co. Minn., July 26, 1999. Oviposition 14:12 *T. repens* leaf top; Hall of Humes Lake, Freeborn Co. Minn., July 30, 1999. Ovipositions 10:34 (very rapid laying of 5 eggs) on five *T. repens* leaf tops; Lakewood, Jefferson Co. Colo., Aug. 23, 2000. Oviposition 10:20 *T. repens* leaf top 2.5 mi. NE Conger, Freeborn Co. Minn., June 27, 2001. Oviposition 13:30 *T. repens* leaf top; Lakewood, Jefferson Co. Colo., July 5-6, 2001. Oviposition 11:36 on *T. repens* leaf top; Lakewood, Jefferson Co.

Colo., July 18, 2001. Adults common in *Medicago sativa* field, Paxton, Keith Co., Neb., Aug. 9, 2005. **NEW HOST:** *Lotus corniculatus*.

***Colias eurytheme* or *philodice*.** Pupal shell (*eurytheme*?) found on *Machaeranthera phyllocephala*, near probable host *Medicago sativa*; Fort Morgan, Morgan Co. Colo., Sept. 15, 1995. Larva (green with white lateral line on body) found in collecting net, near *Thermopsis divaricarpa* but host unknown, died July 20 when 15 wasps emerged; Tinytown, Jefferson Co. Colo., June 17, 1997. Half-grown larva found on *Medicago sativa*; Barr Lake, Adams Co. Colo., Sept. 16, 1997. Mature larva swept from *M. sativa*; 2.5 mi. NE Conger, Freeborn Co. Minn., June 21, 2001.

Colias philodice philodice Godart. Oviposition 13:12 *Astragalus flexuosus* leaf top, Tinytown, Jefferson Co. Colo., July 27, 1993. Oviposition 11:30 *Melilotus officinalis* leaf top, WNW Douglas, Converse Co. Wyo., Aug. 18, 1993. Oviposition 15:28 *Thermopsis divaricarpa* leaf top, Sowbelly Can., Sioux Co. Neb., May 16, 1994. Oviposition 12:17 *T. divaricarpa* leaf top, Sowbelly Can., Sioux Co. Neb., May 17, 1994. Preoviposition *Astragalus adsurgens*, NW Ralston Butte, Jefferson Co. Colo., May 30, 1994. Adults associated with *Medicago sativa*, S Huntley, Goshen Co. Wyo., June 24, 1994. Oviposition 9:34 two eggs side-by-side *M. sativa* leaf top; oviposition 10:00 *Trifolium repens* leaf ups; Hall of Humes Lake, Freeborn Co. Minn., July 30, 1999. Oviposition 11:49 *M. sativa* leaf top; Lakewood, Jefferson Co. Colo., Sept. 29, 2002. Larva swept from *Lupinus ?argenteus* or *Melilotus officinalis*, male adult reared; SW Pine Tree, Campbell Co. Wyo., Aug. 17, 1994. Oviposition 9:11 *Trifolium repens* tiny leaf top, NE Alden, Freeborn Co. Minn., Sept. 13, 1994. Oviposition 10:25 on top of *T. repens* flower; 2.5 mi. NE Conger, Freeborn Co. Minn., July 28, 1999. Albino oviposited 15:25 *Trifolium pratense* mature leaf top; Hall of Humes Lake, Freeborn Co. Minn., July 27, 1999. Oviposition 13:30 *Medicago lupulina* leaf top; Barr Lake, Adams Co. Colo., Oct. 3, 1995. Ovipositions 9:57, 10:22 on ups of leaflets of *Astragalus bisulcatus* seedlings, an albino female oviposited 10:13 on ups of leaflet of *A. bisulcatus* seedling; Leyden Gulch, Jefferson Co., Colo., Sept. 3, 1997. Oviposition 15:01 on leaf ups of lush *A. bisulcatus* seedling; Leyden Gulch, Jefferson Co. Colo., Sept. 5, 1997. **NEW HOSTS:** *Melilotus officinalis*, *Thermopsis divaricarpa*.

Colias scudderii scudderii Reakirt. Oviposition 10:54 two eggs on leaf uns of *Polygonum viviparum* seedling on cushiony mound of willow bog (*P. viviparum* near egg, *Salix planifolia* 10 cm onward); Loveland Pass, Summit Co. Colo., Aug. 28, 1995. Oviposition 10:58 *Vaccinium cespitosum* on mound of willow bog; Loveland Pass, Summit Co. Colo., Aug. 21, 1995. Oviposition 10:59 *V. cespitosum* leaf uns in hollow of willow bog (not near *Salix*); Loveland Pass, Summit Co. Colo., Aug. 29, 1995. Egg found *V. cespitosum* leaf ups in nook below row of *Salix planifolia*, preoviposition near *V. cespitosum* 12:10; Loveland Pass, Summit Co. Colo., Aug. 31, 1995. Oviposition 11:14 egg (red on Aug. 16) on leaf uns of *V. cespitosum* seedling (she landed four times on lush low-herb-mounds in willow bog, then flew to bog edge 30 cm from *Salix planifolia* bush and laid egg) (*V. cespitosum* thick 0-100, *Viola labradorica* 7-100, 8-100 common, *Achillea lanulosa* 4, 8, 8, 10, etc., *Veronica nutans* 6, *Pedicularis groenlandica* 8, *Erigeron ursinus* 10, 10, 15, etc., *Polygonum bistortoides* 25, *Salix planifolia* 30-100, *Salix brachycarpa* 70, 80); Loveland Pass, Summit Co. Colo., Aug. 13, 1998. Oviposition 12:51 (egg hatched Aug. 11) on top of leaf of *Salix planifolia* (4-cm-tall seedling with five little leaves) (*S. planifolia* 0-100, *Polygonum viviparum* 15, 25, *Sedum rhodanthum* 3-30, *Caltha leptosepala* 4-100, *Pedicularis groenlandica* 10-100, *Senecio dimorphophyllus* 8, 40, 100, *Castilleja rhexifolia* 12, 18, 30, etc., *Epilobium anagallidifolium* 9, 10, to 100 common, *Saxifraga oregana* 35); another female preoviposited 12:35 on open mound in willow bog; Loveland Pass, Summit Co. Colo., Aug. 6, 1998. **HOSTPLANTS:** All three plants (*Polygonum viviparum*, *Vaccinium cespitosum*, *Salix planifolia*) are hostplants of this polyphagous butterfly. **EGG** turned orange in 2 days, hatched in 4 days.

Eurema nicippe (Cramer). Female flew slowly over *Phaseolus vulgaris* (garden green beans/wax beans) then landed on cultivated *Lupinus* sp. for a few seconds, then flew; Lakewood, Jefferson Co. Colo., July 22, 1997.

Nathalis iole Bdv. Ovipositions 12:16, 12:17, and three other eggs found (all eggs orangish-yellow), all on leaflet edges inside dissected leaf ends of *Bahia dissecta* seedlings 4-5 cm tall, one female had laid all these eggs because all eggs were within 30 cm and plants farther away (1-3 m) had no eggs; Foxton, Jefferson Co. Colo., Sept. 4, 1998. Adults associated with *Dyssodia papposa*; Windsor, Weld Co. Colo., Aug. 4, 2001. **NEW HOST:** *Bahia dissecta*. **1ST-STAGE LARVA** light-green, heart-line darker-green, T1 seems slightly-lighter-green and larger, T1 has subdorsal brown sclerite (collar) possessing setae, and T1 has large lateral brown sclerite; head black, with small setae all over head.

Pierinae

Euchloe olympia (W. Edw.). Oviposition cream egg 10:25 on *Sisymbrium altissimum* flower buds, Horsetooth Res., Larimer Co. Colo., May 22, 1993. Oviposition 14:28 leaf ups of seedling, 3 mm long larva found on young fruit, both on *Descurainia pinnata*; female fed on *Lesquerella* flowers 10X but did not oviposit; W Penrose, Fremont Co. Colo., May 6, 1994. Preoviposition she bent abd. to *Arabis glabra* silique 2/3 of way up 60 cm plant but no egg found, Tinytown, Jefferson Co. Colo., June 3, 1994. **NEW HOST:** *S. altissimum*. **1ST-STAGE LARVA** dark-yellow, with blackish seta bases and setae and suranal plate and pronotum; head black.

***Euchloe (ausonia) ausonides* or *olympia*.** Egg found *Lepidium campestre* flower buds, egg found *Descurainia sophia* flower buds; Van Bibber Creek, Jefferson Co. Colo., May 20, 1993. **1ST-STAGE LARVA** yellow, with brown sclerites below setae, suranal plate brown, legs blackish; head blackish.

Euchloe (ausonia) ausonides? 2 orange eggs *Descurainia sophia* flower buds, Tinytown, Jefferson Co. Colo., June 3, 1994.

Euchloe (ausonia) ausonides (Lucas) . Orange egg found *Arabis glabra* flower bud, Mt. Falcon, Jefferson Co. Colo., May 27, 1994. 2 orange eggs on side of *A. glabra* inflor., Tinytown, Jefferson Co. Colo., June 1, 1994. Oviposition 9:33 side of inflor., 2nd-stage found on silique, both on *A. glabra*; Tinytown, Jefferson Co. Colo., June 2, 1994. 3 half-grown & 4 nearly full-grown larvae on siliques, oviposition 10:57 flower pedicel of young plant with large siliques, all *A. glabra*; Tinytown, Jefferson Co. Colo., June 17, 1994. 1-cm-long larva found on *A. glabra* silique, Apex Gulch, Jefferson Co. Colo., June 20, 1995. 1-cm-long larva on *A. glabra* silique; Tinytown, Jefferson Co. Colo., July 22, 1995. 2 orange eggs found on *A. glabra* siliques; Ralston Butte, Jefferson Co. Colo., July 10, 1995. 4th-stage larva found *A. glabra* silique; Apex Gulch, Jefferson Co. Colo., June 25, 1996. Preoviposition *A. glabra*; Tinytown, Jefferson Co. Colo., July 5, 1995. 4 mature larvae on *A. glabra* siliques; Tinytown, Jefferson Co. Colo., July 17, 1997. 3 eggs found *Sisymbrium* sp., Tucker Gulch, Jefferson Co., Colo., June 15, 1995.

Pieris rapae (L.). Ovipositions 10:49, 10:50, 10:51, 10:54 on leaves of *Nasturtium officinale*, oviposition 11:16 on *Veronica americana* leaf underside 1-2 cm from *N. officinale*, Wheatridge, Jefferson Co. Colo., July 11, 1992. Ovipositions 13:22, 13:23 *N. officinale*, Wheatridge, Jefferson Co. Colo., July 25, 1993. Oviposition 12:47 *N. officinale*, Wheatridge, Jefferson Co. Colo., July 10, 1994. Adults associated with *N. officinale*, Wheatland, Platte Co. Wyo., Aug. 23, 1994. Oviposition 9:55 *N. officinale* seedling leaf uns, and 2 eggs found on same leaf uns; Leyden Gulch, Jefferson Co. Colo., July 27, 1995. Oviposition 13:44 *N. officinale* leaf uns; Wheatridge, Jefferson Co. Colo., Aug. 30, 1995. Oviposition 10:50 *N. officinale* leaf; Wheatridge, Jefferson Co. Colo., July 3, 1999. Ovipositions 10:25, 10:25, 10:37, 10:38 on *Barbarea orthoceras* leaf undersides in shade of 1/2 m tall plants on creek bank, 1 mi. W. Idledale, Jefferson Co. Colo., Aug. 7, 1992. Adults associated with *B. orthoceras*, Indian Creek Cgd., Douglas Co., Colo., Aug. 27, 1992. Oviposition 11:30 *B. orthoceras* seedling; Tinytown, Jefferson Co. Colo., July 31, 1996. 20-mm-long larva found on top of partly-eaten *B. orthoceras* leaf; Tinytown, Jefferson Co. Colo., Sept. 22, 1992. Ovipositions 10:25, 10:25, 10:37, 10:38 on *B. orthoceras* leaf undersides in shade of 1/2 m tall plants on creek bank, 1 mi. W. Idledale, Jefferson Co. Colo., Aug. 7, 1992. 20-mm-long larva found on top of partly-eaten *B. orthoceras* leaf; Tinytown, Jefferson Co. Colo., Sept. 22, 1992. Preovip. *B. orthoceras*, Apex Gulch, Jefferson Co. Colo., June 21, 1995. Oviposition 11:40 *B. orthoceras*, nr. Golden, Jefferson Co. Colo., May 19, 1994. Adults assoc. common *B. orthoceras*, Lefthand Can., Boulder Co. Colo., June 8, 1994. Adults associated with *B. orthoceras*?, 15 mi. SW Hamilton, Moffat Co. Colo., July 19, 1996. 4 yellowish eggs found on *B. orthoceras* leaf ups and uns; Apex Gulch, Jefferson Co. Colo., Aug. 21, 1998. Preoviposition 11:00 *B. orthoceras*, Apex Gulch, Jefferson Co. Colo., May 26, 1998. Oviposition 10:21 three eggs on uns of basal leaves, and ~6 other eggs found (2 on leaf ups, 4 uns); all on *Barbarea vulgaris*; N Foxton, Jefferson Co. Colo., Aug. 29, 1994. Oviposition 11:05 young leaf of seedling *B. vulgaris*; N Foxton, Jefferson Co. Colo., Aug. 26, 1996. Ovipositions 12:15, 12:14 on leaf uns of *B. vulgaris* seedlings; Lakewood, Jefferson Co. Colo., May 24, 2001. Oviposition 9:35 *B. vulgaris*; Lakewood, Jefferson Co. Colo., July 5-6, 2001. Ovipositions 11:07 on leaf upperside, 11:08, 11:09 on leaf undersides, all on *Cardaria pubescens*; 120th X I-76, Adams Co., Colo., Sept. 15, 1992. Ovipositions 11:59, 11:59, 12:00 on leaf uns of *C. pubescens* seedlings at base of dead inflorescences; Barr Lake, Adams Co. Colo., 5075', Sept. 9, 1996. Adults assoc. *C. pubescens* in pastures and *N. officinale* along stream; Fort Morgan, Morgan Co. Colo., Sept. 15, 1995. Oviposition 9:40 leaf underside and 3 other eggs found, all on *Cardaria chalepensis*, Austin, Delta Co. Colo., July 30, 1993. Ovipositions 11:40, 11:41, 11:46 and three other eggs found on leaf uns of *C. chalepensis* seedlings; Barr Lake, Adams Co. Colo., Oct. 1, 1997. Ovipositions 10:22, 10:34, 10:35, 10:57 *Rorippa sinuata* leaf uns; Barr Lake, Adams Co. Colo., Sept. 1, 1994. Ovipositions 9:59, 10:32, 10:40, 11:30 *R. sinuata* leaf uns, oviposition 11:14 *Rorippa teres* leaf uns; Barr Lake, Adams Co. Colo., Sept. 5, 1994. Oviposition 12:32, 13:31 *R. sinuata* leaf uns; Barr Lake, Adams Co. Colo., Sept. 24, 1994. Oviposition 14:47 *R. sinuata* leaf uns, Barr Lake, Adams Co. Colo., Sept. 28, 1994. Oviposition 10:48 ?*Rorippa hispida* Leaf uns; Rooney Ranch, Jefferson Co. Colo., July 22, 1997. Oviposition 13:16 *Raphanus sativus* seedling leaf uns, Lakewood, Jefferson Co. Colo., May 3, 1996. Oviposition 11:10 on *Raphanus sativus* "White Icicle" leaf uns, oviposition 11:10 on *R. sativus* "Cherry Belle" leaf uns; Lakewood, Jefferson Co. Colo., May 24, 1998. Oviposition three eggs on *Hesperis matronalis* leaf uns at base of plant in garden; Lakewood, Jefferson Co. Colo., July 12, 1998. Oviposition 11:02 and 7 other eggs found, all on uns of lower leaf (near ground) of *H. matronalis* which had flowering inflorescence 1 m above ground; Lakewood, Jefferson Co. Colo., Aug. 15, 2000. Ovipositions 13:00, 13:00, 13:00 on *H. matronalis* leaf uns just below almost-blooming inflorescence; Lakewood, Jefferson Co. Colo., May 15, 2001. Ovipositions 12:08, 12:09 *H. matronalis* leaf uns (50 cm above ground, just below inflorescence); Lakewood, Jefferson Co. Colo., June 25, 2002. Preoviposition near mature *H. matronalis* plant; Windsor, Weld Co. Colo., July 4, 2004. Oviposition 11:51 *Thlaspi montana* leaf uns; Crown Hill Lake, Jefferson Co. Colo., June 2, 1999. Adults assoc. *Lepidium campestre*; South Platte River trail, Denver, Colo. May 18, 1999. One adult seen on *Stanleya pinnata*, but no eggs found; E of Florence, Fremont Co. Colo., Sept. 7, 1998. Ovipositions 9:38 & 9:39 & 11:02 and 8 eggs found on, all on young leaves near top of *Sisymbrium officinale*; 3 mi. NE Conger, Freeborn Co. Minn., July 28, 2004. Oviposition 11:42 & 2 other eggs found, all on leaf uns of *Brassica oleracea* var. *capitata* (cabbage), females stayed near my cabbages and just kept ovipositing on them all summer; Lakewood, Jefferson Co. Colo., July 12, 2005. Oviposition 10:30 leaf uns *B. oleracea* var. *capitata*; Lakewood, Jefferson Co. Colo.,

July 18, 2005. Mature larva found on leaf next to small *B. oleracea* var. *capitata* head, pupated Nov. 16; Lakewood, Jefferson Co. Colo., Nov. 15, 2005. Preoviposition and adults common at *Armoracia lapathifolia* patch, obviously a host (patrolling males even mate-locating and chasing females at patch); Lakewood, Jefferson Co. Colo., July 15, 2004. **NEW HOSTPLANTS:** *Rorippa sinuata*, *hispida*, *Cardaria chalepensis*, *Raphanus sativus*, *Hesperis matronalis*, *Sisymbrium officinale*. **MATURE LARVA** blue-green, with numerous white setae each arising from black base, a dark-yellow heart-band, a lateral row of dark-yellow spots (a spot behind spiracle, and one touching front of spiracle, each spiracle ringed with whitish). **PUPA** greenish-light-gray with numerous tiny white spots, the spiracles and tip of head horn yellowish, proboscis tip black, side of head horn black, middorsal ridge along pupa slightly-yellowish white (with black spots on T2-3 and A4-10), dorsolateral ridge white with the most prominent point on A3 yellowish,

Pieris "napi" mcdunnoughi Remington. Female hovering over *Barbarea orthoceras*; Tinytown, Jefferson Co. Colo., Aug. 17, 1995. Oviposition 12:37 four eggs on leaf uns (3 under one leaf, one under second leaf) of *Thlaspi montanum* seedlings; Loveland Pass, Summit Co. Colo., Aug. 26, 1995. **EGG** cream, with only a slight yellowish tint.

Pontia beckerii (W. Edw.). ~Six 1-cm-long larvae found on *Stanleya pinnata* flower buds (2 pupated Aug. 4-5, 1 male emerged Aug. 15); lab larvae ate *S. pinnata* & *Brassica oleracea* var. *acephala* & *Sisymbrium altissimum*, but refused *Berteroa incana* & *Cakile edentula*; near Gateway, Mesa Co. Colo., July 29, 1993. **HALF-GROWN LARVA** light-yellow, greener (due to gray mottling) between middorsal axis and lateral axis, a wide transverse orangish-yellow band (from lateral to dorsal to other lateral) is centered on each intersegmental area, with numerous black conelike seta bases with long setae that are black on basal half and white on distal half; head light-yellow with similar setae. **MATURE LARVA** slightly-bluish-cream with numerous black spots (one at base of each large seta), middorsal line appears paler because it lacks black seta bases & dark-gray patches & setae, a very broad subdorsal band below that appears darker due to many black seta bases & dark-gray mottling, then a broad paler lateral band (due to few black seta bases & little dark-gray mottling) includes tan spiracles, then a broad darker sublateral band (due to many black seta bases & much dark-gray mottling) lies above legs & prolegs, on each intersegmental area from T1-A9 is a broad orangish-yellow transverse band running from level of spiracles dorsally to other side (the band is narrow laterally behind A8, & only a lateral spot behind A9)(these 11 yellow bands lack black seta bases but have dark-gray mottling where the subdorsal dark band crosses them), side of T1 leg base pale-yellow, side of T2-3 leg bases bright-yellow, a small supraventral yellow patch on A1-2 and small patch on A7, side of prolegs bright-yellow, A10 proleg has black proleg shield, underside cream; head slightly-bluish--greenish cream with black spots at base of major setae, side of head yellowish, slightly yellowish above labrum, eyes black. **PUPA** resembles a bird dropping, mottled blackish-brown on top of head & thorax, underside of head and appendages black or brownish-black (grayish on base of proboscis of one pupa), top of A1 cream with 4 black spots on anterior edge, A2-3 bird-poop cream with light-brown areas on rear of A2-3 (the brown on A2 weak on 2 of 3 pupae), A4-8 mottled creamy-tan, an irregular wide cream band on side of abdomen, A9 and cremaster dark-brown, spiracles orange-brown, a brownish sublateral band on abdomen (widest posteriorly), underside of abdomen bird-poop cream, the bump on sustensor ridge cream, side of T1-2 cream, base & center of wing gray-brown blended into the cream anterior and outer areas of wing, a black spot at end of discal cell, sloping posterior margin of wing gray-brown (with sinuous inner edge), tip of proboscis black where it extends to middle or near rear or rear of A5 (longer than wing tips in all 3 pupae!), a middorsal humped-upward crest on T2 is orange-brown on 1 pupa and blackish on 2 others, A2-3 bulges upward, a point on front of head, pupa has silk girdle over A1 & cremaster is attached to silk pad; duration 10-11 days in lab.

Pontia sisymbrii sisymbrii (Bdv.). 1.5-cm-long larva found on *Arabis glabra* silique, Falcon County Park, Jefferson Co. Colo., June 6, 1994.

Pontia protodice (Bdv. & Leconte). 1 cm larva found on *Arabis drummondii* silique, Fraser, Grand Co., Colo., July 30, 1992. Oviposition 10:04 on leaf top, 5 larvae found on lower branches (2 feeding on leaves)(2 ~3rd-stage, 1 4th-stage, 1 mature, 1 mature larva crawling to pupation site [pupated that evening]), all on *Cleome serrulata*; Barr Lake, Adams Co. Colo., Sept. 3, 1992. 5 larvae (1 mature, one 4th-stage, three 3rd-stage) found on *C. serrulata* leaves; Barr Lake, Adams Co. Colo., Sept. 8, 1992. Oviposition 12:11 on ups of small leaf near inflorescence of 30-cm-tall *C. serrulata*; Barr Lake, Adams Co. Colo., Sept. 2, 1998. Oviposition 10:55 *Rorippa sinuata* leaf uns; female bent abd. on *Sisymbrium officinale* but did not lay; Barr Lake, Adams Co. Colo., Sept. 1, 1994. Ovipositions 10:10, 10:21 *R. sinuata* leaf uns near top of seedlings; Barr Lake, Adams Co. Colo., Sept. 5, 1994. Oviposition 12:47 *Sisymbrium altissimum* flower bud; Kiowa Creek, Elbert Co. Colo., July 4, 1995. Oviposition 14:34 *R. sinuata* leaf uns of seedling; Barr Lake, Adams Co. Colo., Sept. 24, 1994. Ovipositions 10:48, 10:53, 10:55 *Nasturtium officinale* leaves; Wheatridge, Jefferson Co. Colo., July 3, 1999. Oviposition 9:32 two eggs and 2 other eggs found, on pedicels and stems of *Hesperis matronalis* inflorescence, oviposition 13:43 on *Sisymbrium altissimum* silique and several other eggs found on inflorescence of the plant; Lakewood, Jefferson Co. Colo., June 12, 2001. 20-mm larva found on *Barbarea vulgaris* lower stem; Lakewood, Jefferson Co. Colo., June 16, 2001. ~10 2nd-stage larvae found on *Cardaria chalepensis* inflorescence (9) and leaf (1); Crown Hill Park, Wheatridge, Jefferson Co. Colo., June 17, 2001. Ovipositions 11:08 on leaf uns, 11:09 leaf uns, 11:10 on flower bud, all on cultivated *Aurinia "Alyssum" saxatile*; Lakewood, Jefferson Co. Colo., July 4, 2005. **NEW HOSTPLANTS:** *Nasturtium officinale*, *Hesperis matronalis*, *Cardaria chalepensis*, *Aurinia "Alyssum" saxatile*.

Pontia callidice occidentalis Reakirt. Ovipositions 10:11, 10:42, 11:34 *Rorippa sinuata* leaf uns near top of seedlings; Barr Lake, Adams Co. Colo., Sept. 5, 1994. Oviposition 11:29, 13:31 *R. sinuata* leaf uns, oviposition 13:52 *Aster lanceolatus hesperius!* (Compositae, a mistake by the female) leaf uns of tiny seedling; Barr Lake, Adams Co. Colo., Sept. 24, 1994. **NEW HOST:** *Rorippa sinuata*. **EGG** yellow-cream when laid (some older eggs pale-orange), becoming reddish-orange. **1ST-STAGE LARVA** tanish-ochre (deep-yellow), seta-base sclerites are brown; head black.

Neophasia menapia menapia (C. & R. Felder). Female landed 8 m up on *Pinus ponderosa* bough 11:02 and remained there 30 sec until I threw rock, perhaps ovipositing?; Tintytown, Wheatridge, Jefferson Co. Colo., Aug. 20, 1998.

NYMPHALIDAE, Danainae

Danaus plexippus plexippus (L.). ~4th-stage larva found among *Asclepias speciosa* flowers, a leaf eaten; Indian Gulch, Jefferson Co. Colo., July 6, 1992. Mature larva on *A. speciosa* (on middle of underside of leaf larva had chewed midvein down to stop milky sap flow at leaf tip where larva was eating), 1 mi. W. Idledale, Jefferson Co. Colo., Aug. 5, 1992. 2 mature, 1 4th-stage, 1 3rd-stage larvae found on *A. speciosa*, all had leaf midvein chewed through on underside and leaf eaten distal to that, a larva spit a vast amount of green fluid when I grabbed it with tweezers; Barr Lake, Adams Co. Colo., Sept. 8, 1992. Newly-emerged female found next to *A. speciosa* plant with midvein chewed 1.5 cm from base and leaf drooping beyond the cut and leaf tip chewed off and apical leaves of plant chewed off; Wheatridge, Jefferson Co. Colo., Aug. 27, 1994. Adults associated with *A. speciosa*, Meeker, Rio Blanco Co. Colo., July 19, 1996. Mature larva on *A. speciosa* leaf (petiole chewed slightly so that leaf droops); Wheatridge, Jefferson Co. Colo., Sept. 26, 1997. Oviposition 12:14 *A. speciosa* leaf uns (egg placed near midrib under 80 X 22 mm leaf) of seedling 25 cm tall; Wheatridge, Jefferson Co. Colo., July 28, 1998. Near-mature larva eating *Asclepias incarnata* small leaf tip, larva did NOT chew midvein to stop sap flow; Wheatridge, Jefferson Co. Colo., Aug. 20, 1992. 4 mature larvae on top of *A. incarnata* seedlings 25 cm tall; larvae bite through the base of leaf to make it droop and stem the milky sap flow; Wheatridge, Jefferson Co. Colo., Sept. 5, 1996. Ovipositions 9:08, 9:09, 9:12 on leaf uns of *Asclepias syriaca* seedlings 6-8 cm tall; Hall of Humes Lake, Freeborn Co. Minn., July 30, 1999. Newly-emerged adult found near *A. syriaca*; 2.5 mi. NE Conger, Freeborn Co. Minn., Sept. 25, 2000. 4th-stage larva found crawling on grass near *A. syriaca*; 2.5 mi. NE Conger, Freeborn Co. Minn., June 24, 2001. Nearly-mature larva feeding on *A. syriaca* leaf of 23-cm-tall plant after chewing midrib (distal end of pedicel) partway through; 2.5 mi. NE Conger, Freeborn Co. Minn., June 27, 2001. Mature larva on top (chewed down) of *A. incarnata* stem; Hall of Humes Lake, Freeborn Co. Minn., July 26, 2004. **HOSTS:** *A. speciosa* is the main host in Colo., where *A. incarnata* is an infrequent host, because the former is much more abundant in Colo. *A. syriaca* is the main host in Minn. **ANTI-SAP DEVICE:** older larvae have the habit of chewing the midvein (or sometimes the petiole) of large leaves to stem the flow of the milky latex, which must be semi-poisonous to the larvae.

Danaus gilippus strigosus (Bates). Ovipositions 10:07, 10:10, 10:15, 10:17, 10:19 on leaf undersides near base of leaves of 5-15-cm-tall *Asclepias incarnata* seedlings (4 eggs on terminal leaf, 1 egg under penultimate leaf); Wheatridge, Jefferson Co. Colo., July 12, 1993. Egg found on terminal leaflet underside of *A. incarnata* 15-cm-tall seedling, Wheatridge, July 14, 1993. Egg found on top of upper leaf of *A. incarnata* seedling, egg hatched July 31, mature larva by Aug. 11, Wheatridge, July 31, 1993. Oviposition 10:10 on leaf uns of 12-cm-tall *Asclepias speciosa* seedling with narrow leaves after fluttering 20 cm above ground inspecting those seedlings (she landed on mature *A. speciosa* several times but instantly departed); Indian Gulch, Jefferson Co. Colo., July 13, 1998. **EGG** cream, ~22 vertical ridges; duration 4 days. **FIRST-STAGE LARVA** pale-bluish-gray, the insides turning green due to food, with subdorsal fleshy tubercles (brown at base and black near tip) on T2, A2, A8, a wide transverse brown patch across top of each segment from T2-A8 includes a yellow cream spot near top and includes the tubercles near lateral end and narrow extends down to side where setae arise from brown end, proleg plates grayish-black, suranal plate grayish-black, "collar" consists of a large black subdorsal sclerite; head black with gray antenna & gray above labrum. **2ND-STAGE LARVA** like a miniature mature larva, cream with a wide transverse black band on each segment containing a yellow subdorsal teardrop-shaped spot on T2-A8 (this teardrop is nearer the rear of black band on all segments except almost in middle on T2), ~3 narrow transverse brown-black lines between each pair of wide black bands, on lateral area all transverse black bands are narrower and ground color is pale yellow, underside black; head has a cream vertical ellipse on front and behind it are two cream rings (the left and right halves of first ring almost meet at middorsal valley, but the rearmost does not meet in valley). **OLDER-MATURE LARVA** described by other authors (briefly, white with six pairs of black filaments, many transverse black bands & lines, subdorsal bright-yellow teardrop spots, lateral yellow spots, underside black). Larval duration only 12-13 days. **PUPA** light-green, position of labrum tan-green, the usual serrate gold ridge across A4, a gold cone on forewing base, 2 subdorsal gold cones on T2, a gold cone near end of discal cell, a gold cone on anterolateral corner of head, spiracles cream-tan, cremaster black, sustensor ridges black with green between. Pupa duration 12-13 days. Oviposition to adult emergence only 28 days.

Satyrinae

Many Satyrinae oviposit on dead substrates. *Coenonympha tullia*, *Cercyonis oetus*, and alpine *Erebia epipsodea* oviposit mostly on dead horizontal leaves in hostplant clumps. *Cercyonis (sthenele) meadii* oviposits on dead pine needles etc. near the hostplant. True lower mountains *Oeneis chryxus* oviposits on dead twigs above the shaded hostplants. *Erebia*

magdalena and *Oeneis polixenes* and *O. melissa* oviposit on rocks more or less near the hosts. *Oeneis uhleri* and *Neominois ridingsii* oviposit on live or dead plants near the host. *Cercyonis pegala* oviposits on live hosts, or lands on hostplants and shoots its eggs into space so they fall into the litter. *Lethe eurydice* oviposits on green hosts.

A larva (*Cercyonis pegala*) was found in daytime for the first time, indicating that larvae may not always be nocturnal. However, Charles Slater (pers. comm.) states that *Oeneis* and *Erebia* larvae in lab spend most of their time in the hostplant clump base, and crawl upward and feed quickly on leaf tips in early morning, then retreat to the clump base.

Lethe eurydice fumosus (Leussler). Oviposition 11:08 *Solanum dulcamara* leaf underside at level of top of canopy of *Carex emoryi* (*C. emoryi* 0-400 cm away, another sedge 20, 50 cm); Denver metro area, Jefferson Co. Colo., July 14, 1993. Oviposition 14:53 three eggs on *C. emoryi* leaf underside after bending abdomen to another *C. emoryi* leaf (*C. emoryi* 0-500 cm, *Scirpus pallidus* 70, 100), Denver metro area, Jefferson Co. Colo., July 18, 1993. Female bent abdomen to *C. emoryi* 2X then clouds temporarily obscured sun, then she oviposited 14:15 one egg on *C. emoryi* leaf uns, then flew and oviposited 14:16 one egg under *C. emoryi* leaf uns (*C. emoryi* was a large patch, *Leersia oryzoides* common near both eggs); Denver metro area, Jefferson Co. Colo., Aug. 8, 1995. Evidently *C. emoryi* is the main host at this introduced population, which has continued to occur mostly at *C. emoryi* spots through 1998. Female seen in *Calamagrostis canadensis* spot, female seen in *Carex emoryi* slough, Denver metro area, Jefferson Co. Colo., July 3, 1994. Caught in prior year on uniform *Phalaris arundinacea* stand by Ray E. Stanford, Horse Creek, Laramie Co. Wyo., Aug. 22, 1994. Adults associated with *Carex aquatilis*, NE Conger, Freeborn Co. Minn., July 9-10, 12, 13, 1997, June 22, 23, 24, 25, 26, 1998, July 25, 2004. Adults assoc. *C. aquatilis*, NE Alden, Freeborn Co. Minn., July 10-11, 1997, June 22, 25, 1998, July 23 & 26, 2004. Adults assoc. *C. aquatilis* and not *Phalaris arundinacea*; SE Freeborn Lake, Freeborn Co. Minn., July 11, 1997. **EGG** translucent cream when laid, turning cream.

Cyllopsis pertepida dorothea (Nabokov). **HOSTPLANT** unknown. Adults occur in wooded gulches, where hay grasses would seem to be the most likely hosts. Lab larvae hang onto leaves fairly strongly so the hostplant could be a hay grass, in contrast to such Satyrinae as *Oeneis* and *Erebia* which tend to drop off the leaves with a rather slight nudge so that their hosts must be clump- or turf-grasses. Adults occur with the following, so some of the following must be hosts: *Agropyron (Elymus) canadensis* common, *Andropogon scoparius* common, *Agropyron (Elytrigia) repens* common, *Carex pennsylvanica heliophila* common, *Bromus (Bromopsis) lanatipes* fewer, *Danthonia spicata* fairly common, *Muhlenbergia racemosa* common very bottom of gulch, *Muhlenbergia montana* ~20 seen, *Agropyron (Leymus) ambiguus* some; grasses that were fairly common but farther away from most adults were *Agropyron [Pascopyrum] smithii*, *Andropogon gerardii*, *Poa compressa*, *Muhlenbergia wrightii*; rare grasses here were *Panicum (Dichantheium) oligosanthos* var. *scribnerianum*, *Dactylis glomerata* several seen, *Agropyron [Elymus, "Sitanion"] longifolius* several seen, *Bouteloua gracilis* few, *Sporobolus cryptandrus* 1 seen gulch, *Bromus tectorum* 1, *Poa nemoralis interior* 1, *Aristida purpurea* 1, *Bouteloua curtipendula* 1; Coal Creek, Jefferson Co. Colo., July-Aug. 1992-1997. **EARLY STAGES:** *Cyllopsis gemma* and *C. pyracmon* have seasonal forms in adults, in which the spring adults are darker with the ventral bands less sharp and often closer together (and spring *C. pyracmon* "henshawi" lacks a ray along unhn vein M1 present in the late summer flight *nabokovi*). *C. gemma* also has seasonal forms in larvae/pupae: May larvae/pupae are yellow-green, Aug. larvae/pupae are tan (William H. Edwards). *C. pertepida* has only one yearly generation in Colo., but despite this, Colo. larvae and pupae retain the ability to produce green and brown forms, obviously because the Colo. populations are recently derived from two-generation populations that now occur in Ariz.-N. Mex. Presumably photoperiod regulates these forms in nature. It is not known whether the green or tan form is usual in nature in Colo.; the green form is more likely. Perhaps larvae/pupae are green in the overwintering-larva generation in Ariz.-N. Mex., brown in the summer-larva generation, based on *Cyllopsis gemma*. In Arizona, May-mid July is dry when grasses are likely to be straw-colored, whereas rains from July or Aug. to March green the grasses; if overwintering larvae/pupae are green (Sept. to May) and summer larvae/pupae are tan (June to Aug.), they would be camouflaged most of the time. Duration of stages in lab: eggs producing straw larvae took 7 days, eggs plus green larvae 30 days males 30-31 days females (thus green larvae about 23 days males 23-24 days females), straw larvae plus straw pupae 109-139 days males 160 days female, green pupae 9 days males 10-11 days females. Thus the green vs. tan forms have a large difference in duration of early stages as well. There are only four larval stages, based on head widths.

GREEN LARVA/PUPA FORM. Female from Coal Creek, Jefferson Co. Colo., July 17, 1992, laid eggs in lab that produced green larvae & green pupae, 2 males pupated Aug. 16 emerged Aug. 25, 1992, 2 females pupated Aug. 16 & 17 emerged Aug. 27, 1992, thus eggs-larvae took 30 days males 30-31 days females, and pupae took 9 days males 10-11 days females; lab larvae reared to adults on *Poa pratensis pratensis*. **EGG** cream, round, with little pockets of low oval areas all over shell. **1ST-STAGE LARVA** cream, later turning light-green (green except on rear) due to food, heart-line dark-green, a weak subdorsal creamy line, lateral ridge creamy, 2 short tails, subdorsal setae get progressively longer from thorax to tail; head black with 2 large black conelike horns. **2ND-STAGE LARVA** bright green all over with same 5 white lines as mature larva (1 near middorsal plane, wide white subdorsal, narrow white just below it, narrow white somewhat below that, a cream-white lateral ridge), 2 cream tails; head striped and shaped like older larvae (horns longer than 1st-stage). **HALF-GROWN-MATURE LARVA** overall striped bright-yellow-green with numerous tiny white hairs on body & head, with the following pattern (including 5 pale lines numbered #1-5), a broad dark-green heart-band is edged by a (#1) yellow-

cream line (green on T1-front of T2), next a broad yellow-green area (green on T1-front of T2), (#2) a broad yellow-cream line (absent on front of T1, weak T1-2), then darker yellow-green (absent T1, weak T2), (#3) a yellow-cream line (absent T1, weak T2)(bands #2 & #3 coalesce on A10 where they run halfway to tail), a green area, (#4) a yellow-cream line (absent T1, weak T2, and wide on A10 where it runs onto side of tail to tip of tail), a slightly-paler-green area, (#5) a wide light-yellow band, the underside green with organs slightly visible, each A3-6 segment has ventral diaphragm? muscles visible as a longitudinal pale stripe in front of prolegs (and as wide as proleg), legs light-brown; head yellowish-green, a brown stripe above largest eyes extends dorsally to the medial side of horn which is russet to tip and from medial horn base the brownish extends (weakly) ventrally to top of adfrontal cleavage line, beside that stripe laterally a wide band (this band is cream except near thorax where it is yellow-cream and is continuous with stripe #5 of body) runs down side of horn from tip to lower side of head, beside that stripe dorsally a dark stripe runs down rear of horn from tip to bottom of head (it is russet on horn and brown on main head capsule), a pale subdorsal stripe runs from horn tip rearward to back of head (it is cream on horn and greenish-cream on main head capsule, and is continuous with stripe #2 of body), beside this stripe the basal 1/2 of horn is cream dorsomedially, eye #3 is much larger than other eyes and #1 & #6 are tiny, eyes #2-5 have dark rims, a black streak encloses eyes #4-5 and is widest around eye #4 and extends up toward eye #3 and rearward from #5 almost to #6, adfrontal sulcus and lower part of coronal sulcus light brown, coronal sulcus is pale green on top of head, mandible green except basal edge narrowly black and straight (no teeth present) and cutting edge broadly black.

PUPA light green with fine white striations, a head horn extends forward on each side of head and has a weak white line on top that extends back nearly to antenna, a tiny labial sclerite present, a white line connects the 2 horns via a saddle between them on front of head, T1-2 have middorsal crest topped by a white line, a weak white middorsal line on T3, a striking white band (edged above--on dorsal edge of ridge--by a dark-green line) is on the lateral ridge which runs from tip of head horn to base of wing then to tornus of wing (the white of this ridge is wide ventrally then it gradually blends into the green below), each of the 7 marginal wing veins has a dark-green dot at end, 3 blackish spots on mesothoracic leg (one in middle, a smaller one just posterior to it, one on posterior tip), antenna club has tiny blackish dot on medial & on lateral side of each segment, abdomen has very weak cream lines (3 middorsal cream lines encompassing 2 dark-green lines [representing heart], a cream subdorsal line, a cream lateral line, 4 cream midventral lines), posterior to A3 the abdomen is aimed ventrally (angled downward), cremaster has many red-brown crochets, just before emergence wings turn brown and thorax-appendages-A2 turn darker-green.

BROWN LARVA/PUPA FORM. Female from Tinytown, Jefferson Co. Colo., July 30, 1978, laid eggs in lab that hatched Aug. 7 and produced straw-colored larvae & pupae (2 male adults emerged Nov. 24 and Dec. 24 1978, 1 female adult emerged Jan. 14, 1979, in lab)(Scott 1986b briefly described straw larvae & pupae & figured their shapes), thus eggs took 7 days, larvae-pupae 109-139 days males 160 days female; lab larvae reared to adults on *Poa pratensis pratensis*; half-grown larvae hibernated. The following description is based on pickled larvae & pupae so is poorer than the description for green larvae/pupae. **OLDER-MATURE LARVA** resembles dead grass, straw-colored, with mostly the same pattern as green larva (but adds a sublateral brown band), a wide light-brown heart-band, a cream line (#1), a tan broad band, a fairly-broad cream band (#2), a light brown line, a creamy line (#3), a darker brown line, a cream line (#4), a light-brown band with spiracles, a broad cream lateral band (#5), a brown sublateral band (not present on green larva), 2 long tails; head straw, with light brown stripes in same positions as dark stripes of green larva, a stripe above largest eyes extends vertically to the medial side of horn which is brownish and this brown extends weakly down to top of adfrontal cleavage line, a brown stripe on lower rear side of head extends up side to horn tip, a weak narrow brownish subdorsal line runs from back of head almost to horn tip and a pale line edges this line laterally, eye pattern and mandible same as on green larva, adfrontal sulcus and lower part of coronal sulcus light brown. **PUPA** straw-colored, with same pattern as green pupa, many tiny brown longitudinal striations, a white middorsal crest on T1-2, a weak white middorsal line on T3, a dorsal cream line from horn tip to rear of head, a white line between 2 horns on front of head, a white band along side of horn to wing base to tornus blends ventrally into the straw wing color, abdomen has faint white lines (3 middorsal white lines around 2 dark lines, a subdorsal white line, a lateral white band, 2-4 white midventral lines), mesothoracic leg has same 3 brown spots as on green form, 7 brown dots near wing margin, 2 brown dots near wing base, hindwing sliver is slightly paler than forewing.

Coenonympha tullia ochracea W. Edw. Oviposition 13:15, female flew slowly then landed and crawled on litter and bent abdomen (5 cm from *Poa pratensis pratensis*, 1 cm from *Stipa comata*, 6 cm from *Carex pennsylvanica heliophila*) then she flew 2 m to tiny *S. comata* clump and laid egg on dead leaf 4 cm above ground (*S. comata* 0-8, 10, 20, 25 cm, etc. common, *P. p. pratensis* 3, 3, 6, 10, etc. common sward, *Bouteloua gracilis* 3-7, 10-25, 20-100 common, *Carex pennsylvanica heliophila* 20, 25 etc. sparse, *Koeleria macrantha* 35, 50-100 fairly common), at 13:47 she crawled to *S. comata* and oviposited on dead leaf 4 cm above ground (*S. comata* also 10, 10, 15 common, *P. pratensis pratensis* 4, 4-100 sward, *Carex pennsylvanica heliophila* 20 rare), then she flew and landed on *Stipa comata*/*P. p. pratensis* spot and bent abdomen on dead stem but flew; Crawford Gulch, Jefferson Co. Colo., July 1, 1993. Adults associated with *Poa pratensis pratensis*; valley bottoms Green Mtn., Jefferson Co. Colo., June 1, 1993. Adults common at *Poa pratensis agassizensis*; Green Mtn., Jefferson Co. Colo., June 6, 1997. Adults associated with *Poa pratensis agassizensis* slopes, NW Ralston Butte, Jefferson Co. Colo., May 30, 1994. Oviposition 14:25 under dead <1-mm-wide grass stem 1 cm E of 30 cm boulder

(so egg wouldn't desiccate?, but egg was in sun)(*Poa pratensis agassizensis* 5 mm, 3, 8, 9, to 30 cm in sward, *Koeleria macrantha* 30-40, 60, 70, *Carex pensylvanica heliophila* 70, 90, 100), larva died in half-grown diapause Oct. 7; Tinytown, Jefferson Co. Colo., June 4, 1994. Three ovipositions: oviposition 10:05, she flew 4 times on *Poa pratensis agassizensis* area on gentle sloping flat, and landed in *P. p. agassizensis* sward 5 m wide, then she crawled down and laid cream egg under horizontal dead grass blade of *P. p. agassizensis* 6 cm above ground (*P. p. agassizensis* was thick from 2-100 cm away, *Bromus japonicus* common 2-100 cm., *Agropyron repens* 4, 17, 25, 35, 35, 35 cm etc. scattered to 100 cm, *Carex pensylvanica heliophila* common in understory 12, 15, 15 cm away etc., *Stipa comata* 35, 100); then at 10:32 the same female flew twice and landed on *Bromus tectorum* sward 1-2 m wide and crawled down and laid egg under dead leaf tip (angled upward) 3 cm above ground (*B. tectorum* 0-100 cm, *Poa pratensis agassizensis* sward 35-100, *Bromus japonicus* 5, 7, 8 cm etc. scattered to 100, *Poa compressa* 40, 70-100, *Agropyron repens* 1, 2, 2, 3, 7, 8, etc. sparse to 100); later at 11:41 a second female oviposited, during a sunny period she flew a few m and landed in sward of *Poa pratensis agassizensis/Bromus japonicus/Poa compressa*, she basked then crawled down stem and laid egg under dead leaf blade 3 cm above ground (*Poa compressa* thick 5-100 cm, *Bromus japonicus* thick 2-100, *Bromus tectorum* 8, 15, 35, 35, 40 etc. scattered, *Agropyron repens* common 7, 10, 12, 15, 20, 30, 50 etc., *Poa pratensis agassizensis* sward 30-100); females evidently did not discriminate among grass species much, they landed in a thick turf of grass to oviposit, and both females flew briefly then crawled down into grass and laid eggs on dead grass blades or stems; eggs hatched June 23, so duration 10 days; Green Mtn., Jefferson Co. Colo., June 13, 1997. Adults common on *Poa pratensis pratensis/agassizensis* sward on ridge flat and uncommon elsewhere; Indian Peak, Jefferson Co. Colo., June 16, 1997. **HOSTPLANTS:** *Poa pratensis* (especially its ssp. *agassizensis*) is evidently the most common host, based on four ovipositions (reported by this paper and Scott 1992) and based on adult association, as adults are most common at swards of that grass on gentle slopes. Numerous other grasses and even grasslike sedges seem to be occasional hostplants, including *Stipa comata* (two ovipositions), *Bouteloua gracilis* (one ovip.), *Festuca idahoensis* (one ovip.), *Festuca arizonica* (one ovip.), *Bromus tectorum* (one ovip.), *Carex pensylvanica heliophila* (a sedge)(one ovip.), probably *Agropyron smithii* (one ovip.), and *Bromus japonicus*/or/*Poa compressa* (one ovip.), and lastly one egg was laid near four of the above plants. Probably this species eats numerous grasses and perhaps even sedges in nature. Lab larvae eat *Poa pratensis pratensis* leaves and grow adequately, though they always diapause half-grown. **OVIPOSITION:** Nearly all eggs were laid on dead grass blades, mostly horizontal, in the turf above ground 3-6 cm. **HIBERNATION STAGE:** In three separate rearings, half-grown larvae always diapaused, and refused to develop and died, in contrast to California *C. tullia yontocket*, which lacks lab diapause. **EGG** cream or yellowish-cream when laid, the next day sometimes has a narrow red-brown ring, later developing hundreds of orange-brown dots and sometimes retains the same ring; duration ~9 days in lab. **FIRST-STAGE LARVA** cream-tan, turning slightly-bluish green due to feeding, the top of middle of body turning slightly pinkish in some larvae, a middorsal brown line edged by a weak greenish-cream line, a subdorsal brown line edged below by a greenish-cream line, a weak to very weak brown line just below it, next a greenish-cream line edged below by a brown line just above the tan spiracles, a cream band on lateral ridge, underside light-yellowish-green, 2 long tan tails; some larvae have reddish-brown lines instead of brown; head dark-brown (orangish-brown in some larvae). **~3RD-STAGE LARVA** green, a dark-green heart-band edged by a narrow yellow line, a narrow dark (slightly-brown) subdorsal line running onto the dorsal base of a long tail (most of tail is reddish-pink) is edged below by a cream line (the cream line widens on side of base of tail where it stops), which is edged below by a slightly-darker green line, then a slightly-creamy-green band above a dark-green band containing spiracles, edged below by a cream band on lateral ridge, edged below by dark-green (underside dark-green or green); or larva grass-green, a dark-green heart-band, a narrow cream line, a wider green band, a narrower dark-green line, a narrow cream line, a wide green band (containing two faint paler lines, one at spiracles), a pale-yellow narrow line, underside green; prolegs green with a tan tinge, legs light-brown; head fairly-dark grass-green, eyes brown.

Coenonympha tullia yontocket Porter & Mattoon. **LAB HOST:** larvae ate both *Poa pratensis pratensis* and *Bromus inermis* equally well in lab. **HIBERNATION STAGE:** No hibernation in lab (whereas half-grown *C. t. ochracea* larvae always hibernate in lab). **EGG** (sent by Kenneth Hansen, from vic. Kellogg Beach, W Fort Dick, Del Norte Co. Calif., 1994) cream, soon developing hundreds of reddish spots. **1ST-STAGE-LARVA** tan (a bit violet-tan), developing a bluish tinge on top of body due to food, a red-brown heart-line, a red-brown subdorsal line, a narrow red-brown line, a red-brown line above a paler tan lateral ridge, a slightly-brown subdorsal line, two red-brown tails; head light-brown. **2ND-STAGE LARVA** green with some tiny cream dots, a dark-green-tan heart-band, a creamy-green area, a dark-green-tan line, a greenish-cream band, a dark-green-tan line, a greenish-cream band, a wide dark-green-tan band, a cream-yellow lateral ridge edged below by darker-green line, uns yellowish-green, two black-tipped orange-tan tails; head light-brown. **3RD-STAGE LARVA** green with some tiny cream dots, a dark-green heart-band, a wide green area, a dark-green band, a cream band, a dark-green line, a cream band (the two cream bands join on side of orange-red tail), a wide dark-green band, a yellow-cream lateral ridge, uns green, two black-tipped orange-tan tails, prolegs slightly yellower-green; head tanish-green. **4TH-STAGE LARVA** the same. **MATURE GREEN LARVA** has very-dark-green heart-band, a light-yellow line, a wide light-green band, a dark-green line, a light-yellow line, a green band, a light-green line, a green band with paler tracheae & brown spiracles, a yellow lateral ridge, uns dull-green; head dull-green, neck yellow-green. **MATURE YELLOW-BROWN LARVA** has wide very-dark-brownish-red heart-band, a yellow line, a very wide yellow-tan band, a

dark-red line, a yellow line, a light-brown band, a yellow-tan line, a light-brown band, a red line, a yellow lateral ridge, dull-red line below that, a wide light-brown band, uns greenish-tan; head light-brown. **MATURE BROWN LARVA** has wide very-dark-reddish heart-band, a tan-yellow line, a wide tan band, a dark-brownish-red band, a tan-yellow line, a light-brown band, a tan line (the tan-yellow and tan lines join near tail and run onto side of tail), a light-brown band, a wide dark-brownish-red band, a yellow lateral ridge, light-reddish-brown below that, uns greenish-tan, median top of tail dull-red; head light-brown. The green larvae have the same stripes as *C. t. ochracea* and look similar, while the dark-green stripes on the green larvae change to shades of reddish-brown on the brown larvae. **PUPA** of both types (striped and unstriped) light-green with greenish-yellow abdomen when young, later becoming green, near emergence wing becomes reddish-orange. **STRIPED PUPA** green, ventral ridge across head is creamy, a black stripe along top (anal) margin of wing, edged ventrally by white, a black curved stripe through middle of wing (along bottom of discal cell and vein M3), a short black stripe in wing apex about R4-5, a black stripe covers most of middle leg, distal 2/3 of proboscis black, a short black lateral dash at cremaster base, cremaster whitish with red-brown crochets, wing veins darker-green. **UNSTRIPED PUPA** green, ventral ridge across head is creamy, a brown stripe along top margin of wing is edged below by white, wing veins darker-green, cremaster whitish with red-brown crochets. Some pupae are intermediate, with the black bands about 1/3 developed.

Cercyonis pegala nephele (Kirby)(=*boopis* [Behr]=*olympus* [W. Edw.]). Oviposition 12:57, she landed on *Festuca arundinacea* & bent abdomen down & forward and egg shot out into litter (*F. arundinacea* 0-60, *Poa pratensis pratensis* common directly below her and nearby); Wheatridge, Jefferson Co. Colo., Aug. 20, 1992. Oviposition 13:34 she rested on *F. arundinacea* leaf and shot egg from abdomen which fell into litter (*F. arundinacea* 0-500 cm [90% of grasses], *Bromus* [*Bromopsis*] *inermis* 2, 10-100), Wheatridge, Jefferson Co. Colo., July 31, 1993. Mature larva (pupated July 19, female emerged Aug. 2) found on top of 5-cm-long *Muhlenbergia montana* leaf (many leaves eaten in clump)(larva was found in daytime, and when I brushed against it it dropped into clump and curled up); Coal Creek, Jefferson Co. Colo., July 7, 1993. Oviposition 14:30, she landed 4X and bent abdomen on *Bromus inermis* but flew when I scared her a bit, she landed and bent abdomen forward and egg shot forward and landed on *Taraxacum officinale* leaf (not a host)(*Festuca arundinacea* 0-80, *Dactylis glomerata* 0-20, *Poa pratensis pratensis* 0-100 thick in understory, *Bromus inermis* few 20-40); Wheatridge, Jefferson Co. Colo., Aug. 30, 1995. *M. montana* is a new host, and that record shows that Satyrinae larvae do not always hide during the day. **MATURE LARVA** bright-green, heart-line dark-green weakly-edged by pale green, a dorsolateral pale-green line (very weakly edged above by dark line) edged below by a darker-green line, then a wide darker-green area that encloses pinkish-cream spiracles, a lateral yellow-green band edged above by a narrow dark-green line, underside and prolegs darker-green, legs light-brown, 2 pink or reddish-pink tails; head darker-green (grass green), ocelli rust colored, 3rd eye much larger and emerald-green on head capsule, solitary eye #6 nearly absent, mandibles chitin colored at base and black on cutting edge and cream in between. **PUPA** solid-light-green, except cream on anteroventral transverse ridge between eyes, a creamy-green spot on T2 lateral to T1, middorsal cream ridge on T2, a weak middorsal cream line T3-A4, a cream line on dorsal wing ridge (running from forewing base to tornus along position of 1A & 2A), a slightly-darker-green postmedian dot beyond discal cell, spiracles tan, cremaster tip tan. This pupa has fewer bands and streaks than the 1992 pupa.

Cercyonis (sthenele) meadii (W. Edw.). Preoviposition 10:15 just NW of tree, female fluttered slowly about near ground and landed on ground and crawled ~10 cm and maybe bent abdomen then flew to 40-cm-wide rock and landed on horizontal cliff on that rock and bent abdomen under crack at base of cliff then she flew (egg not found and no egg was seen popping out of abdomen)(*Carex pensylvanica heliophila* one plant near rock, *Bouteloua gracilis* was 60% of grass there and *Andropogon scoparius* 40%, *Bromus lanatipes* 70 cm), Foxton, Jefferson Co. Colo., Aug. 16, 1994. Oviposition 11:41, female fluttered near ground after flower-feeding then bent abdomen in litter beside *Campanula* 11:40 (*Carex rossii* 40-100, *Oryzopsis micrantha* 100 onward, *Bouteloua gracilis* 100 onward), then she flew ~70 cm and deliberately fluttered near ground in shade under Ponderosa Pine & landed a few times & crawled a bit then bent abdomen & laid egg on uns of pine needle in litter above 4-cm-wide patch of gray-green lichen near *Carex rossii* (*C. rossii* 10, 20-30, 25, 30, 30, 50, 50, 60, 70-100, *Oryzopsis micrantha* 50, 100, 150-400 common in shade of the pine tree, *Agropyron* [*Sitanion*] *longifolius* 150-180, *Bouteloua gracilis* 100); oviposition 12:52, she flower fed then landed on ground a few times then flew to edge of shade & sun NE of large juniper tree on ridge and fluttered on ground 5X & walked a bit, laid egg on dead pine needle in litter (*Bouteloua gracilis* 2 cm-500 incl. into shade, *Carex rossii*? 70, *Agropyron trachycaulum* 90); both ovipositing females chose the shady N edge of trees, and neither female landed on any grass or sedge, in fact I have never seen a female or male of this species land on any grass or sedge!; Foxton, Jefferson Co. Colo., Aug. 20, 1994. Oviposition 12:46, female flower fed then fluttered under pine tree canopy and landed often (but not on any grass or sedge), bent abdomen under *Agropyron dasystachyum albicans* in litter but flew & landed 3X, then weather became cloudy and she landed near *Carex rossii* and laid egg 12:46 in cloudy weather on dead (last year's) brown-gray *Quercus gambelii* leaf just under oak canopy (on the NW edge of tree canopy) of very large Ponderosa Pine tree on SE-facing slope (*C. rossii* 25-40, 50, 50, 70-90, 100, *Bouteloua gracilis* 40, *Bromus lanatipes* 100), this egg site was shaded but by 13:40 was in full sun, she then flower fed, and when weather became sunny she fluttered into shade under N side of canopy of a row of large *Quercus gambelii* bushes and bent abdomen in *Q. gambelii* litter among *Carex rossii* plants (egg not found, but she then returned to flower feeding so perhaps laid egg)(*C. rossii* 3-100, *Poa nemoralis* 8, 15, 40, 40-45, 60, *Bromus lanatipes* 17, 60, 80, *Bouteloua gracilis* 25,

40-100); no female that I remember has ever landed on a grass or sedge, they always oviposit in shade under edge of canopy on N side of trees-shrubs, so larvae doubtfully feed on *Andropogon scoparius* which grows in full sun; Foxton, Jefferson Co. Colo., Aug. 25, 1994. Oviposition 12:00, she fed often, then in sunny weather fluttered N of pines into shade of pine canopy S of three Ponderosa Pine trees just N of little valley bottom and crawled to 3-cm-wide lichen patch on ground & bent abdomen forward and laid egg on pine needle in litter above the lichen patch and below a 8-cm-wide *C. rossii* clump (*C. rossii* 3, 3, 3, 60 cm onward common, *Bouteloua gracilis* 70); she never landed on any grass or sedge; another female flew into shade by *Andropogon scoparius* but never oviposited; Foxton, Jefferson Co. Colo., Aug. 29, 1994. Oviposition 11:47, she flower fed then landed on shady litter side of *Andropogon scoparius* 4X, flew to N slope then up it to ridge and landed in full sun just 1 m S of Douglasfir tree (& 1.5 m N of small Douglasfir) 5 cm from *Carex rossii* & crawled to litter 3 cm from *C. rossii* & laid egg on uns of pine needle in litter (*C. rossii* 3-25, 30-40, 35, 40, 70, 100, *Bouteloua gracilis* 65); Foxton, Jefferson Co. Colo., Aug. 30, 1994. Oviposition 14:27, she fed on flowers, then fluttered in shade near *Pinus ponderosa* trees, then landed in shade near *Carex rossii* and crawled to it, she fluttered a bit for 15-20 cm and landed again at same green *C. rossii* patch and crawled 8 cm and laid egg on dead *C. rossii* leaf in litter, the dead leaf was still attached to green *C. rossii* clump 2.5 cm away (this *C. rossii* clump was 30 cm wide, 50 & 70 cm from two other similar *C. rossii* clumps; *Bouteloua curtipendula* 35, 90, 100, 120-400 cm, *Andropogon scoparius* 120, 170-800), this egg was in shade 120 cm upslope/north of a *P. ponderosa* tree (5 m tall with 32-cm-wide trunk) and another *P. ponderosa* tree was 2.5 m NE (7 m tall) so the egg was between trees in mostly-shaded (dappled) area; S-facing slope, Foxton, Jefferson Co. Colo., Sept. 4, 1998. **HOSTPLANTS:** *Carex rossii* is the usual host, and *Bouteloua gracilis* is sometimes eaten. *C. rossii* grows mostly in the shade of Ponderosa Pine trees (it is adapted to shade, whereas the similar-looking *Carex pennsylvanica heliophila* grows in the nearby sun), which fits *C. meadii*'s peculiar habitat of laying at the shade's edge near these trees. But *C. meadii* also occurs in areas that lack trees but have shrubs, such as in eastern Wyo.-southeastern Mont., and in the San Luis Valley Colo., where females probably lay eggs on grasses that grow in the shade of Rabbitbrush & Sagebrush etc. bushes. **EGG PLACEMENT:** The female almost never lands on green grasses or green sedges, and the egg is placed on dead plant litter near the host, usually on a dead non-green fallen pine needle but sometimes on a dead grass leaf or dicot leaf. **EGG** pale yellow (whitish-yellow) when laid, later pinkish-tan because of a hundred or so diffuse crimson spots; duration 19 days in lab. **1ST-STAGE LARVA** tan, rosy on T2-A4 (esp. around T3-A2), a middorsal red line, 2 dorsolateral red lines, a lateral red line (all these lines become brown on rear), a cream-tan lateral ridge, the dorsal setae curve forward strongly on thorax, curve rearward strongly on abdomen; head tan with black spot around seta bases, largest eye blue-green, other eyes brown.

Erebia callias W. Edw. Egg found on *Festuca brachyphylla* dead leaf at base (*Festuca* 7, 8, 8, 9, 12 cm etc. away, *Poa alpina* 15, *Kobresia myosuroides* 15); Loveland Pass, Summit/Clear Creek Co. Colo., Aug. 20, 1997. Eight eggs found on dead grass blades in green grass clumps: egg found on dead *F. brachyphylla* leaf in *F. brachyphylla* clump (*F. brachyphylla* also common nearby, *Deschampsia cespitosa* 5, 7-20, 10, *Agropyron scribneri* 17, 40, 50, *Deschampsia cespitosa* common 20, 25, 30, etc., *Carex rupestris drummondiana* 7, *Carex* sp. 25); egg found on *F. brachyphylla* clump (*F. brachyphylla* 20, 40, *Agropyron scribneri* 8-15, 15, 25, *Poa arctica* 20, 20, *Carex rupestris drummondiana* 12, 20, etc.); egg found on *F. brachyphylla* big clump (*F. brachyphylla* 15, 30, etc., *Agropyron scribneri* 15, 15, 20, 37, 40, *Carex rupestris drummondiana* 7 common); egg found on *F. brachyphylla* clump (*F. brachyphylla* 0, 15, 23, 35, etc., *Trisetum spicatum congdonii* 12, 25, 35, etc.); egg found on *F. brachyphylla* clump (*F. brachyphylla* 0-35, *Trisetum spicatum congdonii* 35, 35, *Carex foenea* 10 etc.); two eggs found on *F. brachyphylla* clump (*F. brachyphylla* 25, 30, etc., *Trisetum spicatum congdonii* 30-50, *Poa glauca* 35, *Carex foenea* 5-100); egg found *F. brachyphylla* clump (*F. brachyphylla* 10, 15, 20, *Poa glauca* 18, *Trisetum spicatum congdonii* 30, *Carex foenea* 15-100); Hoosier Pass, 12,100', Park Co. Colo., Sept. 17, 1998. **HOSTPLANTS:** *Festuca brachyphylla* is evidently very popular, and seems to be the favorite host, as eggs can be found more easily on it than on *Kobresia myosuroides*, which seems to be a less-frequent host. So even though at many localities adults are abundant on *Kobresia myosuroides* knolls, that sedge is not their favorite host. **EARLY STAGES:** Larvae ate *Poa pratensis* in lab. **EGG:** Bluish-green (very conspicuous in nature), globose. **YOUNG LARVAE:** Described by Scott (1992). **BROWN HALF-GROWN/MATURE LARVA:** Body overall pattern tan with various black lines and creamier lines and black dashes and paler-tan and browner-tan stripes/lines: in details, heart-band black, edged by a pale-tan line, a very wide finely mottled tan band that has irregular wide black dashes along its bottom edge, a conspicuous creamy-tan dorsolateral stripe, next irregular black dashes along top of a mottled light-brown (tan mottled with brown specks) band, and below this band is a pale-tan line edged on top and bottom by smaller blackish irregular dashes (the top dashes and bottom dashes alternate so that a vertical cross section encounters only one dash), those bottom dashes are at the front of each segment in the top of another mottled light-brown band (tan mottled with brown specks) that also contains the black spiracles in the upper part of the band, next a wide pale-tan lateral ridge (on T1-3 the wide pale-tan lateral ridge is less obvious and is joined to the band above and the union is tan in color with a brown spot near front and another near rear of segment on A2-3), and below it is a wide black dash on front of each segment grading into a brown patch behind black patch (these black dashes are weaker on thorax), underside browner-tan, a blackish spot on posterolateral side of A10 proleg, A10 grayer with the stripes of other segments less distinct; no tails on A10; head fairly-dark-brown (tan with numerous tiny black dots), a tan crescent around in front of eyes extending around behind upper part of rear of eyes,

coronal groove tan, tan along adfrontal sulcus, frontoclypeus has (about a third of way down from top) four unique (I have seen these tubercles on no other butterfly) tubercles side-by-side, each tubercle ending in a seta, jutting down and forward (the two left tubercles are joined halfway up their length, the two right tubercles similarly joined, the two medial tubercles longer than the lateral tubercles), these tubercles are dark-brown with chitin-colored tips. **GREEN MATURE LARVA:** (this green larva possibly might be green because of disease?, because it died of shriveling just after it formed a green pupa, however the 3rd-stage larva described by Scott [1992] had a blue-green tinge on thorax, and *Erebia magdalena* has a greenish larva) the same as brown larva, except the tan areas are mostly replaced by green (except A3-7 are greenish-tan), the cream & pale-tan lines of brown larva (specifically, the pale line edging heart-band, the creamy dorsolateral stripe, the suprspiracular pale line) are creamy on the green larva, and the lateral ridge is tan-green (greenish-tan on A3-7). **BROWN PUPA:** Brownish-yellow (head & wings yellow-brown), heart-band brown (heart-band on T2 a trace, on T3 wider, on abdomen wide, blending to brown on rear of abdomen from A8 onward), a weak dorsolateral brownish band on A2-6, a weak brown dorsolateral spot on rear of segment on A2-7, spiracles red-brown (spiracles large T1-2, small on A2-7, weak A8), cremaster blunt (no hooks or setae), proboscis extends posteriorly to middle of A6; nearing emergence pupa became blackish on top of thorax and top of A1-2 and base of wings & middle of wings, where two black ocelli of adult were visible, then the next day most of pupa became black prior to emergence; duration 9 days in lab for male. Several brown pupae were reared, so this is probably the usual color. **GREEN PUPA:** Head and wings brownish-green, heart-band dark-green. This green pupa might have been diseased? because it shrank and died shortly after pupation.

Erebia magdalena magdalena Strecker. Oviposition 13:00 in shade on NE-facing 2 cm overhang of boulder 30 X 50 X 60 cm size, the egg was 18 cm away from downslope vegetation and ~50 cm away from upslope vegetation (*Poa cusickii epilis* 20, 40, 40, 40, 50, 50, 60, 60, 70, 80, 100 etc., *Festuca brachyphylla* 30, 30, 30, 45, 45, 50, 60, 80, 90 cm away etc. common but small clumps only 2 cm wide, *Carex brevipes* 30, 30, 40, 40-80, 50, 80, 80, common to 100 but each plant is only ~3 leaves, *Luzula spicata* 40, 40, 50, 50, 70-100 common, *Danthonia intermedia* 50, 60, 60, 70, 110, *Carex chalciolepis* 70, 85, *Carex elynoides* 100, *Juncus biglumis* 100, 100), above this boulder mostly grew *Salix reticulata* and *Vaccinium cespitosum*, below rock *V. cespitosum* was the commonest plant, the mostly likely host here would be *Poa cusickii epilis* & *Festuca brachyphylla* & *Carex brevipes*; then the same female flew 4 m to another boulder and crawled to find an E-facing overhang but flew without laying an egg (*Poa cusickii epilis* & *Festuca brachyphylla* & *Luzula spicata* were near boulder); Loveland Pass, Summit co. Colo., Aug. 18, 1995. Tan egg found attached to E-facing edge of 8 (top to bottom) X 15 X 8 cm rock that was resting on top of two large boulders 20-30 cm high and ~70 X 90 cm wide (*Danthonia intermedia* 30, 40, 60, 65, 75, 75, 100, 100, 100, *Festuca brachyphylla* 30, 70, 75, 80, 90, 100, *Trisetum spicatum* 40, 80, 90, 90, 100, *Carex brevipes* 50, 75, 75, eight patches at 80, 100, 100, *Luzula spicata* 50, 60, 80, 80, Juncaceae sp. 100, *Poa arctica* 120, *Poa cusickii epilis* 120), the *Danthonia*, *Festuca*, *Trisetum*, & *Carex brevipes* are the most likely hosts for this egg; Loveland Pass, Summit Co. Colo., Aug. 28, 1995. **HOSTPLANTS:** After finding three ovipositions/eggs in nature, I am still no closer to narrowing down the grasses/sedges eaten in nature by this species, because nine different grasses/sedges were found near the three eggs, and only one of them (*Festuca brachyphylla*) was near two eggs. Females lay eggs on large boulders, which often places them 1/3 meter or more from potential hosts, so determining probable hosts by watching ovipositions will be difficult. Lab larvae eat *Poa pratensis pratensis* well, and eat some sedges less well (Scott 1992), so because females lay eggs so far away from potential hosts, larvae are probably rather polyphagous in nature, eating grasses and sedges. **EGG** light-greenish-yellow. **1ST-STAGE LARVA** previously described (Scott 1992) as light-bluish-green with red-brown lines, but current larva was grayish-cream with the lines widened into dull-red bands.

Erebia epispodea Butler (=rhodia W. Edw.). Preoviposition 10:15 *Deschampsia caespitosa*; preoviposition 10:45 *D. caespitosa*; oviposition 11:50 she fed on flower then landed on *D. caespitosa* clump and laid egg on dead horizontal grass blade near edge of clump, *Poa cusickii epilis* grew also in oviposition clump (*D. caespitosa* 0-10, 15, 25, 30, 30, 40, 60, 60, 70 etc., *P. c. epilis* 2, 7, 35, 35, 200 cm)(other plants *Agrostis humilis* 40, 60, 70, *Festuca brachyphylla* 40, 60, 70, *Calamagrostis canadensis* 8, 15, 20, 35, 40, 70, 80, 100, *Danthonia intermedia* 7, 25, 30, 35, 40, 45, 80, *Trisetum spicatum congdonii* 25, 30, 30, 100, *Trisetum wolfii* 100, *Phleum commutatum* 35, 100, *Carex parryana hallii* 25, *Luzula spicata* 5, 20, 25, 40); Loveland Pass, Summit Co., Colo., Aug. 11, 1993. Oviposition 15:00, she landed in clump of *Deschampsia caespitosa* and laid egg on dead blade low in clump (only 3 cm above ground) by bending abdomen forward (*D. caespitosa* 0-5, 20, 27, 30, 50, 50, 70, 70, 90, 100 common, *Phleum commutatum* 4-20, *Poa cusickii epilis* 15, 40, 50, 50, *Poa nemoralis interior* 27, 40 etc. common, *Stipa lettermani* 45, 60, 80-100, *Poa alpina* 50, *Festuca brachyphylla* 90, *Carex albonigra* 90, 90, 100); Loveland Pass, Summit Co. Colo., Aug. 31, 1995. Oviposition 10:06, she landed just outside bog and crawled 30 cm over *Artemisia scopulorum* etc. and laid egg 2 cm above ground on dead grass blade in clump of *Geum rossii* (*Poa cusickii epilis* 2, 3, 20, 20, 30, 70, 20, 20, 20, 70, 15, 50, 40, 50 etc. rather common, *Trisetum spicatum* 40, 70, 50, 75, 70, *Danthonia intermedia* 45, 100, *Luzula spicata* 90, *Deschampsia caespitosa* 100); oviposition 12:08 in boggy swale near edge of willow bog, she crawled in *Deschampsia caespitosa* clump and laid egg on dead grass blade (she and the last female both crawled out of sight under vegetation to oviposit)(*D. caespitosa* 0-100 a thick sward, *Danthonia intermedia* 8, 15, 20, 65, few, *Festuca brachyphylla* 10, 10-15, *Phleum commutatum* 17, 20, 25, 40, *Carex chalciolepis*? 45, 60, 70, *Carex parryana hallii* 15); preoviposition 11:25 she bent abdomen in litter at *Poa glauca*/*Deschampsia caespitosa*/*Festuca brachyphylla* spot; *Poa cusickii epilis* and *Deschampsia caespitosa* are evidently the hosts for these two eggs; Loveland Pass, Summit Co.

Colo., Sept. 5, 1995. Oviposition 11:43, she fluttered slowly and dropped onto short-grass spot beside grass clump on bunchgrass slope 6 m from bog and laid egg under green leaf of *Danthonia intermedia* seedling (*D. intermedia* 0-10, 10, 10, 10, 15, 15-100 thick, *Festuca brachyphylla* 10, 15, 18, 20, 40, 50, 50, 80-100, *Phleum commutatum* 20, 25, 30, 30, 50, etc. thick to 100, *Deschampsia cespitosa* common 45-100, 50, 50, *Carex ebenea* 35, 35, 90, 100, *Luzula spicata* few 35, 70-90, 100, *Trisetum spicatum* 55, 60, 65); Loveland Pass, Summit Co. Colo., Sept. 14, 1995. Adults assoc. *Poa pratensis pratensis*, saddle NE Crawford Hill, Tucker Gulch, Jefferson Co. Colo., July 14, 1995, June 6, 1996, June 12, 1997.

HOSTPLANTS: In the alpine zone, *Deschampsia cespitosa* is evidently the commonest host, and *Poa cusickii epilis* and *Danthonia intermedia* are evidently also hosts. In the foothills (Scott 1992), the main host is *Poa pratensis pratensis* (rather than *P. pratensis agassizensis*, which grows on drier slopes), and occasional hosts are *Carex pensylvanica heliophila*, *Koeleria macrantha*, and *Danthonia parryi*. **OVIPOSITION:** Females oviposit almost always on dead grass blades. In the alpine zone the eggs are laid near the ground (several cm above it) and females sometimes even crawl out of sight into a clump to oviposit, whereas in the foothills eggs are laid high in the turf grass (~10 cm above ground on average) as the female acrobatically climbs to place the egg as high as possible. This difference evidently serves for thermoregulation, to keep alpine eggs warm and foothills eggs cool, though the high positioning of foothills eggs may also help keep them away from ants. **DIAPAUSE STAGE:** 4th-stage larvae stopped feeding and died in lab during one rearing; no diapause in another rearing. **EGG** cream, soon developing dozens of large purplish-red spots (each formed of dozens of tiny dots); the alpine (Loveland Pass) egg seems to have the tiny dots less gathered into large spots (making the egg more uniform) and the individual dots seem to be slightly browner. **1ST-STAGE LARVA** creamy with brownish-red lines; but after feeding body pale-greenish with tan tint, a fairly-wide middorsal reddish-brown band, a wide greenish band, a red-brown line (all red-brown lines and red-brown bands are narrower on thorax), a cream band (a little greenish dorsally), a red-brown line, a greenish-band, a creamy very narrow line, a red-brown narrow band contains spiracles, a cream lateral ridge (a little greenish dorsally), a red-brown band (edged below by a creamy dash on each segment from T2-abdomen), underside greenish with tan tint, legs tan, rear of A10 tan without tails; head tan, eyes blackish. The alpine (Loveland Pass) larva had brown (not reddish) bands, although some of the difference seems to be due to different lighting (the low-altitude photos from Tintytown, Jefferson Co., being more reddish, the alpine photos being more bluish). **2ND-STAGE LARVA** tan with cream & brown stripes (all the brown stripes are slightly-reddish-brown), a brown dark middorsal band is edged by a cream-tan line, then a wide light-brown band, a brown line, a cream narrow band, a wide brown band (tapering from darker-brown at top to lighter-brown at bottom), a cream-tan line, a narrow reddish-brown band contains spiracles, a cream-tan lateral ridge, a brown band (light-brown on thorax) below it, underside (& legs & prolegs) light-brown, 2 short light-brown tails, anterior eyes blackish; head light-brown. **3RD-STAGE LARVA** has dark-brown heart-band, a cream line, a wide cream-brown or light-brown band, an orange-brown line, a cream-brown or darker-brown narrow line above a cream line (or a wider cream band), an orange-brown line, a light-brown band, a cream line, an orange-brown line or band contains spiracles, a cream-tan or tan lateral ridge edged below by a black patch on front of each abdomen segment, underside light-brown, 2 short tails front third or half of body may be greener due to food; head orangish-brown, biggest eyes dark-brown, a paler (tan) patch around anterior 6 eyes (eyes #1-6). **4TH-STAGE-LARVA** ochre, a blackish-brown heart-band, a cream-tan line, a wide ochre band, a narrow brown band above a narrow cream band, a blackish upper edge to an ochre band, a cream-tan line, a light-brown band contains spiracles, a cream-tan lateral ridge, each abdomen segment then has an anterior blackish rectangle enclosing a tan spot then mottled black then ochre intersegmental folds (these black markings are reduced to a couple blackish blotches on T1 & to one black anterior spot on T2-3), underside light--brown (each abdomen segment has a weak blackish dash above level of prolegs), two short tails; head light-brown, the larger eyes blackish.

Hipparchia (Neominois) ridingsii ridingsii (W. Edw.) (**June flying populations**). Adults associated with *Bouteloua gracilis*, E Box Elder Creek, Arapahoe Co., Colo., early June, various years. Adults associated with *Bouteloua gracilis*, *Festuca arizonica*, *Festuca saximontana*, *Koeleria macrantha*, and other grasses, Guy Hill, Jefferson Co. Colo., various years. Scott (1992) found that *Bouteloua gracilis* is the usual host, and *Koeleria macrantha*, *Agropyron* ("Sitanion") *longifolius*, and *Stipa comata* are occasional hosts. Several grasses must be used as hostplants, because *Bouteloua gracilis* does not occur at Sonora Pass in Calif. and other higher-altitude sites. Larvae easily fall off leaves when nudged, like *Oeneis* & *Cercyonis*, indicating that hostplants must be turfgrasses or bunchgrasses, not few-stemmed grasses such as haygrasses. Scott (1973a) reports ecology, behavior, and movements. **HIBERNATION STAGE:** Adults are biennial in the Hudsonian Zone of Sonora Pass Calif., but seem to be annual in Colo. Lab larvae died in 3rd stage, so this is probably the overwintering stage (however considerable mortality of all stages occurred). **EARLY STAGES** from eggs laid by female from Guy Hill, Jefferson Co. Colo., July 1992. **EGG** bluish-greenish-white, with wide white ridges down sides, valleys between white ridges blue-green and each valley has a narrow white small ridge down middle (between white ridges), tiny white bumps on top. **1ST-STAGE LARVA** tan, a wide darker middorsal band, a wide tan band (very top forming a slightly-whiter line), a brown line, a tan wide band, a brown line, a light brown band, a tan band enclosing spiracles, a cream-tan lateral ridge, tan beneath, A10 top brown with 2 tails, A10 prolegs brown on side, collar black and interrupted middorsally; head tan with brown setae. **2ND-STAGE LARVA** same as 1st-stage but green, and collar not visible. **3RD-STAGE LARVA** has wide blue-green heart-band, a narrow tan band (pinkish-tan on one of three larvae)

edged by red-brown lines, a wide greenish-tan band with many very tiny red dashes, a dark-green-brown line, a wide tan band with 2 rows of tiny red dashes running through it, a black line, a wide blackish-greenish band (darkest on A3-10, this band runs onto side of tail), a brown line, a narrow greenish-tan band, a red-brown line, a medium-width light-green band encloses dark spiracles, a red-brown line, lateral ridge is cream with reddish in middle of segments so entire band looks pinkish (this whole ridge is bright pink on a 2nd larva, even brighter reddish-pink on a 3rd larva), a red-brown line, underside is light-green; head greenish-tan, with a weak brown dot on each side of frontoclypeus, and faint brown bands like those of *Oeneis* (1st runs alongside coronal sulcus then just lateral to adfrontal sulcus, 2nd runs from top of head to bottom of face, 3rd runs from side of head curving ventromedially down to ocelli). The 3rd-stage larva shows a rather amazing resemblance to *Hipparchia statilinus* of Europe on the head and body and especially the pink band on body; however the pink band in *statilinus* contains the spiracles and its lateral ridge is cream; but the similarity is still great, and Lee Miller showed that *Neominois* and *Karanasa* are very close to *Hipparchia*, so I treated all these as subgenera of *Hipparchia*; subsequent authors have ignored this reassignment, but someone knowledgeable should study it. **PUPA** (empty capsule) very stout.

Oeneis uhleri uhleri (Reakirt). Oviposition 13:43, she landed on grass and crawled 5 cm to clump of *Poa pratensis pratensis* and laid egg under *Pinus ponderosa* dead needle (*P.p. pratensis* 0-50 m thick, *Stipa viridula* [in same clump] 0-5, 50, 50 cm, *Bouteloua gracilis* 20, 30-40, 40 cm onward, *Andropogon gerardii* 15, 35, 35, 60, 60, etc., *Bromus tectorum* 80-200, *Carex pensylvanica heliophila* 10, 40, 40, 60-100); *Poa pratensis pratensis* must be the host here; larva reared but died in half-grown diapause Oct. 7; NW Ralston Butte, Jefferson Co. Colo., May 30, 1994. Adults associated with *Poa pratensis agassizensis*, Tinytown, Jefferson Co. Colo., May 11, May 21, 1994, June 1-2, 14, 26, 1995, May 13 & 31, 1996, May 30, 1997, May 28, 1998. Adults associated with *Poa pratensis pratensis*; saddle E Crawford Gulch, Jefferson Co. Colo., June 6, 1996, June 12 & 24, 1997.

Oeneis chryxus (Doubleday), (**the true foothills twig-ovipositing species**). Egg found 1.5 m up on bark of 6 mm twig having green leaves of *Pinus ponderosa* (*Carex pensylvanica heliophila* 6, 10, 35, 60, 25-100, *Agropyron* [*Elytrigia*] *repens* 10, 30, 35, 40, 50, 60-100, *Carex saximontana* 30, *Koeleria macrantha* 100), Apex County Park, Jefferson Co. Colo., Aug. 1, 1992. 7 eggs found all under one *Pinus ponderosa* tree with just as much *Poa pratensis agassizensis* as *Carex pensylvanica heliophila* beneath: egg found 35 cm above ground on bark of 1-cm branch (*P. p. agassizensis* 4-400 common, *C. p. heliophila* sparse 7, 9, 15, 15, 40 etc., *Stipa viridula* 18, 25, 100, *Danthonia parryi* 130); egg found 1.2 m up on bark of 7 mm twig (*C. p. heliophila* 2, 2, 15, 20, 30, 30, etc. to 100 [about half as common as *P. p. agassizensis*], *P. p. agassizensis* 5, 10, common to 300, *Stipa viridula* 50, *Koeleria macrantha* 100, *Danthonia parryi* 100, *Agropyron* [*Elymus*, "*Sitanion*"] *longifolius* 100); egg found 55 cm up on bark of 1 cm branch (*P. p. agassizensis* 2, 5, 8, etc., *C. p. heliophila* 7, 10, 17, common to 300, *Agropyron* [*Elymus*, "*Sitanion*"] *longifolius* 12, *Koeleria macrantha* 30-45, 60-70, *Stipa viridula* 50, *Danthonia parryi* 100, 100); egg found 60 cm up on bark of 5 mm twig (10 cm from last egg) (*P. p. agassizensis* 0, 5, 10, etc. common to 300, *Agropyron* [*Elymus*, "*Sitanion*"] *longifolius* 8, 15, 25, 30, 40, 60, 60, 70, 80, 100, etc., *C. p. heliophila* 25, 25, 30, 40, etc. less common, *Koeleria macrantha* 50-60, 70-80); egg found 2 m up on bark of 6 mm twig (*C. p. heliophila* 2-200 common, *P. p. agassizensis* 60-150); 2 eggs found (8 cm apart) 1 m up on bark of 8 mm twig (*C. p. heliophila* 2, 5, 8, 10, 15, 20, 30, etc. common to 300, *P. p. agassizensis* 3, 5, common to 100, *Danthonia parryi* 40-50, 90-300); Falcon County Park, Jefferson Co. Colo., July 9, 1992. *P. p. agassizensis* must be the main host under this tree (*C. p. heliophila* a less frequent host) but it seldom grows under trees so must be seldom used in nature (*Poa pratensis pratensis* is eaten in lab, so *Poa* is a suitable host). Egg found on uns of 2-mm-thick dead twig of small Douglasfir tree ~8 cm above ground in understory of Ponderosa Pine & Douglasfir at edge of *Carex rossii* clump (0-30, 10-25, only two clumps present, no other monocots near); Tinytown, Jefferson Co. Colo., July 9, 1994. Adults associated with *Carex rossii*; Tinytown, Jefferson Co. Colo., June 17, 1994. **HOSTPLANT**: Scott (1992) showed that the foothills ecotype usually eats *Carex rossii*, and occasionally eats *C. pensylvanica heliophila*, *C. geyeri*, *C. foenea*, and the rare *C. geophila*. The present paper shows that *Poa pratensis agassizensis* is evidently an occasional host in the foothills (and larvae eat *Poa pratensis pratensis* in the lab, which is probably the same species as *agassizensis* as the Great Plains Flora and new Jepson Flora for California treat it [William Weber's local Colorado checklists list them as distinct species, but distinguish them using characters different than those used in the Jepson Flora!!], because *pratensis* differs from *agassizensis* only by having slightly broader leaves and mostly 3-flowered versus 2-flowered spikelets, which differences I think only occur at least in part because of *pratensis* growing in better wetter conditions). This foothills species--which oviposits on tree branches above sedges (seldom grasses)--is evidently restricted to low-altitude pine-forested regions, as shown below. **EGG** white, covered with starfish-shaped bumps on top and vertical sawtoothed-edged ridges on side, grayish (whitish-gray on top of egg, gray on side, brownish-gray on lower side) between these bumps & ridges. **1ST-STAGE LARVA** tan, with dark lines (brownish-red on most larvae, tan-orangish on one larva) including heart-band, a narrow subdorsal band, a wide supralateral band, a narrow band of connected dashes above a whitish-tan lateral ridge, a red-brown line below ridge; head tan with brown coronal sulcus & brown setae. **HALF-GROWN LARVA** banded mostly like mature larva, with a fairly-wide dark-brown middorsal band, a narrow tan band edged below by brown line, a wide mottled brown band edged below by brown line, a wide cream band with a sinuous brown center (the brown center is absent where this band extends along tail), a wide blackish-brown band (pale anteriorly) extends along tail, a narrow cream band edged below by a red-brown line, a narrow creamy band encloses spiracles, a red-brown line, a fairly-wide cream lateral ridge (this cream band and the

cream band above spiracles coalesce on tail, a fairly-wide red-brown band edged below by a red-brown line, a narrow tan band, underside light-brown; head light-brown with the 3 usual blackish-brown bands typical of *Oeneis*, a tan patch around biggest eyes. **MATURE LARVAE** are polymorphic, with continuous variation from mostly-tan larvae to dark-brown larvae, most larvae are fairly light and few are dark-brown; the pale larva has fairly-wide heart-band brownish-black (pale-brown-centered esp. T1-A1 on the paler larva, but heart-band entirely black on dark larva)(geographic variation: this heart-band is broken up into short dashes in Ont., but has dashes anteriorly but a solid band posteriorly in NW Wash.), next a narrow tan band, a wide light-brown band (dark-brown on dark larva; browner on T1-2 of pale larva, brown on T1-3 of dark larva) that blends into a brown (blackish on dark larva) narrow zone on the bottom of this wide band, a wide light-brown band (light-brown with blackish center on dark larva)(this band is also on tail), a wide dark-brown band (paler on T1-3)(entire band blackish on dark larva) that is also on tail, a narrow tan band, a wide light-brown band (brown on T1-3)(entire band blackish on dark larva) that encloses spiracles & is also on tail, a narrow tan lateral ridge, underside light-brown, legs orange-brown; head light-brown (brown on dark larva) with the usual 3 blackish-brown (blackish on dark larva) bands typical of *Oeneis*, and dark larva also has side of frontoclypeus also dark-brown. **PUPA** ochre-tan on top of thorax and on abdomen, with 3 brown dots on top of T2, one brown near-middorsal dot on T3, abdomen has 4 pairs per segment of brown dots near light-brown heart-band and subdorsally & above spiracles & below spiracles, on A5-7 a brown laterventral dot and brown supraventral dot and some tiny brown midventral marks, T1 & head are light-brown, wings dark-brown with lighter veins, a brown vertical stripes on front of head near midline, orbit blackish-brown, antenna & appendages dark-brown edged by light-brown, cremaster red-brown.

Oeneis calais altacordillera Scott, (**high-altitude species**). At Fourmile Creek, Park Co. Colo., July 21, 1993 (a site shown to me by Daniel Petr who was studying mate-location there), the population was common earlier in the year, yet D. Petr and I looked for tree branches that might have eggs and found a shortage of suitable tree branches and sedges beneath trees. At high altitude the trees are mostly *Picea engelmanni*, which has low branches that shade the ground beneath so much that no grasses or sedges can grow beneath, which means that high-altitude populations in general do not oviposit on tree branches and must oviposit on valley bottom grasses such as *Festuca idahoensis*, although a quick search of this grass at that site revealed no eggs. At high-altitude in Gunnison Co. Colo., G. Daily, P. Ehrlich & D. Wheye (1991, *Oecologia* 88:587-596) found that females oviposited on grass, aspen saplings, sagebrush, *Potentilla gracilis*, dead twigs & leaves, and one larva was found on *Poa nemoralis interior* which was common & widely distributed there; their females were stored away from nature for hours and thus kept from ovipositing for hours to increase their probability of ovipositing upon release, which may have reduced their discrimination in choosing oviposition sites; nevertheless, no female oviposited beneath trees. (As an aside, *Picea engelmanni* trees are basically worthless pests because they shade the ground beneath and kill everything below them and grow very thick and crowd out butterflies and most wildlife, and infest vast areas of the high mountains, and most are too thin for great lumber, but proper thinning of these forests is opposed by environmental nut tree huggers who worship trees like gods.)

Oeneis jutta reducta McD. Adults associated with *Carex geyeri*; Hideaway Park, Grand Co. Colo., July 4, 1990, July 31, 1992, July 2, 1996. Adults associated with *C. geyeri*, W of Gore Pass, Routt Co. Colo., July 12, 1996. *C. geyeri* grows in sun-dappled areas in *Pinus contorta* forest. But most *P. contorta* forest consists of dog-hair-thick trees too dense to admit enough light to the forest floor to grow *C. geyeri* or anything else. These forests should be logged or allowed to burn, to restore the lifeless woods to a natural condition. Here again, the idiot tree-hugging gaia-worshipping environmental nuts are the problem, as they file lawsuits to prevent proper forest thinning, even including the removal of millions of downed dead trees caused by a massive natural wind blow-down near Steamboat Springs.

Oeneis polixenes brucei (W. Edw.). Adults associated with *Carex rupestris drummondiana*, McClellan Mtn., Clear Creek Co., Colo., July 10, 1992. **4TH-STAGE-MATURE-LARVA** band #1 alternating black and tan dashes, edged below by cream line (all the cream lines of mature larva are tan in 4th-stage), #2a striated brown, #2b (present on T3-A5 only) has tan ovals or squares in black band, edged below by cream line, #3 striated light-brown, a fairly-wide cream line, #4 solid black, a cream line, #5 mottled brown, lateral ridge cream (cream-tan in 4th-stage), #6 blackish-brown, underside light-brown (an irregular brown line just below #6), 2 short tails; head light-brown with 3 blackish-brown stripes, a few small brown marks on side of frontoclypeus, the largest eyes (#2 & 3) are brown and a pale crescent is just behind them, a small brown crescent (concave upward) behind posterior eye (#6).

Apaturinae

Asterocampa celtis celtis (Bdv. & Lec.). This ssp. has darker wings than other ssp., and has the eyespot in fw cell CuA₁ is a white spot (with no black ring), the eyespot in cell M₃ solid black. Adults associated with *Celtis occidentalis*; Volin, Clay Co. S. D., July 31, 1999.

Asterocampa celtis antonia (W. Edw.). This ssp. generally has the eyespot in fw cell CuA₁ a black ring mostly filled with white, and the eyespot in cell M₃ a black spot with tiny white dot; it occurs in Mex.-Tex.-Okla.-SE Colo. Adults associated with *C. reticulata*; Wetmore, Fremont Co. Colo., Aug. 31, 1996.

Asterocampa celtis montis (W. Edw.). This ssp. generally has the eyespot in fw cell CuA₁ a black ring mostly filled with white, and the eyespot in cell M₃ a solid black disc; it occurs in Ariz., and the same wing phenotype occurs near Denver

Colo. Pupal shell found on underside of *Celtis reticulata* leaf, Wheatridge, Jefferson Co. Colo., Aug. 28, 1992. Preoviposition 11:10 *C. reticulata*, Indian Gulch, Jefferson Co. Colo., June 27, 1996. Oviposition 13:21 two eggs onto end of old dried seed, and empty eggshell found on leaf uns nearby, all on *C. reticulata* (1.5 m above ground on small bushy tree); Indian Gulch, Jefferson Co. Colo., July 10, 1998. Female bent abdomen to dead “witches broom” growths near green *C. reticulata* leaf, Indian Gulch, Jefferson Co. Colo., July 13, 1998. Oviposition 11:15 *C. reticulata* leaf uns; Indian Gulch, Jefferson Co. Colo., July 27, 1998. Oviposition 12:03 two whitish eggs laid side-by-side on upper surface of *C. reticulata* leaf 5 cm long that was angled vertically, on small tree near ridgetop about 100 m W of main concentration of trees; Indian Gulch, Jefferson Co. Colo., July 31, 1998. **OVIPOSITION:** Females are not particular about where they place eggs on the hostplant trees: eggs are laid on leaf uns, leaf ups, twigs, berries, etc. **EGG** watery [translucent]-cream, developing a sharp-edged irregular brown subdorsal ring around egg, ~20 vertical ribs. **1ST-STAGE LARVA** cream, top of T2 more tan, a triangular rosy area extends forward from suranal plate for several segments (the point anterior), a tan heart-line, a weak subdorsal cream line edged by tan-cream, possibly a creamier lateral band, suranal plate brown with a chitinous blunt-tipped subdorsal projection; head black.

Asterocampa clyton clyton (Bdv. & Lec.). Adults associated with *Celtis occidentalis*; Volin, Clay Co. S. D., July 31, 1999.

Nymphalinae, Limenitidini

Limenitis archippus archippus (Cram.). Adults in canal with *Salix exigua* & *Salix amygdaloides*, Barr Lake, Adams Co. Colo., Sept. 1, 5, 1994. Adults assoc. *Salix exigua*; 1 mi. E Thornton, Cerro Gordo Co. Iowa, Aug. 10, 2005. Adults assoc. *S. exigua*; ½ mi. W Hall of Humes Lake, Freeborn Co. Minn., Aug. 15, 2005.

Limenitis weidemeyerii W. Edw. Ovipositions 12:06, 12:13 on dorsal tip of *Prunus virginiana* var. *melanocarpa* mature leaves, oviposition 12:15 on dorsal leaf tip of *Amelanchier alnifolia*; hatching larva fed *P. v. melanocarpa* in lab until half-grown diapause, refrigerated 2 months, fed *Malus pumila* in lab, pupated Nov. 17, 1992; E Mother Cabrini Shrine, Jefferson Co. Colo., June 15, 1992. Oviposition 11:01 *Amelanchier alnifolia* dorsal leaf tip, after landing on *Symphoricarpos* & *Holodiscus discolor*; oviposition 9:53 on *Salix exigua* dorsal leaf tip; female lands on leaf ups causing leaf to sag while she lays egg on leaf tip; Indian Gulch, Jefferson Co. Colo., June 15, 1994. Oviposition 10:40 ups leaf tip of small 3-cm-blade leaf of *P. v. melanocarpa*; she landed on *Berberis repens* 2X but flew; Indian Gulch, Jefferson Co. Colo., June 18, 1994. Female landed on *P. v. melanocarpa*; Indian Gulch, Jefferson Co. Colo., July 25, 1995. Preoviposition 14:02 on *Ceanothus fendleri*; Coal Creek, Jefferson Co. Colo., Aug. 1, 1996. Oviposition 12:52 on tip of ups of *Holodiscus discolor* (= *dumosus*, now included in *discolor*) leaf on shady uns of 75-cm-tall shrub on N-facing slope; Indian Gulch, Jefferson Co. Colo., July 10, 1998. **EGG** olive-green, covered with numerous spikes each arising from each corner of the hexagonal-walled pits covering the surface. **1ST-STAGE LARVA** light mottled brown with numerous cream points (light mottled brownish-olive-green after feeding), the lateral area a bit paler with cream setae, a middorsal darker-brown (after feeding darker-olive-green) band edged by a narrow paler line of cream points, T1 collar cream, subdorsal brown (tan on T3) bumps on T2, T3, A2, A7, A8; head brownish-orange with cream setae. **2ND-STAGE LARVA** similar to 1st-stage in pattern & heart-line, light-brown (mottled with tan and brown areas) with tan bumps, the subdorsal bumps are tan; head orange-brown; larva eats the leaf around a leaf vein & silks dung pellets onto the distal part of the leaf vein, and rests (head aimed toward base of vein) on a silk mat on top of the basal portion of the bared leaf vein. **HALF-GROWN LARVA** resembles bird dropping, black with numerous ochre points, and many short projections (long on most segments but short on A3-6 & A9) covered with tiny ochre points, a white saddle on top of body (A4-6), a lateral white stripe on A6-10 (narrow on A6), T1-3 have a middorsal ochre band and a dorsolateral ochre band; head black (reddish-brown dorsally) with various black, ochre, & cream points. **OLDER-MATURE LARVA** resembles bird dropping, with cream saddle on A4-6 which is connected ventrally to a white lateral band extending from A1-10 (this lateral band is connected to pinkish-cream side of thorax), heart-band darker pink on this saddle and has a black dash on rear of each A4-6 segment, T1-3 mostly pinkish-cream mottled subdorsally and dorsally with some brown spots & black spots, rest of body & underside red-brown, a large near-middorsal brownish-orange bump on A2, many shiny blue-black small domes occur on all the brown areas of body, an orange-brown area is around the small subdorsal clubs on A3 & A7, black subdorsal knobby clubs (the clubs resemble clubbed scoli but lack setae) are on T2 (the longest), T3 (small), A1 (tiny), A2 (small), A3 (tiny), A4 (tiny & white), A5 (a tiny white cone), A6 (tiny & white), A7 (small), A8 (larger), A9 (tiny), A10 (fairly long); head black with dark-red-brown side of face of head and an orangish bump near top of each side of forehead (evidently later the side of face of head turns black with many black bumps and the orangish bump becomes gray). **PUPA** resembles bird dropping (black mottled with cream), the head & appendages & saddlehorn & abdomen tip all black, wings mostly black (wings solid black on one pupa, but second pupa has wings black except basal 2/3 of wings mottled cream-&-black and cream marginal spots on anterior half of wing margin), a creamier patch on lateroposterior part of gena, T1 black except cream subdorsally, T2 black on middorsal ridge & pinkish-tan with brown patches subdorsally (except blackish-brown on rear), black on wing base, T3 has a slight middorsal crest that is brown, T3 pearly-cream beside that, T3 then pinkish-tan, T3 laterally blackish-brown, hindwing brown, abdomen is mostly black, A1 has a pearly middorsal ridge then is black then pearly laterally, A2 saddlehorn is black and its black extends posterolaterally to above the A4 spiracle, abdomen is pearly laterally on A1 and

pearly beside and just above spiracles on A2-4, a pearly patch is above and beside spiracle on A6-7, a creamy saddle occurs on middle of abdomen (dorsally the saddle is pinkish-tan and extends from A4-6 where each A4-6 segment has a middorsal black spot on rear of segment, subdorsally the saddle is pinkish-tan and extends in a pointed dash anteriorly onto A3 and in a pointed dash posteriorly onto A7, then the saddle is cream where it narrows above spiracles to just A5 and the rear part of A4, then saddle joins a wide cream lateral band from A4-8 which is narrow on A8), A67 have a dorsolateral mottled brownish-black band connected to the black abdomen tip, A567 have a supraventral mottled brown area and a midventral cream stripe, A8-10 & cremaster entirely black except for a narrow cream bar below the rudimentary A8 spiracle (which is a closed vertical slit), a bump on underside of head, a bump is on each leg, a bump is on wing base, one bump is on wing 40% of way from base to tip, cremaster broad with ~200 red-brown crochets. **TAXONOMY:** *L. weidemeyerii* was recently placed in *L. lorquini*, despite slight differences in the male valva, because of intergradation in E Calif.-Nev.-W Mont. (in N Nevada *weidemeyeri* and form *fridayi* are both common but pure *lorquini* is absent, because the intergradation has been extensive enough to move the wing pattern of *lorquini* into *weidemeyerii*), and because of Porter's (1990) electrophoretic study of adults from Calif., Nevada, and Montana. However, Steve Kohler (pers. comm.) states that they do not interbreed in the few places they overlap in Montana. And Boyd et al. (1999) place them as distinct species despite an area in N Nev. where intermediates are the dominant form, because of an inferred slight inferiority of hybrids in W Nev.-E Calif.

Nymphalinae, Nymphalini

Vanessa atalanta (L.). Two ~4th-stage larvae in drooping *Urtica dioica gracilis* leaf nest (leaf folded upward), Tinytown, Jefferson Co. Colo., July 14, 1992. Oviposition 13:10 uns of dead 3 mm thick twig 10 cm above top of one of 4 *U. d. gracilis* plants, Green Mtn., Jefferson Co. Colo., May 31, 1994. Oviposition 9:50 uns of ~10-cm-long leaf, ovipositions 10:00 & 10:01, all on *U. d. gracilis*, the female would flutter down beneath host also, Tinytown, Jefferson Co. Colo., June 7, 1994. Oviposition 9:55 under leaf with black shriveled tip (egg lost), ovip. 9:56 under 5 cm fallen branch above *Urtica* (this egg ended up on spider web 3 mm from branch, ovip. 10:00 under base of petiole of large leaf, ovip. 10:01 under bark of 8 cm fallen branch above *Urtica*, all near *U. d. gracilis*; Tinytown, Jefferson Co. Colo., June 17, 1994. Greenish-cream larva in leaf nest, ~20 empty nests found (2 parasitized), all on *U. d. gracilis*; Sowbelly Can., Sioux Co. Neb., June 25, 1994. Egg found on edge of leaf, 8 mature larvae (larvae were slightly-greenish yellow-gray, or mostly yellow-cream, or grizzled-reddish-&-yellow, or mostly-black) found in leaf nests, all on *U. d. gracilis*; Tinytown, Jefferson Co. Colo., July 9, 1994. Larval nest *U. d. gracilis* (leaf veins chewed through at base, leaf folded above larva), Deer Creek, Jefferson Co. Colo., Aug. 4, 1994. Half-grown larva found in *U. d. gracilis* silk-leaf nest (leaf folded above larva, leaf base veins cut); Barr Lake, Adams Co. Colo., Sept. 1, 1994. Oviposition 10:05 under *U. d. gracilis* leaf; Tinytown, Jefferson Co. Colo., June 14, 1995. One 3rd-stage larva found on drooping-leaf *U. d. gracilis* leaf; Tinytown, Jefferson Co. Colo., July 8, 1995. 6 mature larvae in *U. d. gracilis* leaf nests (drooping because leaf base partially chewed through, leaf bowed upward and leaf edges silked together around larva); Tinytown, Jefferson Co. Colo., July 13, 1995. Mature larva in leaf nest folded upward on *U. d. gracilis*; Tinytown, Jefferson Co. Colo., July 26, 1995. 2 mature larvae found on *U. d. gracilis*, which had been 2/3 defoliated by larvae; Tinytown, Jefferson Co. Colo., Aug. 17, 1995. Oviposition 11:30 on *Clematis ligusticifolia* stem 5 cm from stem tip 60 cm above ground 1.7 m from *U. d. gracilis*, after landing on *U. d. gracilis* several times, then she bent abdomen on *U. d. gracilis* but did not deposit egg, then she oviposited 11:36 on *U. d. gracilis* leaf uns 15 mm from leaf tip; Apex Gulch, Jefferson Co. Colo., June 16, 1997. Ovipositions 11:25, 14:00 *U. d. gracilis*, nine ovipositions 11:33-11:41 on *U. d. gracilis* (one egg on top of large leaf at edge of hole in leaf, one on uns of large leaf, one on unexpanded leaf at inflorescence, 5 eggs on inflorescence, one oviposition on *Carduus nutans* leaf 10 cm from *U. d. gracilis*), ~50 eggs found on *U. d. gracilis* (most on young inflorescences, some on young leaves/stems near inflorescence, a few on older leaves, a few on stems of older leaves; one ovipositing female flew to another female at nettle (perhaps to drive her away?, or to get another mating if the other adult were a male?)); Tinytown, Jefferson Co. Colo., June 17, 1997. Oviposition 11:41 two eggs on *U. d. gracilis* inflorescence; Tinytown, Jefferson Co. Colo., June 18, 1997. Five ovipositions by one female: oviposition 11:21 *U. d. gracilis* tiny leaf 6 cm from top of plant, oviposition 11:24 *Rubus idaeus melanolasius* leaf petiole 7 cm from *U. d. gracilis*, oviposition 11:25 on tiny *U. d. gracilis* leaf 7 cm below plant top, oviposition 11:26 on uns of older *U. d. gracilis* leaf 10 cm from top of plant, oviposition 11:28 on *Bromus inermis* leaf 8 cm from *U. d. gracilis*; S of Evergreen, Jefferson Co. Colo., June 26, 1997. ~3rd-stage larva in *U. d. gracilis* leaf nest (leaf edges bent up above larva & tied); Cherry Gulch, Jefferson Co. Colo., July 1, 1997. Half-grown larva in *U. d. gracilis* leaf nest (leaf curled upward); SE Freeborn Lake, Freeborn Co. Minn., July 11, 1997. Many older larvae seen in drooping (folded above larvae) *U. d. gracilis* leaf nests; Tinytown, Jefferson Co. Colo., July 17, 1997. Mature larva in nest on *U. d. gracilis* leaf ups; Tinytown, Jefferson Co. Colo., Aug. 7, 1997. Two mature larvae in nests of several *U. d. gracilis* leaves silked together at top of plant; N of Silverthorne, Summit co. Colo., Aug. 25, 1997. Several multi-leaf larval nests seen near *U. d. gracilis* leaf tops; the devastation caused by numerous larvae earlier in the year is now almost absent due to new growth; Tinytown, Jefferson Co. Colo., Sept. 4, 1997. Larval nest on *U. d. gracilis* leaf top, NE Alden, Freeborn Co. Minn., June 22, 1998. Oviposition 13:15 *U. d. gracilis*; Hall of Humes Lake, Freeborn Co. Minn., June 25, 1998. Blackish mature larva found on *U. d. gracilis* rolled leaf uns; Hall of Humes Lake, Freeborn Co. Minn., July 30, 1999. ~5 young larvae & 2 mature larvae in *U. d. gracilis* leaf nests; 2.5 mi. NE Conger, Freeborn Co. Minn., June 21, 2001. 3 larval nests found on *U. d. gracilis*; 1 mi. E

Sutherland, Lincoln Co. Neb., June 29, 2001. Mature larva found (mostly black) in leaf nest 2 cm from top of *U. d. gracilis* plant, 2 other empty nests beside it, one more nest on plant nearby; Hall of Humes Lake, Freeborn Co. Minn., July 25, 2004. Half-grown larva in *U. d. gracilis* nest; 3 mi. NE Conger, Freeborn Co. Minn., July 27, 2004. Preoviposition 10:45 *Humulus lupulus americanus* 20 times but did not lay egg; another female oviposited 11:00 on *U. d. gracilis*, and two 6-mm-long blackish larvae found in curled-upward leaves near top of *U. d. gracilis* plants; Wheatridge, Jefferson Co. Colo., June 16, 1998. 2 adults seen near *H. l. americanus*; Wheatridge, Jefferson Co. Colo., Aug. 4, 1997. Four new **MATURE LARVA** color variations were found at Tinytown: one larva yellowish-cream with strong black mottling, a black heart-band, black bands above (wide) and below (including spiracles) BSD scoli, a strong lateral cream band, cream scoli; one larva cream-yellow with weak darker band below BD2 scoli and weak brown band along spiracles; one larva black except for numerous cream dots (the cream dots most frequent near black heart-band) and cream scoli, and cream lateral abdominal band enclosing cream scoli; one larva slightly-bluish gray (blackish on intersegmental area) with numerous tiny white dots and cream-tan scoli; one larva entirely black (including black scoli) except for cream dots formed from cream seta bases (the cream dots most frequent near black heart-band), a cream zigzag band below spiracles, proleg tips red-brown; another larva is black like the last but has orange-brown rings around BSD scoli, a whiter area anterior to BD2 scoli and a black curved patch around and anteroventrad of BD2 scoli, and the band below spiracles is a series of cream crescentlike spots. All larvae have black heads with cream seta bases, but the variation of body color is incredible, as the general color and the color of the mounds below scoli and the color of the scoli themselves, all vary drastically between individuals.

Vanessa cardui cardui (L.). 2-cm-long larva in *C. arvense arvense* nest, 3 mi. NE Alden, Freeborn Co. Minn., June 11, 1995. ~6 larval silked-leaf nests found on *C. a. arvense*; 3 mi. SE Brady, Lincoln Co. Neb., June 29, 2001. Larval nest on *Cirsium arvense incanum* (*incanum* was previously lumped into *C. arvense*, then was treated as a separate species by W. Weber, who now lumps it again into *C. arvense*), Indian Gulch, Jefferson Co. Colo., July 6, 1992. ~10 larval nests on *C. a. incanum*, Wheatridge, Jefferson Co. Colo., July 11, 1992. Oviposition 13:15 *C. a. incanum*, near Indian Creek Cgd., Douglas Co. Colo., July 6, 1995. Oviposition 11:01 on ups of tip of 5-mm-long new leaf of small *C. a. incanum* plant; Marshall, Boulder Co. Colo., July 10, 1995. Oviposition 13:14 *C. a. incanum* leaf uns; Wheatridge, Jefferson Co. Colo., July 24, 1995. Larval nest *C. a. incanum*; 11 mi. E Hamilton, Routt-Moffat Co. Colo., July 19, 1996. Two larval nests on *C. a. incanum* leaf tops; Wheatridge, Jefferson Co. Colo., July 7, 1998. Oviposition 11:35 *C. a. incanum*; 2.5 mi. NE Conger, Freeborn Co. Minn., June 27, 2001. Five 3rd-stage larvae in silk webs on *C. a. incanum* leaf tops; one mature larva in silk nest nearly closing leaf top of mature *Carduus nutans macrolepis*; Tinytown, Jefferson Co. Colo., July 17, 1997. Wasp pupa beside dead young larva in *Cirsium vulgare* leaf nest, Red Rocks, Jefferson Co. Colo., July 7, 1992. Larval nest on *C. vulgare* leaf top, Red Rocks, Jefferson Co. Colo., July 9, 1992. Mature larva & ~4 empty nests on *C. vulgare*, Marshall, Boulder Co., Colo., July 15, 1992. Larval nest on *C. vulgare*, Wheatridge, Jefferson Co. Colo., July 28, 1992. Larval nest *C. vulgare*, Austin, Delta Co. Colo., July 30, 1993. Large *C. vulgare* plant mostly defoliated by larvae, Barr Lake, Adams Co. Colo., Aug. 31, 1993. Two silked-leaf larval nests with frass on *C. vulgare*; Penasco, Taos Co. New Mex., Sept. 9, 1998. 8 larval nests found on *Cirsium ochrocentrum*, Falcon County Park, Jefferson Co. Colo., July 9, 1992. ~4 larvae in *C. ochrocentrum* leaf nests, Tinytown, Jefferson Co. Colo., Aug. 4, 1992. Shriveled half-grown larva in nest on *C. ochrocentrum* with 5 mm parasitoid wasp cocoon beside it; Tinytown, Jefferson Co. Colo., Sept. 22, 1992. Larval nest containing parasitoid cocoon on *C. ochrocentrum*, SW Greenwood, Custer Co. Colo., July 16, 1993. ~10 empty nests (a parasitoid was beside shriveled 2nd-stage in one nest) on *C. ochrocentrum* leaf tops; 4 empty nests and a 2nd-stage larva on *Carduus nutans macrolepis* leaf tops; Tinytown, Jefferson Co. Colo., July 14, 1992. Larval nest on *Cirsium undulatum*; nest with empty parasitoid wasp cocoon on *C. ochrocentrum*; 1 mi. W. Idledale, Jefferson Co. Colo., Aug. 5, 1992. ~7 silk-web nests found on top of *C. ochrocentrum* leaves (only one on flowering plant, the remainder on seedlings); Tinytown, Jefferson Co. Colo., July 2, 1997. 3 empty nests on *C. undulatum*, 2 empty nests (including parasitized half-grown larva) on *C. ochrocentrum*, Red Rocks, Jefferson Co. Colo., Aug. 13, 1992. 6 empty nests on *C. ochrocentrum*, 3 on *C. undulatum*, Red Rocks, Jefferson Co. Colo., Aug. 14, 1992. ~5 empty nests on *C. ochrocentrum*, ~2 empty nests on *C. undulatum*, Red Rocks, Jefferson Co. Colo., Aug. 17, 1992. Larval nest and empty wasp cocoon on *C. undulatum*; half-grown and mature larvae found in *Cirsium canescens* leaf nests; Sowbelly Can., Sioux Co. Neb., Aug. 23-24, 1993. Older larva in nest on *C. undulatum* (and 2 empty nests nearby), Tucker Gulch, Jefferson Co. Colo., Aug. 3, 1992. Larval nest on *C. undulatum*; Mt. Zion, Jefferson Co. Colo., July 25, 1995. Larval nest on *C. undulatum*, 1 mi. W. Idledale, Jefferson Co. Colo., Aug. 7, 1992. Two 3rd-stage larvae found in silk nests on top of *C. undulatum* leaves, Green Mtn., Jefferson Co. Colo., June 1, 1993. ~3rd-stage larva skin next to wasp pupa in nest on *C. undulatum* leaf top, Wolf Park, Fremont Co. Colo., June 24, 1993. 6 empty larval nests on *C. undulatum* seedling, Green Mtn., Jefferson Co. Colo., June 19, 1994. Larva in silk web on *C. ?undulatum* leaf top; Tinytown, Jefferson Co. Colo., Aug. 7, 1997. Three empty larval nests in *C. undulatum* leaf tops; Tinytown, Jefferson Co. Colo., July 2, 1998. 2/3-grown larva in nest of 6 *Lupinus argenteus* leaves bent upward into silk nest; 2 empty silk nests on *C. undulatum*; Apex County Park, Jefferson Co. Colo., Aug. 1, 1992. Larval nest with 3rd-stage larval head capsule found on *Cirsium neomexicanum*, near Gateway, Mesa Co. Colo., July 29, 1993. One 5th-stage larva and one 3rd-stage found in *C. neomexicanum* leaf nests, one 4th-stage found in *Cirsium arvense arvense* leaf nest, one 4th-stage found in *C. arvense incanum* leaf nest; W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 17,

1993. Two 4th-stage larvae and 11 empty nests found on *Onopordum acanthium* leaf tops; Barr Lake, Adams Co. Colo., Sept. 3, 1992. Oviposition 10:03 *Carduus n. macrolepis* leaf uns; Tinytown, Jefferson Co. Colo., July 8, 1995. 2 larval nests on *C. n. macrolepis* seedling; Fort Morgan, Morgan Co. Colo., Sept. 15, 1995. One 3rd-stage larva and 7 empty nests on *C. a. incanum* leaf tops; one 4th-stage larva in nest on *C. n. macrolepis* leaf top; oviposition 10:51 on *C. n. macrolepis* large bad-looking (mottled with yellow) leaf ups; Tinytown, Jefferson Co. Colo., July 13, 1995. A dead black 3rd-stage larva found in silk nest on leaf ups near top of *C. n. macrolepis*; Tinytown, Jefferson Co. Colo., Sept. 4, 1997. One 1-cm-long larva in silk web nest on *C. ochrocentrum* leaf ups; oviposition 14:37 leaf top of 70-cm-tall *C. n. macrolepis*; Tinytown, Jefferson Co. Colo., July 22, 1995. Ovipositions 13:19 on bract uns, 11:43 & 11:44 on leaf uns, all on *C. n. macrolepis*; 17-mm larva found in nest on *C. n. macrolepis* leaf uns; oviposition 13:18 *C. a. incanum* leaf uns [?]; Tinytown, Jefferson Co. Colo., July 26, 1995. Empty nest and mature larva in leaf nest on *C. undulatum*; *C. ochrocentrum* plant nearly defoliated by absent larvae; Tongue Can., Sheridan Co. Wyo., Aug. 1, 1995. Larval nests found on *C. arvense arvense* and *Cirsium ?coloradense*; Cabin Crk., Bighorn Co. Wyo., Aug. 3, 1995. Larval nest on *Cirsium coloradense* (=drummondii =foliosum); S Loaf Mtn. Overlook, Johnson Co. Wyo., Aug. 4, 1995. 2 larval nests on *C. a. incanum*, 1 nest on *C. arvense arvense*; Wheatridge, Jefferson Co. Colo., Aug. 10, 1995. Oviposition 14:30 *C. arvense incanum* main stem while resting on leaf base, 5 larval nests on *C. a. incanum*, 1 larval nest on *C. ochrocentrum*, 3rd-stage larva found on *C. n. macrolepis*, larva 20-mm long ~4th-stage found on *Rudbeckia laciniata* and 3 other empty nests of this larva found on same plant, so this is a successful host; Tinytown, Jefferson Co. Colo., Aug. 17, 1995. 2 larval nests on *Cirsium centaureae*, 2 half-grown larvae and ~10 empty larval nests on *C. a. incanum*; Tinytown, Jefferson Co. Colo., Aug. 24, 1995. 3rd-stage larva in silk web nest on *Cirsium centaureae* large leaf uns; Keystone Gulch, Summit Co. Colo., Aug. 21, 1997. 20-mm larva in *Cirsium tweedyi* leaf top nest; Loveland Pass, Summit Co. Colo., Aug. 21, 1995. 2 larval nests on *C. tweedyi* seedling; Loveland Pass, Summit Co. Colo., Sept. 14, 1995. Mature larva (later pupated) found *Lupinus argenteus*; W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 2, 1995. Oviposition 13:25 *Cynoglossum officinale* (Boraginaceae) leaf uns; Tinytown, Jefferson Co. Colo., June 14, 1995. Preoviposition 11:06 *Helianthus pumilus*; NNE Idledale, Jefferson Co. Colo., Aug. 8, 1997. Larval nest on *Cirsium discolor*; NE Conger, Freeborn Co. Minn., June 26, 1998. ~7 small larvae and 2 mature larvae found in *C. discolor* leaf nests; 2.5 mi. NE Conger, Freeborn Co. Minn., June 21, 2001. Larval nest on *Cirsium vulgare*; 3 mi. NE Conger, Freeborn Co. Minn., July 24, 2004. Larval nests made by older larvae on 2 *C. vulgare* leaves; Cozad, Dawson Co. Neb.; Aug. 9, 2005. 4 larval nests found in *Cirsium discolor* leaf tops, 1 larval nest on *Cirsium arvense* var. *incanum*; 3 mi. NE Conger, Freeborn Co. Minn., July 27, 2004. Several larval nests in *C. discolor* leaves; 2.5 mi. NE Conger, Freeborn Co. Minn., Aug. 12, 2005. **NEW HOSTPLANTS:** *C. neomexicanum* & *C. coloradense* & *C. tweedyi* & *C. discolor* & *Rudbeckia laciniata* & *Cynoglossum officinale*. **MATURE LARVA:** One larva from Bighorn Co. Wyo. was rather extreme in having the body mostly gray, with several intersegmental yellow transverse lines and a black transverse subdorsal dash behind these, and all scoli were white, and only the supralateral BSD scoli had pink at base.

Vanessa virginiensis (Drury). Ovipositions 13:17, 13:18, 13:19, 13:20 on top of basal leaves of one 30-cm-wide clump of *Antennaria neglecta*; Tinytown, Jefferson Co. Colo., July 4, 1997. Preoviposition 12:03 drumming on *Artemisia ludoviciana* three seedlings but no eggs laid, Apex Gulch, Jefferson Co. Colo., May 26, 1998. **NEW HOST:** *Antennaria neglecta*. **EGG** cream with a slight greenish tint, 12-13 vertical ribs.

Polygonia interrogationis (Fabr.). Preoviposition 12:22 on *Humulus lupulus americanus*; Red Rocks, Jefferson Co. Colo., June 19, 1997. Female assoc. *H. l. americanus*; Wheatridge, Jefferson Co. Colo., July 3, 1999. Preoviposition 13:10 *Urtica dioica gracilis*; Hall of Humes Lake, Freeborn Co. Minn., July 27, 1999. Preoviposition *U. d. gracilis* leaf uns, 2 larvae near-mature found on top of and uns of *U. d. gracilis* leaves, parasitized by Tachinids; Hall of Humes Lake, Freeborn Co. Minn., July 30, 1999. **PUPA** mottled dark-brown, shiny gold on T3-A2 (behind BD2 cone near rear of segment), middorsal stripe on A4 (A5 to cremaster) is ochre edged by blackish, a lateral blackish band on abdomen includes spiracles and is blackish at lower edge in a line below spiracles, midventral brown band on abdomen extending along side of cremaster to tip, a keel on top of T2, many cones occur including small low middorsal cones on front of each segment (A2-7), subdorsal cones T2-A1 small, A2-3 & A5-7 large, A4 giant, supralateral cones A(1)2-3 a shiny vestigial bump, A4-7 a vestigial bump, A7-8 a paler spot, each cone is generally blackish at base with a reddish-brown ring above that and blackish above that on most of cone and then an ochre tip of cone; distal 2/3 of proboscis blacker; a lateral black band on cremaster, cremaster looks like the two arms of a blacker-edged horseshoe; silk cremaster pad pink.

Polygonia comma (Harris). Female(s) seen on *Humulus lupulus americanus* apparently preovipositing 10:15; Wheatridge, Jefferson Co. Colo., July 6, 1997.

Polygonia satyrus satyrus (W. Edw.). Oviposition 10:15, she landed on dead and live *Humulus lupulus americanus* stems, then laid 1 green egg on overhang of 3 m rock 1 m above *H. lupulus*, she also landed on dead & live *H. l. americanus* stems 10:10, Apex Gulch, Jefferson Co. Colo., May 13, 1993. Four females rested on *H. l. americanus*, Wheatridge, Jefferson Co. Colo., July 18, 1994, July 6, 1997. Preoviposition 11:15 *H. l. americanus*, Apex Gulch, Jefferson Co. Colo., June 20, 1995. ~4th-stage larva (15 mm long) found in net after swinging net onto *H. l. americanus*; Red Rocks, Jefferson Co. Colo., June 19, 1997. Oviposition 10:29 next to midrib in center of 7-cm-wide leaf *H. l. americanus* leaf uns; Wheatridge, Jefferson Co. Colo., July 7, 1998. Oviposition 10:00 two eggs side-by-side on *Urtica dioica gracilis* leaf uns; Tinytown, Jefferson Co. Colo., June 14, 1995. 2 eggs found 1 mm apart on *U. d. gracilis* leaf uns;

Tinytown, Jefferson Co. Colo., June 22, 1995. 3 mature and one 1.5-cm larva found in leaf nests of *U. d. gracilis* (the leaf base chewed through so leaf droops, the leaf edges drooped downward around larva but edges not silked together), one plant had two empty nests and one occupied nest; larvae abandon a nest when the outer part of leaf is eaten then make another nest; Tinytown, Jefferson Co. Colo., July 13, 1995. 2 older larvae in *U. d. gracilis* nests; Tinytown, Jefferson Co. Colo., July 22, 1995. Two near-mature larvae found on *U. d. gracilis* in usual leaf nests, later that day they had moved to nearby stems and were under large leaves preparing new nests; Tinytown, Jefferson Co. Colo., July 26, 1995. Adults assoc. *U. d. gracilis*; Wheatridge, Jefferson Co. Colo., July 7, 1995. Female from Wheatridge, Jefferson Co. Colo., July 7, 1995, was placed in net bag on *U. d. gracilis*, and laid eggs, mostly on leaves, some on stem, in these clusters: 4, 3, 3, 3, 1, 1, 1, 3, 1, 6, 3, 3, 1, 1, 2, 3, 1, 2, 3, 3, 3, 2, 3, 1, 4, 1, 3, 2, 1, 3, 1, 1, 1, 3, 1, 3, thus the average = $82/37 = 2.2$ eggs/cluster. Adults associated with *U. d. gracilis*, Tinytown, Jefferson Co. Colo., May 31, 1996. One 3rd-stage-larva and two mature larvae found under *U. d. gracilis* leaf nests (the larva chewed through the three main leaf veins near leaf base and chewed each adjacent leaf edge and in the process severed four little leaf veins, to make leaf droop, so that leaf edges are bent downward over larva, and then some silk laid onto leaf undoubtedly helps curl leaf edges downward somewhat); Cherry Gulch, Jefferson Co. Colo., July 1, 1997. **EGG** has 11 or 13 ribs, versus 9 ribs in *Vanessa atalanta*.

Polygonia gracilis zephyrus (W. Edw.). Preoviposition 11:05 *Ribes cereum*; Lookout Mtn., Jefferson Co. Colo., May 21, 1996. . Preoviposition 13:35-13:44 *R. cereum*; Tinytown, Jefferson Co. Colo., May 28, 1998. Mature larva found wandering 5 m from three *R. cereum* bushes (no other *Ribes* near); Indian Peak, Jefferson Co. Colo., June 12, 1998.

Polygonia oreas satellow Scott. Adults associated with *Ribes inerme* common, *Ribes lacustre* common, *Ribes wolfii* few; Game Creek N Minturn, Eagle Co. Colo., Aug. 24 & Sept. 3, 1996.

Polygonia faunus hylas (Edw.). Mature larva (died later) found, resting in L-shape on top of *Ribes inerme* branch, near Golden Gate Can. State Park, Gilpin Co., Colo., Aug. 18, 1992. Adults associated with *Salix bebbiana*, ?*monticola*, and various *Ribes*; Game Creek N Minturn, Eagle Co. Colo., Aug. 24, 1996.

Aglais milberti (Godart). 3rd- & 4th-stage larvae on top of curled *Urtica dioica gracilis* leaves, Tinytown, Jefferson Co. Colo., July 14, 1992. ~50 near-mature larvae found on *U. d. gracilis* leaves, Van Bibber Creek, Jefferson Co. Colo., May 20, 1993. 2 older larvae in leaf-folded-upward *U. d. gracilis* nests, Tinytown, Jefferson Co. Colo., July 27, 1993. Cluster of ~100 1st-stage larvae in nest of terminal young *U. d. gracilis* leaves, Tinytown, Jefferson Co. Colo., June 4, 1994. Oviposition 10:00 ~216 eggs in a 4-deep pile about 9 X 6 eggs wide under top 10-cm-long leaf, and 4 clusters of 2nd-3rd stage larvae found in silk nests in vertical small topmost leaves, all on *U. d. gracilis*; Tinytown, Jefferson Co. Colo., June 7, 1994. 9 clusters of 2nd-5th-stage larvae found on *U. d. gracilis* tops, Tinytown, Jefferson Co. Colo., June 17, 1994. Many larvae on *U. d. gracilis*, Tinytown, Jefferson Co. Colo., June 20, 1994. ~50 near-mature larvae found *U. d. gracilis*, Apex Gulch, Jefferson Co. Colo., June 21, 1995. Oviposition 10:45 *U. d. gracilis* leaf uns (two eggs laid but she then was scared by video camera); Tinytown, Jefferson Co. Colo., June 26, 1995. Cluster of ~38 eggs in 3-layer pile, with a pile of ~181 eggs in four-layers next to it, all on one *U. d. gracilis* leaf; Tinytown, Jefferson Co. Colo., July 5, 1995. Oviposition 10:25, female landed and oviposited on existing egg cluster on *U. d. gracilis* leaf uns, the cluster had about 680!! eggs in pile 20 X 8 mm wide, and was obviously laid by several (perhaps 4 or more) females because one part of cluster had paler eggs than the other part; ~100 3rd-stage larvae found on top of another *U. d. gracilis*; Tinytown, Jefferson Co. Colo., July 8, 1995. ~100 1-cm-long larvae in cluster on *U. d. gracilis* leaf top; Tinytown, Jefferson Co. Colo., July 22, 1995. Many larvae on *U. d. gracilis*; Mosier Gulch Picnic Area, Johnson Co. Wyo., Aug. 4, 1995. Female found upside down under *U. d. gracilis* leaf, Tinytown, Jefferson Co. Colo., June 22, 1995. Preoviposition 10:30 *U. d. gracilis*; Tinytown, Jefferson Co. Colo., July 13, 1995. Several clusters of older larvae defoliating *U. d. gracilis*; Tinytown, Jefferson Co. Colo., June 27, 1996. Mature larva in *U. d. gracilis* leaf nest of leaf edges bend upward around larva; Tinytown, Jefferson Co. Colo., July 1, 1996. Cluster of 20 3rd-stage larvae on ups of curled-up *U. d. gracilis* leaf base, then the leaf was chewed to midrib, then distal third of leaf was rolled by younger larvae; Tinytown, Jefferson Co. Colo., June 17, 1997. Cluster of ~25 3rd-stage larvae defoliated two *U. d. gracilis* plant tops; ~10 near-mature larvae had defoliated upper half of three *U. d. gracilis* plants; Tinytown, Jefferson Co. Colo., July 2, 1997.

Nymphalis antiopa (L.). ~20 mature larvae found on *Salix exigua*; Shell Falls, Bighorn Co. Wyo., Aug. 3, 1995. Mature larva wandering on ground, 3-5 m from *S. exigua*, *Populus tremula tremuloides*, *Salix irrorata*, *S. bebbiana*, *Prunus virginiana*; Tinytown, Jefferson Co. Colo., June 27, 1996. Oviposition *S. exigua* stem tip 76 cm above ground on plant with unexpanded leaves 5-6 mm long, I first spotted her wings-spread at 12:04 ovipositing the top third of cluster, and last saw her at 12:35 ovipositing lower end of cluster, at 13:36 she was gone with almost no more eggs laid, so I surmise that she oviposited from about 11:50-12:55, she laid ~172 eggs, eggs hatched June 3; W of Idledale, Jefferson Co. Colo., May 25, 1997. **EGG** light-green when laid in 1988, but light-ochre when laid in 1997 (perhaps because eggs were older inside female?), most with 8 vertical ribs (some with 7), duration 8 days in lab. **FIRST-STAGE LARVA** ochre, heart-band brownish, setae black, collar black, neck translucent grayish; head black.

Nymphalis californica (Bdv.). Oviposition 11:58-12:14, at 11:50 a female fluttered over *Ceanothus fendleri* plant (with no leaves except a few young leaves on one side) and landed upside down on a branch with small leaves for a few minutes (without ovipositing), she then fluttered and landed several times on bush, and by 11:58 she had landed upside down on a branch (she was about 20 cm above ground near branch tip) with half-grown immature leaves and started laying eggs, then

suddenly flew away at 12:14, after laying about 200 eggs in two masses, the first mass of ~115 eggs in a 3-4-layered pile under entire surface of a dead brown leaf at branch tip, the second mass (8 mm below first mass on same branch) ~85 eggs in a 3-4-layered pile attached to both the underside of the distal half of a green leaf and the adjacent stem, these eggs hatched May 21 for a duration of 6 days; a search of same bush revealed a cluster of ~65 eggs (28 sucked dry by some Hemiptera predator, 11 were brown on side, the remainder were live and green) which hatched May 17 so were 4 days older than oviposition eggs; Mt. Zion, Jefferson Co. Colo., May 15, 1997. Two groups of 20 and 6 half-grown larvae found on outer branches of *C. fendleri*, 7 branches defoliated on outer part; Crawford Hill, Jefferson Co. Colo., June 15, 1997. Cluster of ~70 3rd-stage larvae, plus 20 more 3rd-stage larvae 20 cm away, all on *C. fendleri* bush, they had defoliated leaves over a 40-cm-wide area on two branches; Tintytown, Jefferson Co. Colo., June 18, 1997. Many larvae seen on three *C. fendleri* bushes: 1st bush had ~10 mature larvae (1.5 m from each other in three spots, 3-90 cm from where eggs were placed); 2nd bush had ~14 mature larvae spread over 150 X 150 cm area on bush; 3rd bush had ~30 3rd-stage larvae spread over 60 cm and ~25 mature larvae spread over 130 cm (these two groups were obviously from two egg clusters laid at separate times), black shed skins of young larvae (~3rd-stage) were found 1.5 m away on defoliated stems of bush; these black shed skins (10-20 per stem) are a good way to find larvae in nature; larvae eat leaves and eat a little of flower buds; one larva ate a host leaf in daytime (12:30), and larvae are found on the plant in daytime, so larvae are not solely nocturnal; one pupating larva was found hanging from silk pad on *Astragalus adsurgens* leaf 22 cm above ground, 8 m from nearest *C. fendleri*, pupated June 25; ridge near Crawford Gulch, Jefferson Co. Colo., June 24, 1997. 4th-early 5th-stage larvae on two *C. fendleri* bushes (first bush had 23 larvae scattered over 90 cm, and one larva on this bush was being eaten by Vespidae "yellow jacket" wasp 130 cm away, second bush had 83 larvae scattered over 120 cm, all larvae were on branch tips; Mt. Zion, Jefferson Co. Colo., June 10, 1998. 5th-stage larvae found on *C. fendleri* (first bush had 16 larvae scattered over 70 cm, second bush had 25 larvae scattered over 120 cm), Indian Peak, Jefferson Co. Colo., June 12, 1998. 3 clusters (of 15, 15, 2 larvae) of 3rd-stage larvae found 15 cm apart at most, four larva clusters (of 2, 4, 5, 8 larvae) found 27 cm apart at most, all on *C. fendleri*; Apex Gulch, Jefferson Co. Colo., June 11, 1999. **EGG** light-green, with 8 (sometimes 9) vertical ribs. **FIRST-STAGE LARVA** light ochre (cream dorsally) or greenish-ochre (A8-9 ochre), heart-band light-brown, seta bases brown, setae black, small suranal plate brown or blackish, collar blackish, neck translucent-gray, legs & collar black; head black. **HALF-GROWN LARVA** similar to mature larva, but some are blacker (with less conspicuous pale stripes). **MATURE LARVA** was described by Scott (1992), but most larvae I have seen since have had the paler scoli brownish-ochre-yellow, and most larvae have a conspicuous ochre-yellow band beside heart-band, but some larvae have this band absent between BD1 scoli. **PUPA** as described by Scott (1992) varies from gray to blackish in different individuals, but a 1997 pupa was very pale (grayish-white) with a light-orangish-brown saddle (the top of T3-A3 and very top of A4), with a cream patch around subdorsal cone on T3-A2 (the cream patch large on T3 and A2, small around the minuscule cone on A1). In details, this pupa was grayish-white, with a light ochre area on top of abdomen A1-10 and on both ridges on top of cremaster, this ochre area extending laterally to wings on A2-4, a keel on top of T2 has black sides, a black point on lateral edge of head, a tan area on top of head above orbit of eye, two blackish points on T2 wing base, a black point at middle of wing margin (below A3), cones on T2-3 (tiny) (A1 absent) A2 (large) A3 (large) A4 (giant) A5 (large) A6-7 (small), each cone has orange-brown tip and black around cone except on rear of cone which is whitish, base of T3 & A2 cones broadly whitish, tiny middorsal cones on A2-8 are blackish (orange-brown tipped on A4-7), a black oval dot above spiracle A2-8, a black dot posterodorsal to A2 spiracle, a black oval posteroventral to spiracle on A4-8, side of abdomen more tan-white, sustensor ridges of cremaster ochre, cremaster dark-gray, a blackish dash just beyond middle of each leg, a blackish erratic line marks approximately the end of discal cell, 3 tiny black dashes between that line & wing apex, orange-brown near midventral of A5-6, some black narrow streaks on hind margin of both wings.

Junonia coenia (Hubn.). Female assoc. *Agalinis tenuifolia*, Wheatridge, Jefferson Co. Colo., July 30, 1994. Some adults seen at locality where only suitable plant was *Plantago major* (which was not common, and adults could have flown in from a mile or more away); Leyden Gulch, Jefferson Co. Colo., Sept. 5, 1997. Adults associated with *P. major*; Hall of Humes Lake, Freeborn Co. Minn., July 27, 1999. **EGG** green. **1ST-STAGE LARVA** light-reddish-brown, developing green innards after feeding. with a row of transverse white dashes near heart-band; pronotum and suranal plate and setae and head black. **2ND-STAGE-LARVA** brown, with wide transverse white dashes near heart-band, at least one lateral white line, scoli black, mound below BSD and BL1 scoli orangish-brown; head black. **3RD-STAGE LARVA** resembles mature larva.

Nymphalinae, Melitaeini

Euphydryas (chalcidona) anicia capella (Barnes). 2 larval clusters (~20 2nd-stage larvae in one nest of ~3 leaves, ~50 ~1st-stage larvae in nest of ~3 leaves), found 2/3 up on *Linaria genistifolia dalmatica* stems, Tucker Gulch, Jefferson Co. Colo., Aug. 3, 1992. No larvae found on ~30 *Orthocarpus luteus* plants, Tucker Gulch, Jefferson Co. Colo., Aug. 3, 1992. Female newly-emerged among *L. g. dalmatica*, Chimney Gulch, Jefferson Co. Colo., June 9, 1994. Oviposition ~80 eggs ?-10:17 on *L. g. dalmatica* leaf uns on N side where leaf was shaded; female preovip. *Penstemon glaber=alpinus* nearby at same time and later I found fresh cluster of 88 eggs on this *P. glaber* plant and slightly-older clusters of 128, 63, 93 eggs on 3 leaf uns of this same plant, obviously *P. glaber* is preferred, and the few plants of it have heavy egg loads because of a

superabundant population of females reared on the abundant *dalmatica*; Lookout Mtn., Jefferson Co. Colo., June 13, 1994. Cluster of ~40 2nd-stage larvae defoliating middle of *L. g. dalmatica* in silk nest enclosing ~5 leaves, Tucker Gulch, Jefferson Co. Colo., July 6, 1994. 2 clusters of 1st-stage larvae made silk nests covering *L. g. dalmatica* middle leaves; one *P. glaber* plant had 14 clusters of eggs (two of which were reddish, evidently diseased) plus 3 clusters of 1st-stage larvae; Tucker Gulch, Jefferson Co. Colo., July 7, 1994. Cluster of 45 2nd-stage larvae in silk nest among ~3 leaves, ~30 3rd-stage larvae in similar web on another stalk of plant; on both *L. g. dalmatica* plants, larvae fed downward on stalk and so half of larvae were on fresh leaf below web; Tucker Gulch, Jefferson Co. Colo., July 16, 1994. Adults associated with *P. glaber*, N Plainview, Jefferson Co. Colo., June 11, 1994. Oviposition 12:55 female interrupted laying 25+ eggs; oviposition 12:25 female interrupted laying 59+ yellow-cream eggs next to a cluster of 229 orangish eggs, the same plant had clusters of 75 & 62 eggs, all on *L. g. dalmatica* leaf uns; Tucker Gulch, Jefferson Co. Colo., July 14, 1995. Mature larva found on *Artemisia frigida* near *L. g. dalmatica* at 11:10 in sunny weather; Lookout Mtn., Jefferson Co. Colo., May 15, 1996. Mature larva found on *Carex pensylvanica heliophila* leaf ~70 cm from *L. g. dalmatica*, evidently wandering to pupate; Apex Gulch, Jefferson Co. Colo., May 31, 1997. Pupa found on *Carex rossii* sedge 6 cm above ground, 15 m from nearest hostplant *L. g. dalmatica*; Indian Peak, Jefferson Co. Colo., June 16, 1997. Female seen near *P. glaber*, Tinytown, Jefferson Co. Colo., June 30, 1994. 4 clusters of ~2nd- and 3rd-stage larvae on *P. glaber*, Tinytown, Jefferson Co. Colo., July 28, 1994. Clusters of 74 red eggs and 340 red eggs found on *P. glaber* leaf uns; Tinytown, Jefferson Co. Colo., July 22, 1995. Preoviposition 12:28 *P. glaber*; Tinytown, Jefferson Co. Colo., July 13, 1995. 78 eggs found on *Penstemon virgatus asagrayi* leaf when female scared from plant; adults very common as was *L. g. dalmatica*; Apex Gulch, Jefferson Co. Colo., June 25, 1996.

EARLY STAGES. The mature larva is described here because it is incredibly different from larvae of the following described by Scott (1992) (differences as large as the astonishing difference between *Poladryas minuta minuta* and *P. m. arachne*, and the difference between the pupae of Calif. and Colo. *Chlosyne palla*); the ssp. *capella* mature larva is much whiter, whereas the alpine ssp. *brucei* larva is mostly black with reduced whitish areas, the ssp. *wheeleri* larva is mostly black with some orangish and no white, and the ssp. *chalcona* larva is striped with white and black. Pupae of the various ssp. show rather little difference, in contrast to the great larval differences. Thus there do seem to be great differences between the subspecies, though reproductive isolation is evidently absent within this species (as electrophoretic studies by Peter Brussard etc. have shown, and Dennis Murphy has proved that the sympatric subspecies in N-C Nevada actually interbreed completely within the narrow altitudinal range and time of year where and when they overlap, in E-C Elko Co. from northern Pequop Mts. N to Windemere Hills and Snake Mts., where *E. c. wheeleri* (H. Edw.) flies earlier at warmer/lower sites and overlaps a little with *E. c. wallacensis* (Gunder) = *nevadensis* Bauer which flies later at cooler/higher sites, Austin & Murphy 1998). **MATURE LARVA** white, a narrow black interrupted heart-line, narrow black lines at segment joints, a remnant of a wide black subdorsal band occurs around each BD2 scoli (anteriorly forming a cheesecloth-like or lace-like black network that encloses white spots), a narrow black ring surrounds BL1 scoli, an interrupted very narrow black line runs just below spiracles, a narrow black line connects BL1 scoli; scoli are black (except base of BD1 scoli is orange-brown or brownish-orange, and SV scoli are brownish-orange), a wide brown-orange or brownish-orange ring surrounds BD1 scoli, a narrow brownish-orange ring surrounds BSD scoli, proleg plates brown-orange; setae & suranal plate & collar & head black. **PUPA** white with the usual black dashes and dots, a brownish-orange dot occurs near top of T2 and T3 each is cupped into in a black sickle-shaped mark, many brownish-orange abdominal cones (each anteriorly edged by a black crescent), some small lateroventral and near-midventral brownish-orange dots on abdomen, some brown dashes near leg tips.

Euphydryas (chalcona) anicia wecoet Fisher, Spomer, & Scott. **MATURE LARVA** (SE of Cortez, Colo.) very black, and all white areas are absent as they are changed to orange-ochre, and these orange-ochre areas are reduced to some very small orangish spots (a few near-middorsal spots between the BD1 scoli, and a few supralateral spots between the BSD scoli), a fairly-wide orange-red ring surrounds both the BD1 & BSD scoli, the BD2 scoli are black, whereas the BD1 & BSD & BSV scoli are orange-ochre; suranal plate & collar & head black.

Euphydryas (chalcona) anicia brucei (W. Edw.) (*brucei* is a weak ssp., similar to *anicia* [Dbldy.]). **MATURE LARVA** (Uncompahgre Peak) mostly black, as the white areas are very reduced in size.

Euphydryas chalcona chalcona (Dbldy.). **MATURE LARVA** (California) white, but there is a striking wide subdorsal black band (connecting the BD2 scoli) that makes the larva look striped with black and white.

Chlosyne gorgone (Hubn.). 2 *Helianthus pumilus* plants were extensively defoliated by *gorgone*, Red Rocks, Jefferson Co. Colo., Aug. 14, 1992. One *H. pumilus* plant half defoliated, Red Rocks, Jefferson Co. Colo., Aug. 17, 1992. Mature larva found wandering near *H. pumilus*, Mt. Zion, Jefferson Co. Colo., May 13, 1993. 143 eggs in cluster found under *H. pumilus* young leaf, Tinytown, Jefferson Co. Colo., June 3, 1994. Cluster of 55 eggs found under leaf, plus ~130 and 17 eggs in two old clusters on leaves, all halfway up *H. pumilus* plants, Lookout Mtn., Jefferson Co. Colo., June 13, 1994. ~200 2nd-3rd-stage larvae under *H. pumilus* leaves, a silk web spun over part of the leaf uns (mostly where the rows of hispid hairs are), Indian Gulch, Jefferson Co. Colo., June 18, 1994. 2 clusters 2nd-3rd-stage larvae on 2 *H. pumilus* plants, they spin silk web on top of spines that covers ~30% of leaf, Green Mtn., Jefferson Co. Colo., June 19, 1994. 5 clusters of 16, 20, 25, 30, 40 2nd-4th-stage larvae on *H. pumilus* leaves, Cherry Gulch, Jefferson Co. Colo., June 21, 1994. Four 4th-stage larvae and one 3rd-stage larva found on *H. pumilus* leaves, Tucker Gulch, Jefferson Co. Colo., July 16, 1994. 3rd-

stage black larva on *H. pumilus* leaf top, other leaves eaten on plant; Indian Gulch, Jefferson Co. Colo., July 31, 1998. Many ~4th-stage larvae found on *Helianthus petiolaris* leaves; Barr Lake, Adams Co. Colo., Sept. 1, 1994. Preoviposition 11:10 *H. petiolaris*, Tintytown, Jefferson Co. Colo., June 2, 1994. 3 black mature larvae *Helianthus annuus*, Sowbelly Can., Sioux Co. Neb., June 25, 1994. Half-grown larva on *H. annuus* leaf top, Big Springs, Deuel Co., Neb., Sept. 10, 1994. 5 larvae found on *Iva xanthifolia* leaf & whole plant mostly defoliated; Van Bibber Creek, Jefferson Co. Colo., Sept. 17, 1992. ~40 half-grown larvae found on top of *I. xanthifolia* leaf, an ant on this leaf crawled over larvae but did not bite them and constantly wiped its antenna with foreleg; no larvae found on *Verbesina encelioides*; Barr Lake, Adams Co. Colo., Sept. 8, 1992. ~35 half-grown larvae (~20% form *rufa*, 80% *bicolor*) found on *I. xanthifolia* leaf tops; 20 half-grown form *bicolor* larvae on *I. xanthifolia* leaf tops; 3 clusters of 50, 70, & 80 half-grown larvae found on *H. annuus* leaf tops; NO larvae found on *V. encelioides*; Barr Lake, Adams Co. Colo., 5075', Sept. 9, 1996. 15 half-grown larvae on *Helianthus petiolaris*, 30 half-grown larvae on *I. xanthifolia*; no larvae or feeding damage found on *V. encelioides* (many years searching for larvae on *Verbesina* at Barr Lake has failed to find it through 1998); Barr Lake, Adams Co. Colo., Aug. 31, 1993. **HOSTPLANT VARIATION:** The mystery remains why *gorgone* eats *Verbesina* in Texas but refuses it in Colo. But *C. gorgone* evidently has different host preferences in different regions of its range, for instance *C. gorgone* eats *Rudbeckia hirta* in Ontario (Catling & Layberry 1998), even though no butterfly eats *R. hirta* in Colo. **TAXONOMY:** *carlota* (Reak.) is a synonym of coastal Ga.-S.C. *gorgone*, based on the specimen and photos of the latter that I examined.

Chlosyne nycteis drusius (W. Edw.). 3 clusters of 1st-stages on *Rudbeckia laciniata* var. *ampla*, Tintytown, Jefferson Co. Colo., July 28, 1992. Many 1st- and 2nd-stage larvae found in dead curled upper leaf of *R. l.* var. *ampla*, Tintytown, Jefferson Co. Colo., Aug. 4, 1992. ~7 older larvae found *R. l.* var. *ampla* leaf tops (1 seen eating at 9:25 in daytime) all day (they rest on leaf tops all day); Tintytown, Jefferson Co. Colo., June 1, 1994. Mature larva found on *R. l.* var. *ampla* leaf top, Tintytown, Jefferson Co. Colo., June 3, 1994. Cluster of 80 1st-stage larvae on *R. l.* var. *ampla* leaf uns, Tintytown, Jefferson Co. Colo., July 11, 1994. 2 clusters of 1st-stage larvae found *R. l.* var. *ampla*, Tintytown, Jefferson Co. Colo., July 21, 1994. One cluster of 1st-stage larvae and three clusters of 2nd-stage larvae found *R. l.* var. *ampla*, Tintytown, Jefferson Co. Colo., July 25, 1994. 3 clusters of 1st-stage larvae (~49, ~10, ~80) on *R. l.* var. *ampla* leaf uns; Tintytown, Jefferson Co. Colo., Aug. 17, 1995. 2 clusters of 1st-stage larvae found on *R. l.* var. *ampla* the same as last time; Tintytown, Jefferson Co. Colo., Aug. 24, 1995. Oviposition 11:51, she landed ~50 times on leaves of adjacent *R. l.* var. *ampla*, then backed under leaf and laid 2 eggs until I disturbed her for photo; egg clusters of 81+, 145, and 98 found; all on *R. l.* var. *ampla* leaves; Tintytown, Jefferson Co. Colo., July 1, 1996. ~20 1st-stage larvae found under one leaf, and 4 other plants had leaves had chewed brown leaves with larvae beneath, all on *R. l.* var. *ampla*; Tintytown, Jefferson Co. Colo., July 31, 1996. 4 larval clusters found on *R. l.* var. *ampla* leaf uns; Tintytown, Jefferson Co. Colo., Aug. 8, 1996. Cluster of ~221 eggs found in one layer on *R. l.* var. *ampla* leaf uns ~70 cm above ground; Tintytown, Jefferson Co. Colo., July 17, 1997. Two clusters of 1st-stage larvae on *R. l.* var. *ampla* leaf uns; Tintytown, Jefferson Co. Colo., Aug. 7, 1997. Three clusters of 1st- and 2nd-stage larvae on *R. l.* var. *ampla* leaf uns; Tintytown, Jefferson Co. Colo., Aug. 13, 1997. This species also evidently has geographic differences in host preference, since it eats several composite genera in E U.S., but only one species in the Rocky Mts. **TAXONOMY:** Gatrell (1998) designated as the neotype of *ismeria* (Bdv. & LeC.) as a specimen of *C. nycteis* from coastal Georgia, which means that anyone who agrees with this designation of neotype will have to use the name *ismeria* instead of *nycteis*. However, I cannot accept this neotype, because the original illustration of *ismeria* shows very little in common with *nycteis*, its submarginal white uns band is much more like *C. harrisii*, and the unh postbasal white stripes are unlike any checkerspot; this uncertainty suggests—and stability demands—that *ismeria* is at most a nomen dubium. Gatrell designated his neotype only because he found both *C. gorgone* and *C. nycteis* in Burke Co. Georgia, and he assumed that Boisduval & LeConte's specimens must all have come from that area, and he assumed that Boisduval and LeConte's two checkerspots must be those two species, so he deduced that since Boisduval and LeConte's first painting resembles *gorgone*, that the second painting must be *nycteis*, even though it looks quite unlike *nycteis*. All these assumptions and deductions are too tenuous, and the painting too unlike *nycteis*, to overturn a name that has been used for so long, so I retain the name *nycteis* and keep *ismeria* safely discarded in the taxonomic garbage can as a nomen dubium. Recently, John Calhoun (2003 J. Lepid. Soc. 57:204-219, 2004 J. Lepid. Soc. 58:143-168, 2005 J. Lepid. Soc. 59:172-3) has proved conclusively that the name *ismeria* belongs to *Chlosyne gorgone*, based on study of the original *ismeria* paintings, thus *ismeria* has nothing to do with *nycteis*.

Chlosyne nycteis nycteis (Dbldy. & Hew.) *X drusius*. NW Colo. populations seem intermediate. Young larval head capsules/cast skins in silked-leaf nest on *R. l.* var. *ampla*, 10 mi. E Hayden, Routt Co. Colo., Aug. 18, 1994. Cluster of 178 eggs on *R. l.* var. *ampla* leaf uns; 5 mi. NE Radium Hot Springs, 7500', Grand Co. Colo., July 11, 1996. Cluster of 134 eggs on *R. l.* var. *ampla* leaf uns; Blacktail Creek, Grand Co. Colo., July 11, 1996. Adults associated with *R. l.* var. *ampla*, Copper Spur, Eagle Co. Colo., July 12, 1996.

Chlosyne palla calydon (Holland). ~10 larvae found 2/3 up on branch of *Erigeron speciosus* (var. *macranthus* has been dropped from the name of this plant in the local keys to plants by W. Weber); Tucker Gulch, Jefferson Co. Colo., Aug. 3, 1992. ~5 clusters of 1st- & 2nd-stage larvae found on *E. speciosus*, all in somewhat-dead-looking curled leaves 3/4 of way up stem to flower, Coal Creek, Jefferson Co. Colo., Aug. 31, 1992. ~5th-stage larva found inside bract of inverted Douglasfir cone under *E. speciosus*, 8 leaves of plant chewed from edge, feeding damage on many other *E. speciosus*

plants, Ralston Butte, Jefferson Co. Colo., May 23-24, 1994. Edge-chewed leaves of *E. speciosus* seen but no larvae, Tinytown, Jefferson Co. Colo., June 1, 1994. Two *E. speciosus* clumps had larval feeding damage, two 2nd-stage head capsules and four cast larval skins found on tip of one chewed stem; Ralston Butte, Jefferson Co. Colo., Aug. 15, 1994. Two ~3rd-stage larvae found on *E. speciosus* leaf uns; Ralston Butte, Jefferson Co. Colo., Aug. 10, 1996. Adults associated with *E. speciosus*, Grizzly Creek Cgd., Jackson Co. Colo., July 12, 1996. Three almost-mature larvae found on *E. speciosus* bush (first larva on partly-eaten leaf on top of plant 32 cm up on 35-cm branch of the 35-40-cm-tall bush, second on last-year's inflorescence 20 cm above ground, third on litter beneath bush), ~40 leaves of bush had been partly eaten by larvae; Ralston Butte, Jefferson Co. Colo., June 1, 1997. **OLDER-MATURE LARVA** black but with so many tiny cream dots & cream markings all over as to appear mostly white with a wide blackish subdorsal band in some [1994 and 1997] larvae, whereas in other [1997] larvae the white dots are coalesced completely so body is even whiter (except that several black lines occur in the intersegmental folds, and a group of tiny white dots occurs in a black patch in front of and behind BD2 scoli), and there is a cream band with orange dashes beside the heart-line, and another similar band just below the subdorsal wide band, and a third similar band below lateral scoli: in details, the heart-band black, a wide black subdorsal band has numerous white dots except at bottom (this band in palest larvae has the white dots so large as to make the blackish band disappear except below and above the scoli), a long dash (absent on T1) touching bottom of each BD1 scoli is cream at anterior and posterior ends but mostly orange for most of dash (except dash is smaller and only cream on thorax), many cream dots below that band and above BD2 scoli, a cream band above spiracles circles around (and touches) bottom of BSD scoli and is orange next to BSD scoli and contains a spot of orange near rear of segment (except on thorax the orange color is only behind BL3 scoli on T2-3 and absent on T1), area including spiracles and BL1 scoli has brown background with many cream dots making the area look mostly cream, black spiracles are surrounded by a narrow cream ring, below BL1 scoli is a cream band formed of enlarged cream dots, this cream band has a small orangish patch just ventrad and posteroventrad of BL1 scoli where the band circles around BL1 scoli (except the band has no orange on T1, and only a touch of orange below small BL1 scoli on T2, and only a touch of orange behind the very tiny BL1 scoli on T3), some cream dots in a band above legs/prolegs, underside dark-brown, in paler larvae a midventral brown dash-line; collar black with cream middorsal line, scoli all black, except BL3 scoli brown at base and black on distal 2/3, a tan ring around base of BL1 scoli, the setae on scoli mostly black except some tan setae on BD1 scoli and many tan setae on BSD and BL1 scoli, suranal plate black, proleg shields brownish-black except distal third is tan on A3-6, membranous proleg tips tan; head black, with gray middorsal cleavage line. **PUPA** slightly-tanish white with black spots & streaks, front rim of head black & bottom white (except mostly black medial to orbit), front of head white with a small black spot beside antenna base, eye white & black, orbit brown, labial sclerite black, mandible remnants tan with black spot, T1 white with black anteromedial spot and a black spot overlapping lateral end, top of T2 has a large 6-pronged black patch from front to middorsal point and lateral to subdorsal cone (some pupae have this patch narrower and broken into black spots), T3-A1-3 have brown near whitish middorsal band and have brown on narrow sliver of hindwing and just above hindwing, spiracles dark-brown, large black subspiracular spots on abdomen, small black lateroventral dots on abdomen, A5-7 have a long midventral black staple-shaped mark narrowly edged posteriorly by creamy and that edged widely by orange-brown, light crimson & yellow (fat body) mottling on intersegmental membranes of abdomen, abdomen tip & cremaster & sustensor ridges of cremaster mostly black, proboscis black, legs white with many fine black transverse streaks and a whitish dash across middle of each leg, leg mostly black distal to dash, a little orange-brown in joints between appendages, antenna black with white checks, antenna club black, wing white with black streaks (a black streak through discal cell then curving to near tornus, black streaks along anal veins of wing, a black streak in apex, a black streak along costa of apex) and wing has a black postmedian spot in cell R5 & white postmedian spots in black patches in cells M1, CuA1, CuA2); many cones present (middorsal cones include A1 weak [the only cone that lacks orange], A2-3 small, large A4-7, only a black spot there A8; subdorsal cones T2 large, T3 small, A1 a trace, A2 moderate, A3-7 large, only a large black spot at missing cone position on A8; supraspiracular cones A2 tiny (A1 a tiny black spot), A3-4 moderate, a small black patch at that spot A5-8) and each cone has a pale-orange tip and the anterior and lateral sides of cone is black (the black largest on A4-8); duration 9 days for female pupa in lab. **TAXONOMY:** The pupa is white-and-black, versus brown in *C. palla* elsewhere, which might mean that *calydon* is more than just a ssp., although John Emmel notes some variation in color of pupae in California.

Chlosyne sterope acastus (W. Edw.). ~30 2nd-3rd-stage larvae found on many *Aster (Eucephalus) glaucodes* plants, most on leaf uppersides, most diapaused as ~3rd-stage (actually 4th?) and refused to feed (the first black pupa pupated Nov. 4 and died due to lack of fresh food [refrigerated food was getting old], the second brown pupa pupated Nov. 8 and died, the third brown pupa pupated Jan. 1 and male emerged Jan. 15, 1994, other larvae sent to John F. Emmel were reared to adults); W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 17, 1993. Seven 3rd-stage larvae (lot B) found on 7 *A. glaucodes* stems within 80 cm of each other (larvae mostly ~15 cm up on 30 cm stems)(~4 oviposition leaves on several defoliated stems had 1st- and 2nd-stage head capsules and shed skins, plus extensive silk web [the whole oviposition leaves silked over on uns]), fed *Aster laevis* var. *geyeri* in lab but all 4th-stage larvae diapaused; Game Creek, N edge Minturn, Eagle Co. Colo., 8050', Sept. 3, 1996. **DIAPAUSE STAGE:** 4thstage larva; most larvae refused to develop beyond this stage and eventually died. **EARLY STAGES:** **SILK WEB** is extensive over uns of oviposition leaf as noted above. **HALF-GROWN LARVA**

middorsal line black, edged by a line of cream dots (brownish-orange or ochre laterally beside BD1 scoli), then a wide black band with some tiny cream dots, a narrow or wider cream band just above spiracles (wider on abd., interrupted between segments--the width of the cream larval bands varies somewhat between individuals)(this cream band is brownish-orange ventrally beside BSD scoli), a blackish-gray band includes spiracles, a cream band along lower edge of BL1 scoli is constricted to nothing below BL1 scoli, a ring of brownish-orange around BL1 scoli, underside dark-brown with tiny white dots, a creamy ring around base of BL3 scoli, A10 solid black, legs black, all scoli long and solid black except BL1 scoli are ochre with black tip (except A9-10 BL1 scoli all black); head solid black. A 3rd?-stage larva is similar to the above, but the ochre-cream spreads laterally from beside heart-band to just below level of bottom of BD2 scoli, and BSD scoli have an orangish-cream dash above base of scoli. The Bighorn Mts. larvae were at first confused with those of *Phyciodes batesii apsaalooke* Scott (which has the same host), but were easily distinguished because *acastus* has scoli twice as long, lacks the cream head stripe(s) of *Phyciodes*, has numerous bumps on head capsules, has larger eyes, and has paler half-grown head capsules (brown vs. dark-brown). **OLDER-MATURE LARVA** (Bighorn Mts. Wyo.) black with tiny cream dots, a black middorsal band connects BD1 scoli, some bigger small cream dots beside band, a wide black area (enclosing BD2 and BSD scoli) with some tiny cream dots and tiny transverse cream ellipses(few dots occur between segments and few occur below & above scoli), slight-brownish-orange narrow edges ventral side of BSD scoli, then a wide lateral band (between BSD and BL1 scoli) of dark-grayish-brown or dark-orangish-brown or dark-brown (in 2 that died, one as larva that died the other as blackish pupa that died) or nearly solid black (in larva that produced brown pupa and male adult *acastus*) with cream dots (the upper part of this band includes spiracles and some larger cream dots, which are biggest on the larvae with the palest band, and were fairly large cream spots behind BSD scoli on the larva that produced *acastus* adult), a narrow ring of brown around BL1 scoli, cream dots are more frequent than usual between BL1 scoli and form an interrupted cream band on the palest larvae, sublateral area brown with tiny cream dots, underside light-brown with tiny cream dots, legs black, proleg tips light-orangish-brown, A9-10 black with some brown dots, suranal plate black, scoli black with black setae, scoli very long (about twice as long as *Phyciodes*), collar black (bipartite, interrupted middorsally); head solid black. **PUPA** (Bighorn Mts. Wyo.) orangish-brown on 2nd & 3rd pupae as in the description below, but blackish-gray (except side of abd. orange-brown) on 1st pupa (John Emmel pers. comm. writes that he has gotten dirty-cream, brown, and black pupae from both *C. acastus* and *C. palla*; the color seems to depend more on their pupation substrate etc.)(the first pupa reared was black rather than brown, and the larva it came from had a brown lateral area with smaller supraspiracular cream dots, whereas the pupa reared to male *acastus* was brown and its larva was entirely black with larger supraspiracular cream patches; both are assumed to be *acastus* here because John Emmel reared only *acastus* from larvae that I sent); the orangish-brown pupa has top of abdomen and front rim & lateral rear of thorax blackish-gray-brown, wings orangish-brown with a postmedian row of tan (cream on 1st pupa) dots (except cell CuA2) and a submarginal row of tan dots and a small blackish streak in discal cell (1st pupa has cream dash on wing base about at vein 1A), many sharp cones on top of thorax & abdomen (middorsal A1-8 [tiny A1-2, small A3 & A8, big A4-7 or A5-7], subdorsal T2-3 A2-7 and small A1 A8, supraspiracular A3-4 [biggest A4], small A2 A5-7, tiny A8), each cone is orange with tan (sometimes orange) tip and black front rim (or black ring completely around cone)(except supraspiracular cones may be solid black A6-8), a weak cream-tan middorsal line T2-A5 or A6 (strongest T2), some transverse small black dashes on top & sides of rear of A4-9, A2-8 a dark-brown spot on each segment above supraspiracular cone, A2-7 have yellowish-cream (orange-cream A2-3) supraspiracular spot on rear of segment that is almost connected to an orange-tan band just above and including the black spiracles, black spiracles present A2-8, A4-8 have a dark-brown subspiracular spot on each segment (each spot surrounded by a narrow or wide orangish-tan ring, the orangish-tan forming a band that narrows between segments), small lateroventral brown spots on abd. (one spot A4, several A5-7, one A8), A5-6 have cream dash edged by blackish near midventral axis, a midventral dark-brown spot on A5-6 (absent on 1st pupa), antenna orangish-brown with dark-brown cross bar at each segment (blackish-gray on 1st pupa with tan crossbars) and dark-brown club, head & mouthparts mottled-brown (mouthparts blackish-gray on 1st pupa), orbit smooth dark-brown, proboscis dark-brown beyond basal third, cremaster dark-reddish-brown with usual hooks, a dark-brown spot near anterior end of sustensor ridge (the U-shaped ventral ridge at base of cremaster), a dark-brown spot between sustensor ridges and 3 dark-brown spots just anterior to them; just before hatching pupa turns blackish with orange-brown cones, the side & underside of abdomen and underside of cremaster orange-brown, appendages dark-orange, wings orange-spotted like adult; duration 14 days.

Chlosyne whitneyi damoetas (Skin.). Adults associated with *Erigeron leiomeris*, Horseshoe Mtn., ~12,000', Park Co. Colo., July 21, 1993.

Phyciodes. My extensive hostplant records from 1992-1994 are detailed in Scott (1994) except for one record, so need not be repeated here. 1995 and later records are given below.

Phyciodes mylitta arizonensis Bauer. Adults associated with *Cirsium vulgare* & *Cirsium undulatum*, Questa, Taos Co. New Mex., 6750', Aug. 13, 1996, female laid 52 eggs in lab on *Cirsium arvense incanum* Aug. 15, hatched Aug. 23, laid and reared on *C. a. incanum*, adults emerged Sept. 21-29, 1996; on Aug. 26 much web was present over eaten area of leaf, made by 1st-stage larvae. Early stages were described by Scott (1998a).

Phyciodes pallida pallida (W. Edw.). Four ~3rd-stage larvae found on *Cirsium undulatum* seedling (leaves 12 cm long; identified from three flowering plants 40 cm away and one 3 m away) leaves (3 larvae on leaf ups, 1 on uns), many pits

chewed on ups and some on uns, one larva was on oviposition leaf (determined by traces of eggs and 1st-stage larval heads and skins on leaf uns) and other three were on other leaves; three pupae and two ~~red~~; Foxton, Jefferson Co. Colo., Sept. 4, 1998. This record clearly proves that *C. undulatum* is a hostplant. Larvae and pupae were like those described by Scott (1994), except that pupae were somewhat darker (medium-brown). Pupal duration ~10-11 days.

Phyciodes pallida barnesi Skinner. Two ~3rd-stage larvae found on *Cirsium neomexicanum* leaf tops, Sewemup Mesa, Montrose Co. Colo., 5000', July 18, 1996, reared on *Cirsium arvense incanum*, adults emerged Aug. 9, 1996. Early stages were like those described by Scott (1998a).

Phyciodes tharos tharos (Drury). One 3rd-stage larva found on *Aster laevis laevis* leaf uns (many other leaves pitted by larval feeding), reared on *A. laevis geyeri*, pupated July 2, male emerged July 11; NE Conger, Freeborn Co. Minn. June 21, 1998. *Aster simplex* leaf found (25 cm up on 50 cm plant) with 1st-stage-larval feeding damage (caused by *P. tharos tharos*?, or possibly by *P. cocyta diminutor*); NE Alden, Freeborn Co. Minn., June 22, 1998. Adults (uncommon & worn) associated with *Aster simplex*, 3 mi. NE Alden, Freeborn Co. Minn., June 11, 1995 (main flight was E June). 2 clumps of *A. simplex* found with extensive young-larval chewing on leaf uns including the egg-deposition leaf; 2.5 mi. NE Conger, Freeborn Co. Minn., Sept. 25, 2000.. Older-larval chewing holes found in *Aster simplex*; 3 mi. NE Alden, Freeborn Co. Minn., June 22, 2001.. 65 eggs found in mostly-one-layered cluster (~4 eggs in 2nd layer) on *Aster simplex* leaf uns (the 4-cm-long leaf 10 cm above ground on 40-cm-tall plant); 2.5 mi. NE Conger, Freeborn Co. Minn., June 22, 2001. Adults associated with *Aster simplex*, reclaimed prairie 1/3 mi. W Hall of Humes Lake, Freeborn Co. Minn., June 27, 2001. Adults (near ssp. *tharos*) associated with *A. ?simplex*; 4 mi W Kearney, Buffalo Co. Neb., May 15, 2002. Adults associated with *Aster ericoides*, I-80 rest stop, Underwood, Pottawattamie Co. Iowa, Sept. 26, 2000. Adults assoc. *A. simplex*; rest stop I-35 just N Iowa, Freeborn Co. Minn., Aug. 10, 2005. Adults assoc. *A. simplex*; 3 mi. NE Alden, Freeborn Co. Minn., Aug. 15, 2005.

Phyciodes tharos orantain Scott. 2 males assoc. *Aster ascendens* (common) and *Aster glaucodes* (common) and *Aster foliaceus* (frequent along creek, not a host); W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 2-3, 1995. Adults assoc. *Aster ericoides*, Fort Morgan, Morgan Co. Colo., July 17, 1995. Preoviposition 13:15 *A. ericoides*; Barr Lake, Adams Co. Colo., Oct. 3, 1995. Adults associated with *Aster ericoides* var. *ericoides*; Barr Lake, Adams Co. Colo., 5075', Sept. 9, 1996. Adults associated with *Aster ericoides* & *Aster lanceolatus hesperius*; E Walsenburg, Huerfano Co. Colo., Sept. 1, 1996. Scott (1998a) reported early stages.

Phyciodes (cocyta) diminutor Scott. Adults associated with *Aster simplex* var. *simplex*, 3 mi. NE Alden, Freeborn Co. Minn., Sept. 13, 1994. Adults common fresh assoc. *A. simplex*, 3 mi. NE Alden, Freeborn Co. Minn., June 11, 1995. Preoviposition 11:30 near *A. simplex*, 3 mi. NE Alden, Freeborn Co. Minn., June 20, 1996. Females collected 3 mi. NE Alden, Freeborn Co. Minn., June 20, 1996, laid eggs in lab (clusters of 3, 31, 38, 94, 122 eggs) that were reared; egg stage took 6 days (for family 94) and 7 days (for family 122); a family from 38 eggs had no silk web June 29, slight silk web July 4; a family from 94 eggs had slight silk web July 2; a family from 122 eggs had some silk web June 29; four diapaused 4th-stage.

Phyciodes cocyta selenis (Kirby). Mature larva found rolled in ball at very base of *A. laevis* var. *geyeri* that had eaten spots on ~6 of 20 leaves, pupated June 18, male emerged June 28; several other clumps had eaten spots; Tucker Gulch, Jefferson Co., Colo., June 15, 1995. Adults assoc. *A. l.* var. *geyeri*, near Indian Creek Cgd., Douglas Co. Colo., July 6, 1995. ~Three 2nd-stage larvae found on leaf uns ~30 cm up on 50 cm plant; ~80 1st-stage larvae found under leaf ~25 cm up on 50 cm plant; ~10+ older 1st-stage larvae found under leaf curled with strong silk web, ~40 cm up on 60 cm plant; all on *A. l.* var. *geyeri*; Tucker Gulch, Jefferson Co. Colo., July 25, 1996. 35 2nd-stage larvae found under *A. l.* var. *geyeri* leaf ~25 cm up on 40 cm plant (much silk web and 1st-stage head capsules on 1 cm² of this leaf uns); Tinytown, Jefferson Co. Colo., July 31, 1996. 35 2nd-stage larvae found on *A. l.* var. *geyeri* leaf uns, with much silk web; start of Rollins Pass Road, Gilpin Co. Colo., 9400', Aug. 5, 1996, reared on *A. l.* var. *geyeri*, adults emerged Sept. 1-9, 1996; pupal ridges only moderate in size (few large, some small). Three 2nd-stage larvae (25 cm up on 45 cm plant) found on *A. l.* var. *geyeri* leaf uns (leaf curled under due to moderate silk web at curled spot); Tinytown, Jefferson Co. Colo., Aug. 8, 1996. Larval chewing on *A. l.* var. *geyeri*; Ralston Butte, Jefferson Co. Colo., Aug. 10, 1996. Extensive larval chewing on *A. l.* var. *geyeri*; Tucker Gulch, Jefferson Co. Colo., Aug. 29, 1996. ~25 2nd-stage larvae found on uns of 4 leaves of a 15-cm-tall basal rosette plant (the eggshells were 4 cm above ground); egg cluster of 97 eggs (40 still present, 57 eggs missing—evidently eaten by some unknown predator such as ants—but their former presence marked by 57 dark-green indentations on the leaf surface noticeable using a microscope) found on leaf uns 40 cm above ground on 85-cm-tall plant; egg cluster of 97 eggs (70 present, 27 indentations of former eggs present) found on leaf uns 20 cm above ground on 95-cm-tall plant; cluster of 42 eggs found on leaf uns 3 cm above ground on 40-cm-tall plant; cluster of 61 1st-stage larvae (a little silk web present made by newly-hatched larvae) found on leaf uns 45 cm above ground on 60-cm-tall plant; cluster of 68 1st-stage larvae found on leaf uns 37 cm above ground on 75-cm-tall plant (a strong sheenlike silk web present over eggshells); all on *A. l.* var. *geyeri*; all southwest of Morrison, Jefferson County Colorado, June 30, 1997. ~14 larvae (two 1st-stage, 12 2nd-stage) found on uns of about six *A. l.* var. *geyeri* lower leaves (3-10 cm above ground on 35 cm plant), reared to identifiable older larvae; NNE Idledale near pass, Jefferson County Colorado, Aug. 8, 1997. Cluster of 2nd-stage larvae found 60 cm above ground on 75-cm-tall plant, cluster of young larvae found ~55 cm above ground on 70 cm plant, all on *A. l.* var.

geyeri, reared to adults; Tinytown, Jefferson County Colorado, Aug. 13, 1997. *A. l.* var. *geyeri* plant 60 cm tall mostly defoliated by now-absent larvae; Tinytown, Jefferson Co. Colo., Sept. 4, 1997. 28 older-1st-stage larvae found on *A. l.* var. *geyeri* leaf uns on leaf tip, a strong silk sheen web was present on leaf and larvae were crawling on silk web, adults reared; Tinytown, Jefferson Co. Colo., Aug. 17, 1998. Adults assoc. *A. l.* var. *geyeri* (one clump of *Aster* sp. with blue flowers and pointed leaves found along road); Tongue Can., Sheridan Co. Wyo., Aug. 1, 1995. Adults assoc. *A. l.* var. *geyeri*; Mosier Gulch Picnic Area, Johnson Co. Wyo., Aug. 4, 1995.

Phyciodes cocyta selenis, or possibly *P. tharos orantain*. Oviposition leaf with 1st-stage larval head capsules, and larval feeding damage (caused probably by *selenis*, or perhaps by *orantain*) on top of leaves of four plants, all on *A. laevis* var. *geyeri*; 5 mi. NW Beulah, Custer Co. Colo., Sept. 23, 1998.

Phyciodes cocyta selenis W Colorado Aster foliaceus variety. Lot A, 58 2nd-stage larvae found on uns of leaf 33 mm wide, 10 cm above ground on 27-cm-tall *Aster foliaceus* plant, in partly-shaded nook beside log in valley bottom, no silk web under this non-egg leaf and no web found under adjacent 32-mm-wide oviposition leaf (which had many shed 1st-stage head capsules), reared to adults emerged Sept. 14-23, 1997, except three 4th-stage larvae diapaused; lot D, 18 2nd-stage larvae found on leaf uns of two leaves 20 cm above ground on 35-cm-tall *A. foliaceus* plant, little web noted and no web noted later in lab, on SE-facing slope base, reared to adults emerged Sept. 17-21, 1997, one 4th-stage larva diapaused; E part of Vail, ~8300 ft., Eagle Co. Colo., Aug. 22, 1997. Lot H, cluster of 83 1st-stage larvae found on uns of 22 mm wide by 20 cm long leaf 8 cm above mud on 10 cm-tall *A. foliaceus* plant, no web noted then or later in lab, in shade under two *Salix monticola* bushes in valley bottom, reared to adults emerged Sept. 22-Oct. 6, except six 4th-stage larvae diapaused; 7.4 mi. N of I-70, N of Silverthorne, Summit Co. Colo., Aug. 25, 1997. Male caught Grizzly Creek, Garfield Co. Colo., in 1966, where *Aster laevis* var. *geyeri* was present on July 17, 1996, though *Aster foliaceus* could have been present also. *Aster foliaceus* is a new host. Scott (1998a) discussed this variety and described early stages.

Phyciodes batesii apsaalooke Scott. Many eggs and larvae found on *Aster glaucodes*, adults reared; newly-emerged female (floppy wings, could not fly more than 5 cm, so probably resulted from a larva feeding there or nearby) found resting on *A. glaucodes* at 13:00; W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 2, 1995. Scott (1998a) reported early stages.

Phyciodes batesii anasazi Scott. Adults associated with *Aster glaucodes*; SE end Green Mtn. Res., Summit Co. Colo., July 11, 1996. 4 adults associated with *A. glaucodes* and *A. laevis*; 5 mi. NE Radium Hot Springs, 7500', and 3 mi. NE, 7200'; Grand Co. Colo., July 11, 1996. Adults associated with *A. glaucodes*, NE Radium, Grand Co. Colo., 7300', July 11, 1996; three females from here laid eggs in lab on July 12 and hatched July 19, laid on *A. glaucodes* and reared on *Aster laevis* and *glaucodes*: lot 3 (cluster of 3 eggs), adults emerged Aug. 19-24, 1996; lot 43 (43 eggs, laid by same mother as lot 3), adults emerged Aug. 17-23; lot 98 (cluster of 98 eggs), slight silk web noticed on July 21, adults emerged Aug. 19-27; lot 128 (cluster of 128 eggs), slight silk web noted July 21, some web on two leaves and much silk web on two leaves made by 1st-stage larvae July 23, adults emerged Aug. 19-27; all NE Radium, Grand Co. Colo., 7300', July 11, 1996. Adults associated with *A. glaucodes*, just E Avon, Eagle Co. Colo., 7800', July 17, 1996. 30 1st-stage larvae (later died) found on *A. glaucodes* leaf uns in shade in gulch bottom, much silk web forming a sheen; W side Avon, Eagle Co. Colo., 7500', July 17, 1996. 51 1st-stage larvae (lot A) (later died) found on *A. glaucodes* leaf uns (20 cm up on 40 cm stem), in shade of bushes, nearby leaves chewed and two had strong silk web; 137 1st-stage larvae (lot B) found on *A. glaucodes* leaf uns (22 cm up on 50 cm stem), in shade of bushes, much silk web July 19 & strong sheen silk web July 21 made by 1st-stage larvae, much silk web July 21 made by 2nd-stages, some web July 23 made by 2nd-stages, reared on *Aster laevis* var. *geyeri*, adults emerged Aug. 19-28, 1996; some 4th-stage larvae diapaused; WNW up Deep Creek, Eagle Co. Colo., 6500', July 17, 1996. Five 3rd-4th-stage larvae found on *A. glaucodes* leaf tops, Sewmup Mesa, Montrose Co. Colo., 5000', July 18, 1996, reared on *Aster laevis* var. *geyeri*, adults emerged Aug. 19-23, 1996. 22 1st-stage larvae (lot C) found on uns of two *A. glaucodes* leaves (two leaves had much silk web [so thick it formed a sheen] and some larvae were under the web on one leaf), adults emerged Aug. 16-20, 1996; some 4th-stages diapaused; leaves containing eggshells (oviposition leaves) at this site were 15 cm up on 30 cm stem, 10 on 25, 8 on 25, 3 on 35; 39 1st-stage larvae (lot D) found on *A. glaucodes* leaf uns, much silk web on uns of oviposition leaf and on tiny leaf at top of stem, adults emerged Aug. 16-21, 1996; some 4th-stages diapaused; 25 2nd-stage larvae (lot Misc.) of three family clusters found on *A. glaucodes* leaf uns, some silk web on leaf uns including a dense sheen of silk on 2 cm² of one leaf, 8 produced older larvae with black frontoclypeus and adults emerged Aug. 14-18, 1996, 17 produced cream frontoclypeus and adults emerged Aug. 13-23, 1996; all reared on *Aster laevis* var. *geyeri*; all in shade under Englemann Spruce, San Miguel River E Norwood, San Miguel Co. Colo., 6470', July 18, 1996. Extensive larval feeding damage noted on very common *A. glaucodes*, including one oviposition leaf that had a strong silk web all over uns and had ~30 1st-stage and ~15 2nd-stage larval head capsules and some shed larval skins; the *A. glaucodes* host and strong silk web suggest that these larvae were *P. batesii anasazi*; some *A. laevis* & many *A. ?adscendens* also present; 1 male adult found that resembles *cocyta* (unf black spots small, upf not two-toned; but unh crescent is dark-gray), but is probably *anasazi*; Chaffee Creek, Ouray Co. Colo., July 18, 1996. 8 2nd-stage larvae (lot A) found on *A. glaucodes* leaf uns, adults emerged Aug. 23-Sept. 5, 1996; 62 1st-stage larvae (lot B) found on *A. glaucodes* leaf uns (a little silk web found on uns of oviposition leaf containing eggshells), a little silk web July 29, adults emerged Aug. 27-Sept. 5, 1996; 24 1st/2nd-stage larvae (lot C) found on *A. glaucodes* leaf uns (much silk web found on oviposition

leaf which contained some uneaten eggshells), adults emerged Aug. 27-Sept. 5, 1996; all larvae of lots A-C found ~5-10 cm up on 30-35 cm *A. glaucodes* stems, all reared on *Aster laevis*; all just ESE Avon, Eagle Co. Colo., 7800', July 27, 1996. 55 2nd-stage larvae (lot A) found on *A. glaucodes* (egg leaf was ~18-20 cm up on 38 cm branch)(egg leaf and nearby leaf had strong silk web, egg leaf had many empty 1st-stage head capsules, a third leaf had some web); one 4th-stage diapaused; Game Creek, N edge Minturn, Eagle Co. Colo., 8050', Aug. 24, 1996, reared on *Aster laevis*, adults emerged Sept. 30-Oct. 8, 1996. Scott (1998a) reported early stages.

Phyciodes pulchella pulchella (W. Edw.). **EARLY STAGES** (marsh near Eureka, Humboldt Co. Calif., sent by Kenneth Hansen): **EGG**: clusters of 58 and 44 eggs laid on one leaf, cluster of 98 on another leaf, eggs laid in lab; light-green, turning brown about a day before hatching as larva becomes visible within; ~24 vertical ribs; duration 9-10 days in lab. **1ST-STAGE LARVA**: has little color pattern, for instance the wide brown subdorsal band described by Scott (1994) is absent, so not all *P. p. pulchella* have a pattern on 1st-stage larva; duration ~3 days in lab. **SILK WEB**: No silk web was noticed, except a moderate web was found on a small area on a leaf that 1st-stage larvae had been on. **2nd-STAGE LARVA**: greenish-tan when young with usual pattern of subdorsal browner band etc., becoming browner-tan with brown pattern. **MATURE LARVA**: quite-dark-brown, subdorsal cream band mostly-complete on all larvae, with brownish-orange beside BD2 scoli in subdorsal cream band, a bit of orange-brown beside BD1, a little brownish-orange next to BSD scoli, orangish-brown around base of BL1, the BL1 and BL3 scoli are orangish-tan on most larvae (reddish-tan on many larvae, tan on some larvae), other scoli (BD1, BD2, BSD) are blackish-brown (the scoli tips not cream), a partially-cream band runs along body below BSD scoli (this cream band is 50% complete on most larvae [30% complete on a few larvae, 60% complete on some larvae, , 80% complete on some larvae], the band is especially complete anteroventrad of BSD scoli), the usual cream line running below BL1 scoli; head all black, except for the usual cream dash on vertex that is sometimes weak. Larval stages ~27 days in lab. Larvae did not eat *Solidago canadensis*. **PUPA**: ~60% of pupae orangish-tan, ~40% creamy-tan, with some brown mottling on thorax and abdomen; wing mottling moderate to fairly strong, few weak; cremaster shouldered, width .89 mm on average, which is wider than the other ssp. *pulchella* family I have reared, and smaller than *P. pulchella camillus*; duration ~10 days for males, ~ 11 for females, in lab. **EMERGENCE LAG**: Females emerge an average of 1.84 days later than males in lab. **DURATION**: from oviposition to adult emergence averages 46 days for males, 48 days for females in lab.

Phyciodes pulchella camillus (W. Edw.). Female preovip. *Aster porteri*, Mt. Zion, Jefferson Co. Colo., June 19, 1995, and associated with *porteri* there Sept. 1, 1997. Female preovip. 12:05 *A. porteri*, Tinytown, Jefferson Co. Colo., June 26, 1995. Preoviposition 10:30 *A. porteri*, Hogback E. Red Rocks, Jefferson Co. Colo., Sept. 12, 1995. Adults assoc. *A. porteri*, Tinytown, Jefferson Co. Colo., June 14 & July 8, 1995, and Van Bibber Creek, Jefferson Co. Colo., Oct. 10, 1995, and Red Rocks, Jefferson Co. Colo., Oct. 10, 1995. 5 larvae (two 6th-stage, three 5th-stage) found resting in litter under *A. porteri* (found by noticing feeding damage on leaves), these larvae found at 15:00 in sunny weather, so the larvae evidently feed at night; preoviposition 13:30 *A. porteri*; Green Mtn., Jefferson Co. Colo., May 7, 1996. Adults associated with *A. porteri*, Tinytown, Jefferson Co. Colo., May 13 & 31, 1996. Adults associated with *A. porteri*, Crawford Gulch, Jefferson Co. Colo., June 6, 1996. Oviposition 11:29 35+ (I disturbed her twice) eggs on *A. porteri* leaf uns, Lookout Mtn., Jefferson Co. Colo., June 10, 1996. Adults associated with *A. porteri*; Tucker Gulch, Jefferson Co. Colo., Aug. 29, 1996. Adults associated with *A. porteri*; Ralston Butte, Jefferson Co. Colo., Aug. 10, 1996. Oviposition 119 eggs *A. porteri* 11:20-11:45, she landed on seedlings at 11:00 and investigated seedlings until 11:20 when she began to lay, eggs were laid on uns of leaf 2.5 cm above ground on upper part of seedling, eggs hatched June 12 (duration of 11 days); preoviposition *A. porteri* 11:42; Ralston Butte, Jefferson Co. Colo., June 1, 1997. Oviposition, she fluttered and landed on *A. porteri* seedlings from 11:00-11:02 then settled on one *porteri* seedling and laid cluster of 119 eggs from 11:20-11:45 on leaf uns 2.5 cm above ground, hatched June 12; Ralston Butte, Jefferson County Colorado, June 3, 1997. Oviposition 32+ eggs 10:46 onward on uns of leaf of non-flowering *A. porteri* plant, I walked by and scared her from plant so she would have laid more eggs, eggs hatched June 15 (duration 9 days); Green Mtn., Jefferson Co. Colo., June 6, 1997. Adults assoc. *Aster ericoides*, Mt. Vernon Can., Jefferson Co. Colo., Oct. 14, 1995, and 1 mi. E Morrison, Jefferson Co. Colo., Oct. 14, 16, 1995. ~30 1st (& a few 2nd)-stage larvae in dense silk web covering distal 3 cm of tender basal shoot (among mature stems) of *A. ericoides* var. *ericoides* (stem hairs appressed, involucre 3-4 mm tall, but petal count 20, 20, 20, 22); Barr Lake, Adams Co. Colo., 5075', Sept. 9, 1996; reared on *Aster laevis*, *A. lanceolatus hesperius*, & *porteri*, adults emerged Oct. 20-Nov.2, 1996; one larva diapaused as 4th-stage (head width 1.4 mm) for several weeks. Adults associated with *A. porteri*, *Aster lanceolatus hesperius*, *Machaeranthera pattersoni*; N Foxton, Jefferson Co. Colo., Aug. 26, 1996. Preoviposition 9:57 *M. pattersoni*; Mt. Falcon, Jefferson Co. Colo., June 27, 1995. Adults associated with *Aster glaucodes*; SE end Green Mtn. Res., Summit Co. Colo., July 11, 1996 (5 adults), July 19, 1996 (1 adult). 19 older 2nd-stage & 3rd-stage larvae found on leaf uns on about 5 *Aster foliaceus* stems; Maloit Park, S edge Minturn, Eagle Co. Colo., 8200', Aug. 24, 1996, reared on *A. laevis* var. *geyeri*, adults emerged Oct. 4-10, 1996. Lot B, 75 2nd-stage larvae and two 1st-stage larvae found on leaf uns 9 cm above ground on 15-cm-tall *A. foliaceus* plant, a very strong sheen silk web on uns of oviposition leaf, and much web noted later in lab through Sept. 2, in sunny meadow in valley bottom, reared to adults; lot C, 17 2nd-stage larvae found on leaf uns 15 cm above ground on 39-cm-tall *A. foliaceus* plant, much web noted on uns of this and two adjacent leaves, in sunny meadow in valley bottom, reared to adults; lot E, four 2nd-stage larvae found on leaf uns 8 cm above ground on 8-cm-tall *A.*

foliaceus seedling, some silk web noted under a tiny 2 cm leaf and a strong sheen web noted later in lab, on S-facing slope base, 60 cm from lot C (and 60 cm from *P. cocyta* lot D), not reared to adults due to mortality, but identified by larval color pattern; near east end of Vail, ~8300 ft., Eagle Co. Colo., Aug. 22, 1997. Adults associated with *Aster ascendens*; S Cucharas Pass, & E of Stonewall, Las Animas Co. Colo.; Sept. 1, 1996. Lot G, cluster of ~65 2nd-stage larvae and one 1st-stage larva found on leaf uns 15 cm above ground on 25-cm-tall *A. ascendens* plant, much web noted on leaf uns and later in lab, adults reared; on NE-facing slumping bank of mesa, 3.7 mi. N of I-70 (=Dillon Res. dam), 8550 ft., Summit Co. Colo., Aug. 25, 1997. Adults associated with *A. ascendens*, SE San Luis, Costilla Co. Colo. Sept. 8, 1998, and ESE Costilla, Taos Co. New Mex., Sept. 10, 1998, and Amalia, Taos Co. New Mex., Sept. 10, 1998. *Aster fendleri* had no eggs, leaves too narrow and small, probably not a host or a rare one; 1 mi. E Morrison, Jefferson Co. Colo., Oct. 10, 1995, Sept. 25, 1997, Sept. 28, 1998. **NEW HOSTPLANTS:** *A. foliaceus*. I have now reared enough clusters of *Phyciodes* eggs/larvae from *Aster laevis* var. *geyeri*, to be certain that it is NOT a host of *P. pulchella camillus*.

Phyciodes picta (W. Edw.). Adults were very local and flew only near *Machaeranthera phyllocephala* seedlings (4-17 cm tall, most ~5 cm) and not found away from this plant (one male remained at patch at least 3 hours), *Convolvulus arvensis* absent, *Aster ericoides* & *Machaeranthera canescens* scarce; Fort Morgan, Morgan Co. Colo., June 14, July 17, 1995. Adults assoc. *M. phyllocephala*; preoviposition 13:00, female landed often on green vegetated area near *M. phyllocephala* and fluttered to mowed *Artemisia filifolia* and fluttered over it and landed on it several times after circling and landing, at 13:10 she bent abdomen on it while crawling through clump, she rested on it in between crawling and bending abdomen, from 13:20-13:25 she oviposited 20 eggs on underside of tender *A. filifolia* leaves low in plant, then I interrupted her and took her 10 m away in net to see what else she would oviposit on and let her go on bed of *M. phyllocephala*, she flew fast and ignored *M. phyllocephala* and landed twice, and within 5 minutes she had found the same mowed *A. filifolia* plant (the only plant present at locality except 80 m away) and landed on it and crawled and bent abdomen & rested, and from 13:39-13:52 she laid 77 eggs on that *A. filifolia* and flew away (thus she laid 97 total eggs on it, which hatched Aug. 4); two other clusters of 7 and 67 new (yellowish-green) eggs (but no larvae) were found on same mowed *A. filifolia* plant (hatched Aug. 3), which was 5, 20, 20, 35, 40, 40 cm (common 50 cm onward) from *M. phyllocephala*; Fort Morgan, Morgan Co. Colo., July 28, 1995 (a female from Fort Morgan July 28, 1995 was bagged on transplanted *M. phyllocephala* in garden and laid cluster of 48 eggs on leaf uns (hatched Aug. 8), and the young larvae survived well and skeletonized about 6 lower leaves, but on Aug. 25 I opened net bag and found only one live 3rd-stage larva (the others evidently escaped out a hole in net), I rebagged that 3rd-stage larva and 10 ~4th-stage lab larvae onto same branch, and these larvae lived a week or so and molted since many head capsules were found, then all but one shriveled and died (due to moisture loss from being forced to be up on the plant during the day?). No adults seen at Fort Morgan, Morgan Co. Colo. in 1996 (June 23), evidently because in 1996 *M. phyllocephala* grew only near road intersection and not westward where ovipositions and most adults were found in previous years. . Adults assoc. *M. phyllocephala*; Fort Morgan, Morgan Co. Colo., July 15, 1997 Adults associated with *C. arvensis*, N Penrose, Fremont Co. Colo., Aug. 31, 1996. **HOST PREFERENCE:** Older lab larvae ate none of *Artemisia filifolia*, ate none of *Artemisia scopulorum*, ate much of *Machaeranthera phyllocephala*, ate a lot of *Aster laevis*, and ate a lot of the favorite *Convolvulus arvensis*. When *C. arvensis* is in a jar with *A. laevis* & *M. phyllocephala* & *A. filifolia* & *M. canescens*, larvae eat all the *arvensis* and less of *laevis* & *phyllocephala*, and eat none of the *filifolia* or *canescens*. Therefore *M. phyllocephala* seems to be the host at Fort Morgan (even though lab larvae like it less than *C. arvensis* and *A. laevis*), and may be a host in many areas, because the range of *M. phyllocephala* (NE Colo., W. Neb. south to C Okla., Tex., & N.M.) fits the plains range of *P. picta*. **SILK WEB:** young larvae make very little web: on Aug. 6 some web was noticed on one leaf after egg leaf, Aug. 8 2nd-stage larvae made little web on large *A. laevis* leaf, Aug. 10 very little web (a small amount on one spot of one leaf). **EGG:** pale-yellowish-green; duration 7 days. **MATURE LARVA:** the frontoclypeus is brown (not cream as stated in Papilio #7 based on pickled larvae), as are the adjacent adfrontal areas, the whole brown area surrounded by a cream stripe along the adfrontal sulcus; this cream-edged brown area readily identifies *P. picta*. The rest of the head often resembles some other *Phyciodes*, as the cream area surrounding the eyes and the cream stripe on top of vertex are sometimes prominent but are often dark (brownish) and are sometimes nearly absent. **PUPA** variable, many creamy, many orangish-tan, a few dark-brown, the wing has weak mottling (paler pupae have only a small discal cell spot, darker pupae have a moderate brown streak from discal cell spot to margin).

Nymphalinae, Heliconiini = Argynnini

Boloria eunomia caelestis (Hemming). Oviposition 9:51 3 eggs on *Gentianella acuta* leaf underside (*Viola labradorica* 1, 1, 5, 7-50-100 thick, *Polygonum viviparum* 2, 4, 6, 10, 15, etc. common, *Erigeron ursinus* 1-60 thick, *Potentilla diversifolia* 5, 10, *G. acuta* 6, 15 uncommon, *Trollius laxus* 3, 7, 20 common, *Caltha leptosepala* 5, 6-100 common, *Salix planifolia* 20, 35, 40, 70, 80, *Castilleja rhexifolia* 30, 40, *Castilleja occidentalis* 65), then the same female crawled 6 cm away and laid 2 eggs 9:53 on *Polygonum viviparum* leaf underside (*P. viviparum* 2, 3, 6, 7, 10, 12, 20, 20 etc., *Viola labradorica* 2, 5, 7-50, *Erigeron ursinus* 0-50, *Potentilla diversifolia* 3, 3, 5 etc.); Loveland Pass, Summit Co., Colo., Aug. 2, 1993. Oviposition 13:25, she landed 2X near/on older *Salix reticulata nivalis* leaves and flew, then landed among much *Viola* and young *S. r. nivalis* and laid 2 eggs on underside of young *S. r. nivalis* leaf (*S. r. nivalis* 0-300 cm common

continuous mat, *Viola labradorica* 5 mm-100 cm very common, *Polygonum viviparum* 1, 3, 3, 4, 6, 7, 8, 10, 17, 17 etc. common, *Salix planifolia* 60, 80 cm onward, *Trollius laxus* 3, 5, 8, 8, 15-100 common, *Caltha leptosepala* 15, 30, etc., *Erigeron ursinus* 8-50 common, *Swertia perennis* 3, 7, 10, 12, 13, 15 etc., *Castilleja rhexifolia* 3, 13, *Castilleja occidentalis* 90, *Gentianella acuta* 10-15, 20); Loveland Pass, Summit Co., Colo., Aug. 6, 1993. Oviposition 11:38, she landed 3X and then crawled 10 cm through vegetation in mossy wet short-vegetation area of bog to lay two eggs under tiny *Polygonum viviparum* leaf (*P. viviparum* seedlings common to 100, *Caltha leptosepala* 4-100, *Salix planifolia* 40, 40, 50 etc., *Sedum rhodanthum* 5, 8, common to 100, *Pedicularis groenlandica* 7, 15, 12, 25, 40, etc., *Potentilla diversifolia* 35, 50, etc., *Swertia perennis* 30, *Vaccinium cespitosum* 40, 70); Loveland Pass, Summit Co. Colo., Aug. 16, 1995. Oviposition 11:08 (egg hatched Aug. 16), she investigated low-vegetation mounds in *Salix planifolia* willow bog, landed and crawled 6 cm and laid cream egg on lower leaflet uns of *Thalictrum alpinum* (*T. alpinum* 0, 1, 8, 8, 8, 13-30, 20, 25, 35, etc., *Viola labradorica* 1, 3-7, *Polygonum viviparum* 2, 4, 5, 8, 8, 8, 10, 12, common to 100, *Vaccinium cespitosum* 2, 4, 8-30, 8-50 common, *Salix arctica nivalis* 5, 6-100, 12, 17-100, *Salix planifolia* 25-100, *Erigeron ursinus* 1, 4, 4, 5, 6, 7, 7, etc. thick to 100, *Veronica nutans* 2, 4, 8, 8, 10, etc., *Trollius laxus* 2, 6, 7, 13, 15 common, *Pedicularis groenlandica* 6, 25, 35, *Potentilla diversifolia* 7, 8, 15-25, 30, 35, etc., *Caltha leptosepala* 8, 10, 20, 40, *Gentianella acuta* 9, 17, *Artemisia arctica saxicola* 11, 35, 60, 70, 100); Loveland Pass, Summit Co. Colo., Aug. 10, 1998; the larva hatching from this egg would have its choice of *Viola*, *Polygonum*, *Vaccinium*, and perhaps others to eat. Oviposition 9:44 on *Viola labradorica* leaf uns, she landed three times, then landed on grassy mound beside *Salix planifolia* and laid egg (*V. labradorica* 0-100 common, *Vaccinium cespitosum* 5, 5, 6-100, *Polygonum viviparum* 10, *Salix planifolia* 40, *Veronica nutans* 2, 3, 3, 4, 4, 6, 6, 7, thick to 100, *Caltha leptosepala* 5-100 common, *Trollius laxus* 6, 20-100, *Castilleja rhexifolia* 8, 10, 12, 14, *Pedicularis groenlandica* 8, 30, 45, etc., *Gentianella acuta* 8, 35, *Erigeron ursinus* 10, 10-20, *Gentiana* [*Pseumonanthe*] *parryi* 10, *Potentilla diversifolia* 18-100); Loveland Pass, Summit Co. Colo., Aug. 13, 1998. **NEW HOSTPLANTS:** *Salix reticulata nivalis* is a new occasional host. **EGG** yellow-cream, ~21 vertical ribs. **1ST-STAGE LARVA** gray-tan, innards green after feeding, with ochre around bases of the brown sclerites, A1, A3, A5, A7 slightly more orange-brown, suranal plate & collar dark-brown; head black. **2ND-STAGE LARVA** mottled brown (or dark-brown on rear 2/3) because ground color tan with browner patches in subdorsal area between scoli, a middorsal line of dark-brown dashes, scoli dark-brown; head black.

Boloria titania helena (W. Edw.). **PUPA:** A pupal shell abdomen still attached around the abdomen of a female adult from McClellan Mtn., Clear Creek Co., Colo., July 15, 1980, has much larger middorsal and subdorsal cones than *B. improba* (distribution of cones: middorsal cones A3-7 [largest A5-7], subdorsal cones A2-7 [small A2, fairly small A4, large A3 & A5-7], on A5-7 [and weakly on A3-4]), the middorsal and subdorsal cones are connected by a large ridge, forming a paler broad dorsal V (the middorsal cone at the point of each V).

Boloria freija browni Higgins. Adults associated with *Vaccinium cespitosum* 5.3 mi. W Hopewell Lake, Rio Arriba Co. New Mex., June 20, 1978.

Speyeria aphrodite columbia (H. Edw.) = *ethne* (Hemming). Oviposition 11:02, she landed 70 cm downslope of *Cercocarpus montanus* bush on NE-facing slope in a little hollow among *Eriogonum umbellatum* & walked 1-2 cm & probed abdomen & laid egg on underside of dead grass blade in litter (*Carex pensylvanica heliophila* common all around, *Bromus tectorum* near, *Bouteloua gracilis* & *Heterotheca villosa* nearby, no *Viola* seen); Green Mtn., Jefferson Co. Colo., Aug. 29, 1992. Older larva found on top of *Gnaphalium* plant ~1 m from *Viola nuttallii* growing under *C. montanus* bushes, larva ate *V. nuttallii* & *Viola sororia affinis* in lab and pupated, Green Mtn., Jefferson Co. Colo., June 1, 1993. 1st-stage larvae must wander to find violets, and this record shows that older larvae also wander away from and toward their hosts. Preoviposition, bent abdomen ~8X in litter on N side *Salix exigua* in valley bottom but scared away by grasshopper; Indian Gulch, Jefferson Co. Colo., Sept. 7, 1994. Preoviposition 12:40 near *Viola adunca*; Tinytown, Jefferson Co. Colo., Aug. 17, 1998. **EGG** cream when laid, turning tan after a day, duration 16-17 days in lab. **1ST-STAGE LARVA** tan with large dark-brown sclerites, suranal plate & collar dark-brown; head dark-brown. **OLDER-MATURE LARVA** grayish-black with some tiny cream dots at seta bases, with twin brown middorsal lines, BD2 scolus black with brown base, a large black patch around BD2 scolus except beneath, BSD scoli black on distal half and light-orangish-brown on basal half, a black patch around BSD scolus (except dorsally) that encloses black spiracle, BL1 scolus is black on distal third & brownish-orange on basal 2/3 & and rests on an orange mound, underside & prolegs dark-brown, legs black; head black, the rear rim of head orange (with tiny brown spots) laterally (above eyes) and dorsally (except middorsal valley is black). **PUPA** orangish-cream, the wings creamy (but brown on distal 2/3 of inner margin) with brown wing veins and numerous small transverse brown striations, a brown spot at end of discal cell, a large black patch on underside of head, orbit black, eye mostly black, very base of forewing black where it slopes forward from a point, dorsal slope of inner margin of forewing black, hindwing sliver black, top of head has a transverse black patch and a black posterolateral area, T1 has a black subdorsal cone and a black central patch, head & T1-2 have a narrow black middorsal line, T2-3 have a twin middorsal tan band, T2-3-A1 mostly tan with black mottling, A5-7 have a middorsal tan cone on front of each segment which is the front end of a tan area, and similar tan areas are on A3-4, a subdorsal cone on head-T1-3-A1-7 (this cone is at the edge of a black anterior area and rear of cone is in a tan area), on abd. these cones have a tiny orangish tip, A2-7 have usual black serrate anterior spots (including a black triangle on A4-7), on A4-7 below this triangle the black is reduced to a

small black spot near middle of segment above a small black patch containing spiracle, appendages mostly black except hind leg partly tan, antenna segments black with tan joints.

Speyeria mormonia eurynome (W. Edw.). 3 ovipositions ~12:05: she landed on *Taraxacum officinale* flower ~3 times and crawled and drummed forelegs, flew & landed on *Potentilla fissa* 20 cm from *Artemisia tridentata* tiny bush, crawled and laid egg on dead brown twig 1 mm wide in litter 3 cm from *Viola adunca* (the only *Viola* seen nearby)(*P. fissa* common, *Erigeron ursinus* 30, 40, *Potentilla gracilis pulcherrima* 10 etc., *Anemone* 7), she then flew & landed in hollow beside *Pentaphylloides floribunda* on several sides and crawled around hollow and laid egg on *Fragaria* stem 8 & 5 cm from *Viola adunca*, then she laid egg on *Fragaria* stem 4 & 9 cm from *V. adunca*, she then crawled 2 cm away & bent abdomen twice but eggs not found (*P. floribunda* 15, *Potentilla pulcherrima* 8-100, *Artemisia ludoviciana* 30, *Erigeron ursinus* 20 etc., *Taraxacum officinale* 15); *V. adunca* is the host here; Fraser, Grand Co., Colo., July 30, 1992. Oviposition 11:26 on base of dead leaf underside of *Cirsium coloradense* var. *acaulescens* seedling (*C. coloradense* also 15, 15, 35, 40 etc., *Viola labradorica* 2, 7, 8, 10, 12, 15 etc. common, *Potentilla fissa* 7, 17 etc., Umbelliferae 8-10, *Besseyia?* 20, *Achillea* 35, *Penstemon* seedlings 8, 15, 20, *Taraxacum officinale* 12, *Polygonum bistortoides* 7-15, 12, 15, 25, etc., *Potentilla pensylvanica* 20, 30, *Potentilla diversifolia* 12, 35); oviposition 11:28 on 4-mm-long dead twig in litter at base of *Fragaria* (0-100 common, *Viola labradorica* 7, 8-10, 15, 17, 20 etc. common, *Pedicularis parryi* 8-20, *Erigeron ursinus* 15, 25, *Polygonum bistortoides* 17, 20, *Potentilla gracilis* 20); preoviposition 11:30 (*Viola labradorica* 7, 8, 9, 10, 15, *Potentilla pulcherrima* 5 common, *Linanthus nuttallii* 0-10, *Achillea* 0, & other plants); *V. labradorica* is the host here; SW Tennessee Pass, Lake Co. Colo., Aug. 13, 1993. Oviposition 12:26, she landed ~10 times, then finally landed & laid egg on tiny dead leaf in litter at top of mouse hole (*Polygonum bistortoides* 4, 4, 10, 15 cm common to 100, *Antennaria parvifolia* 2-100, *Potentilla diversifolia* 15 cm onward common, *Epilobium* 5-100, *Thlaspi montana* 2, 25, 25, 25, etc., *Achillea lanulosa* 8-100, *Cerastium strictum* some 20-100, *Oxypolis fendleri* 30, tiny ?*Swertia* 30, *Erigeron ursinus* 20); no *Viola* seen); SE Rollins Pass, Gilpin Co. Colo., Aug. 5, 1996. Oviposition 10:24 (egg hatched Aug. 21), she landed on *Salix reticulata nivalis* patch and crawled on it for 45 cm and bent abdomen 3 times on the way but I found no egg at those three spots, egg was laid on green vertical grass blade 1 cm above ground (*S. r. nivalis* thick 0-100 cm, *Viola labradorica* 20, common 35-50, *Veronica nutans* 2, 4, 8, 10, 12, etc., common to 100, *Trollius laxus* 5, 8, 8, etc. common, *Vaccinium cespitosum* 9, 30 onward, 40 onward, *Polygonum viviparum* 18, *Gentiana parryi* 8, 18, 35, *Erigeron ursinus* 30, 60, *Arnica mollis* 45, 80, *Caltha leptosepala* 50, 70, *Sedum rhodanthum* 80); Loveland Pass, Summit Co. Colo., Aug. 13, 1998; perhaps *Viola labradorica* is the host at this oviposition site. **HOSTPLANTS:** *Viola adunca* and *V. labradorica* are both hosts. But I am disturbed by the casual way *S. mormonia* throws away its eggs, and I wonder whether larvae are semipolyphagous. In fact, I would not be surprised to find that most or all *Speyeria* are semipolyphagous like most *Boloria*. **EGG** yellowish-cream, turning pinkish-cream, ~24 vertical ribs. **1ST-STAGE LARVA** ochre-tan with brown plates below setae (overall appearance brown), suranal plate & collar brown; head brown. **2ND-STAGE LARVA** gray, with twin gray middorsal lines, pattern like older larvae but black and gray. **HALF-GROWN-LARVA** similar to older larva but twin middorsal lines cream. **MATURE LARVA** dirty-orangish-cream with tiny black spots and a complicated pattern of larger black spots and patches, a middorsal black heart-line, two middorsal creamy bands (brown medially beside heart-line and cream laterally), a large black patch anterodorsal and another posterodorsal to BD2 scoli, a black streak ventroposterior to BD2, the pale areas around patches dirty-orangish-cream (some ochre-tan patches on thorax), BSD scoli mostly connected by black band, spiracle black, with large reddish-black patches anterior & posterior to spiracle, an ochre-cream lateral ridge contains BL scoli, reddish-brown below that, underside creamy with red-brown mottling (light-brown on thorax), a darker patch below BSV scoli, a black dash just above proleg, a creamy (tan on thorax) midventral band, BD2 scoli dirty-light-brown, BSD scoli dirty-orangish-cream (but brown near body), BL scoli dirty-orangish-cream; head black, top and side orange-tan with many black spots. **PUPA** blackish-brown with orange-brown pale areas, wing pale (translucent orange-brown) with blackish dot at cell end, black transverse striations across base and anterior part of wing, veins R5-CuA1 are blackish in median-postmedian area, tracheae visible on veins of fw and visible on hw, edge of hindwing and anal edge of forewing black, top of head mostly black, ventral side of head orange-brown with a V-shaped mark (the point touching proboscis, the two ends curled medially), top of T1-2 mostly black, a pale subdorsal bump T1-3 & A1-4, twin pale middorsal lines on T2 (divided by black middorsal line), T3 orange-brown laterally, abdomen mottled orange-brown, A1 black anteriorly (except laterally) and posteriorly, A2-3 has pale patch behind & laterad of subdorsal bump, A3-9 a wide middorsal orangish-brown band (widest in middle of segments) with weak brown heart-line through it, a red-brown irregular interrupted band below this middorsal band, A4 has black irregular patch on front near middorsal lines, and on A5-9 the equivalent patch is triangular, A3-7 has transverse dorsal-subdorsal blackish line near rear of segment (thicker on A3), a line of red-brown dashes above spiracles, A2-7 spiracles are in a blackish patch (spiracle vestigial A8), an small light-orange-brown spot below spiracle on A4-8, a small light-orange-brown lateroventral spot (in a browner area) below previous spot on A5-7, a blackish dot near midventral axis on A5-6, a small middorsal saddlehorn on front of A5-7 (wide on A5), mouthparts & legs mostly mottled dark-brown, antenna segments blackish with pale joints, cremaster red-brown; in silked-leaf nest of violet leaf curled and silked shut (enclosing pupa completely). **PUPAL SHELL** (Greenhorn Peak, Huerfano Co. Colo.) mottled pale and brown, head mostly pale except a brown transverse area at level of top of frontoclypeus and a brown patch on gena (narrowly connected to proboscis), thorax mottled brown, wings pale with

network of fine brown lines, appendages mottled brown (antenna shaft checkered), abdomen mostly pale (the usual sawtooth brown pattern typical of *Speyeria callippe/atlantis* etc. occurs on A1-3, less on A4, and the brown on A5-7 is mostly restricted to a subdorsal triangle extending backward from front of segment and a tiny brown spot above spiracle), a middorsal bump on front of A5-7 segments.

Speyeria coronis halcyone (W. Edw.). **EGG** greenish-cream, turning slightly-pinkish after about a week, duration 16-17 days in lab.

Speyeria callippe meadii (W. Edw.). Preoviposition 11:20 shady gulch bottom but no violets present, Tynytown, Jefferson Co. Colo., July 9, 1994. **EGG** has ~26 vertical ribs, versus ~19 or 21 for *Speyeria hesperis*.

Speyeria hesperis hesperis (W. Edw.). Larva 13 mm long found under *Viola adunca* plant (but no feeding damage noted on leaves), reared on *Viola sororia affinis*, emgd. June 18, Tynytown, Jefferson Co. Colo., May 14, 1993. Preovipositions 12:50, 13:00 near *Viola canadensis* var. *scopulorum*; Coal Creek, Jefferson Co. Colo., July 30, 1996. Oviposition 11:51 under dead grass blade in litter near *V. c.* var. *scopulorum*; Tynytown, Jefferson Co. Colo., July 31, 1996. Female oviposited 11:35, 11:36, 11:45 in litter (one under dead aspen leaf) near *Viola rydbergii* (12, 15, 15 cm from eggs); a second female oviposited 11:59 on uns of dead *Poa pratensis pratensis* leaf in litter near *V. rydbergii*; the second female landed on a *Viola adunca* patch but flew; Tynytown, Jefferson Co. Colo., Aug. 13, 1997. Oviposition 11:52 at ground level on base of 1.5-cm-wide trunk of young (1-m-tall) *Quercus gambelii* plant, 1 cm from *V. adunca* (*V. adunca* also 30, 35-300 thick, 45, 80, 100, 100, 100 cm from egg); a second female oviposited 12:19 as she bent abdomen to horizontal dead grass blade (3 cm above ground) and then raised her abdomen and egg was wiped off onto horizontal live *Poa pratensis pratensis* leaf 4 cm above ground; the same (second) female then crawled 7 cm away and oviposited 12:20 on stem of *Viola rydbergii* (*V. rydbergii* 0-200 cm from egg in a thick patch); three other females preoviposited at *Viola adunca* 11:55-12:00 but no eggs laid; Tynytown, Jefferson Co. Colo., Sept. 4, 1997. Oviposition 12:25, 20 cm from *V. adunca*, she preoviposited and crawled 3 times near *V. adunca*, then flew 10 m and landed on *V. adunca* clump and crawled around and laid egg on *Pinus ponderosa* needle in litter hollow (*V. adunca* 20, 20, 35, 60, 70, *Rubus idaeus* 2-100, *Geranium cespitosum* 2-100, *Trifolium hybridum* 18-50, *Aster laevis* 22-30, 30, *Berberis repens* 17); Tynytown, Jefferson Co. Colo., Aug. 20, 1998. Oviposition 13:47 in aspen grove, she fluttered at one *V. adunca* patch, then flew slowly to another and landed and crawled on ground and laid pale-yellow egg in litter on dead 2-mm-wide twig 10 cm from *V. adunca* (*V. adunca* 10-25 cm, *Galium* sp. seedling 7, *Smilacina stellatum* 15, *Symphoricarpos* 15, *Aster laevis* 25, *Quercus gambelii* seedling 25, *Geranium cespitosum* 70, *Populus tremula tremuloides* 100); later a female oviposited? 14:25 (bent abdomen in litter but no egg found though it may have been present) 5 cm from *V. adunca*; Tynytown, Jefferson Co. Colo., Aug. 17, 1998.

HOSTPLANTS: *Viola adunca*, *rydbergii*, and *canadensis* var. *scopulorum* are all hosts. **EGG** cream turning brownish (because it is microscopically mottled with maroon-reddish) after about a day, about 19 or 21 vertical ribs; duration 13-17 days in lab. **FIRST-STAGE LARVA** brownish-tan, the seta bases and setae dark-brown; head black.

Speyeria edwardsii (Reakirt). Oviposition 13:33 dead twig in litter in shade of *Yucca glauca* (nearby plants *Thlaspi arvense*, *Gutierrezia sarothrae*, *Psoralea tenuifolia*, *Antennaria parviflora*, *Aster ericoides*), on barren grassland at end of low ridge; hostplant here must be dormant *Viola nuttallii* somewhere; E Morrison, Jefferson Co. Colo., Sept. 4, 1993. **EGG** cream, turning tan after about a day (light-brown like *aphrodite*), duration about 18 days in lab.

Euptoieta claudia (Cramer). Oviposition 11:07 on ups of 3-mm-long leaf near dried seed pod, oviposition 11:15 on ups of 3-mm-leaf near base of plant, oviposition 11:16 on uns of 6-mm-long leaf on middle of plant, all on cultivated *Linum lewisii*; Julesburg, Sedgwick Co. Colo., July 15, 1997. Oviposition 14:32 on ups of 1-cm-wide leaf, oviposition 14:33 on uns of 1.5-cm-wide leaf, oviposition 14:34 on side of dead grass blade above young plant, oviposition 15:00 under edge of 2-cm-wide leaf, all on *Viola adunca*; Tynytown, Jefferson Co. Colo., June 17, 1997. Oviposition 12:51 on *V. adunca* leaf ups; Little Cub Creek S Evergreen, Jefferson Co. Colo., June 26, 1997. Oviposition 12:30 on uns of tiny leaves at growing middle of *Viola tricolor* var. *tricolor*, 2 other eggs and 2 1st-stage larvae found on plant also; Lakewood, Jefferson Co. Colo., June 10, 2001. Newly-emerged female near *V. tricolor* var. *tricolor*; Windsor, Weld Co. Colo., Aug. 4, 2001. Ovipositions 15:14, 15:14, 15:15 on *V. tricolor* var. *hortensis*; Lakewood, Jefferson Co. Colo., May 15, 2001. Ovipositions 11:49, 11:50 on top and on uns of tiny *Viola sororia affinis* leaves in center of seedlings growing out of crack in patio; Lakewood, Jefferson Co. Colo., July 28, 2003. **EGG** greenish-cream when laid, hatched Aug. 3. **SEDUM HOSTPLANT:** Theodore Mead's record of "*Sedum*" at Fairplay Colo. I recently thought was a misidentification of *Linum lewisii*, because *Linum* is similar in appearance (a tall single-stalk with simple short leaves), though not as fleshy. However, two ovipositions were seen on *Sedum lanceolatum*, and eggs were found on *S. lanceolatum*, and larvae ate *S. lanceolatum* in lab to half-grown size, at Cow Creek, Rocky Mtn. Nat. Park, 2001, Colo., by Richard Bray's (pers. comm.) friend Stephanie. In addition, Clyde Gillette (pers. comm.) has found *S. lanceolatum* to be an occasional hostplant in Utah. **NEW HOST:** *Viola adunca*, *Sedum lanceolatum*.

LYCAENIDAE, Riodininae

Apodemia mormo pueblo Scott. Ovipositions 11:25, 11:27, 11:30 just below *Eriogonum jamesi* (the old variety name *jamesi* is no longer used, because the only other variety *flavescens* is now considered to belong to and be a synonym of *E. flavum*) flowers (1 egg on underside of bract, 1 at side of base of bract just below flower bud, 1 on side of calyx cup of

flower buds); 12 eggs laid in lab were mostly on underside of bracts but some were on upper surface of bracts and 2 on inflorescence branches; at least some eggs hatched in lab (photos of 1st-stage taken Sept. 14); Red Creek, El Paso Co. Colo., Sept. 1, 1993. Adults associated with *E. jamesi*, near Questa, Taos Co. New Mex., 6900', Aug. 13, 1996.

HIBERNATION STAGE: evidently very young larvae hibernate, as at least some eggs hatch in lab, although in nature it is possible (but unlikely) that eggs diapause. **EGG** light-pinkish-purple, covered with minute craters edged by knife-sharp walls, micropyle depression wide. **1ST-STAGE LARVA** purplish-pink, the many sclerites (verrucae) and pronotum and suranal plate and long setae are all black, except lateral setae pale; head black.

Apodemia nais nais (W. Edw.). Oviposition 9:30 two eggs on leaf top, then she moved to stem & at 9:30 oviposited egg on stem (halfway up stem); oviposition 11:00 on leaf uns; all on *Ceanothus fendleri*; Lookout Mtn., Jefferson Co. Colo., July 7, 1996.

Lycaeninae, Theclini

Hypaurotis crysalus crysalus (W. Edw.). 2 larvae found on *Quercus gambelii*, on uns of young ~5 cm-long leaves resting near eaten hole in leaf (at 15:40-16:00, so larvae rest under leaves all day), Tintytown, Jefferson Co. Colo., June 3, 1994. Older larva found on *Q. gambelii* leaf uns, Tintytown, Jefferson Co. Colo., June 7, 1994. Oviposition 12:14 on end of *Q. gambelii* twig next to base of leaf petiole, the twig had 4 mature leaves; Tintytown, Jefferson Co. Colo., Aug. 17, 1995. 32 eggs laid on *Q. gambelii* by females enclosed in net bag around branch, on junction of twigs (14), on end of twig at leaf petiole (13), on junction of leaf petiole and twig (4), or on netting (1); Tintytown, Jefferson Co. Colo., Aug. 17-24, 1995.

EGG light-green (pale bluish-greenish-white) when laid, but turns white by one hour later, and remains white, covered with hundreds of long blunt-tipped spikes, micropyle a small indentation. **HALF-GROWN LARVA** pale-creamy-green, with a yellowish-cream band near middorsal axis (running beside pale-creamy-green pronotum and is farthest from middorsal axis just behind pronotum, then this band angles toward middorsal axis on T2-3 so that on A1-9 it runs along darker-green heart, lateral ridge has cream band, two faint paler oblique subdorsal dashes on each segment, a slightly-darker-green band above spiracles, light-green beneath (later gray-green when mature). **MATURE LARVA** the same, but a little greener in color (light-green) and near-middorsal band weaker, spiracles tan, body covered with pale hair; head brown. **PUPA** when young has thorax & wings translucent-dull-greenish-yellow with green innards, abd. very-pale-bluish-green, a slight cream edging of darker heart-band, heart-band slightly green on T2-3, green A1-2, orange-tan A3-5, & heart-band is a patch of orange-tan on A6-7, an orange-tan subdorsal area on A3-5, a cream subdorsal oblique dash on A1-7 (short on A1 & A7), a brown spot below that on A2-7; a little later (less than a day old) pupa is translucent-dull-light-olive-green with pale-green abdomen, after several days becoming light-orange-brown with abdomen paler-orange-brown, abdomen has a weak or stronger middorsal brown band edged by creamy-green, body covered with black spots (except few tiny black spots on wings & on underside), including a large black subdorsal spot on front of T2, a large black streak near midline of T2, weak or stronger black middorsal mottling on T1, a large middorsal black spot on A2-7, a large black subdorsal spot on A2-7 (touched by an oblique creamy-green dash on young pupa before it turns brown), smaller black spot below that above spiracles, absent or small blackish spots below spiracles on A4-7, many tiny blackish spots, the size of black pupal spots varies somewhat between individuals, spiracles cream, a reddish U-shaped field of crochets on uns of abd. tip, antenna brown, before emergence eyes turn black, then wings turn black, then most of pupa becomes blackish; pupa attached by silk girdle over A2 or between A1-A2 and cremaster is attached to silk pad; duration 16 days in lab.

Lycaeninae, Lycaenini

Lycaena cupreus snowi (W. Edw.). **PUPA** also has large brown area extending from subdorsal to above spiracle on A5-7, and distal wing margin dark-brown, a subdorsal brown spot on T3 also.

Lycaena thoe (Guerin-Meneville)(=*hyllus* [Cram.]). A one-year-old egg and three hatched eggs (hole in top) found in litter at base of *Rumex crispus*, Wheatridge, Jefferson Co. Colo., July 28, 1992. 3 larvae (4, 8, 20 mm long) on underside of *R. crispus* leaves at base of plants June 3, 1993, 2 females emerged June 18, 20, 1993; Wheatridge, Jefferson Co. Colo. Female resting on *R. crispus* red-dead-seed inflorescence, a few green leaves at plant base; 2.5 mi. NE Conger, Freeborn Co. Minn., July 28, 1999. Female near *R. crispus*; reclaimed prairie 1/3 mi. W Hall of Humes Lake, Freeborn Co. Minn., June 27, 2001. Adults common to uncommon in pure stand of *Polygonum coccineum* at lake edge, Barr Lake, Adams Co. Colo., Sept. 3, 1992 to Sept. 5, 1994. **EGG** dull-pale-greenish when laid, turning white. **YOUNG LARVA** green, heart-band slightly darker and edged by pale-green, lateral ridge pale-green. **OLDER LARVA** green, heart-band dark-green, yellow-green beside heart-band, spiracles pink. **PUPA** when young pale-creamy-yellowish, wings (and sometimes also head-thorax-A1) pale-creamy-olive-green, with rear half of top of abdomen suffused with some reddish-brown, heart-band brown, with four bands (a creamy band beside heart, a reddish-tan diffuse band [that includes a tiny brownish spot on middle of segment], a creamy band [both creamy bands join and extend forward nearly to head], a reddish-tan diffuse band [this band includes a weak brownish spot on middle of segment; both reddish-tan bands are present only on abdomen]), spiracles cream; older pupa the same, with the same bands (which are now colored red-brown and creamy-reddish), but the whole body becomes reddish on top, shading to reddish-cream beneath, and the distal wing margin becomes brown, and some small reddish spots appear on abdomen (one ventroposterior to spiracle, one behind spiracle), the spiracles become

pinkish-cream; a second pupa became not quite so reddish so that pale-yellow was still present on side of abdomen; the eyes turn blackish before emergence. **TAXONOMY:** A. Koc'ak proved that the type of *hyllus* (TL Turkey) is—or at least might be—*Lycaena thersamon*, so the name *hyllus* does not apply to *L. thoe*. The name *hyllus* should be considered to be at most a nomen dubium, because there is great doubt as to which species it represents (F. Brown called it *thoe*, Koc'ak called it *thersamon*).

Lycaena helloides helloides (Bdv.). 2 eggs found in litter at base of *Rumex crispus*, Wheatridge, Jefferson Co. Colo., July 28, 1992. Oviposition 14:40 on dead leaf underside 20 cm above ground, oviposition 14:45 on dead leaf underside 5 cm above ground, oviposition 14:50 on underside of narrow (<1 mm) dead *Equisetum* stem near litter, all on or beneath *Polygonum lapathifolium* var. *incarnatum* (*Rumex crispus* dead inflorescence 20 cm away); Barr Lake, Adams Co. Colo., Sept. 3, 1993. Adults associated with *Polygonum coccineum* & *R. crispus*, Barr Lake, Adams Co. Colo., Sept. 5, 24, 1994. Adults associated with *P. coccineum*; ESE Costilla, Taos Co. New Mex., Sept. 10, 1998. **NEW HOST:** *Polygonum lapathifolium*.

Lycaena castro castro (Reakirt). Adults assoc. *Polygonum douglasii* on gopher diggings and ?ant nests (no *Pentaphyllodes floribunda* seen); east side of Vail, Eagle Co. Colo., Aug. 22, 1997.

Lycaena dione (Scudder). 4 ovipositions at base of *Rumex crispus*: she landed on dried rust-red inflorescence of 70-cm tall plant & stayed 1 min. and occasionally crawled down slowly then walked down stem to base, 10:26 laid egg on main *R. crispus* stem, 10:27 laid 1 egg on dead vertical 2 mm stem 1 cm from *R. crispus* stem, 10:28 laid egg on vertical dead 2 mm stem 1 cm from *R. crispus* stem, 10:30 laid egg on horizontal dead 2 mm twig 4 cm from main *R. crispus* stem; preoviposition 12:00 *R. crispus*, she crawled down stem to lower leaf & saw litter wasn't shaded and flew; ~8 other *R. crispus* plants searched and 21 eggs found in litter (most near stem 1-2 cm, ~3 on main stem, 10 on last year's stems, 3 on small dead 1 mm twig, 6 on small dead grass, 2 on dead curled red leaf); Wheatridge, Jefferson Co. Colo., July 28, 1992. 3 eggs found at base of *R. crispus* (1 on 2 mm dead twig, 1 on 1 cm wide main *R. crispus* stem base, 1 on old dead leaf base); Wheatridge, Jefferson Co. Colo., Aug. 20, 1992. **SPECIES STATUS:** *L. dione* is a distinct species from *L. xanthoides montana*, because they are sympatric at one exact spot (Bear Creek, LaBonte Can., Laramie Mts. Wyoming) without any evidence of interbreeding (R. Hardesty & D. Groothuis, pers. comm.); *xanthoides* and *editha* are conspecific. David M. Wright (pers. comm.) found that eggs of some Calif. *L. xanthoides* (Bdv.) populations are like those of *dione*.

Lycaena xanthoides (editha) vurali Koc'ak. Oviposition 11:01, she landed on *Polygonum douglasii* ~3 times and flew, landed on *P. douglasii* and crawled down it to ground & walked 10 cm to a spot 3 cm from *Polygonum bistortoides* & probed & flew a bit to same *P. douglasii* & crawled to same spot below *P. bistortoides* & probed abdomen 3 times (2X in same spot, 1X 1 cm away) in litter beside *P. bistortoides* (*P. bistortoides* semi-dry 5 mm, green-leaved 2 cm, shoots 6, 8, 8, 10, 15, 15, 18, 20, 30, etc. very common to 50 cm and common to 100, *P. douglasii* 5 mm, 1, 4, 5, 12, 15, 20, 50, 100); 3 ovipositions 11:05, she landed near *Rumex acetosella* several times, landed on old red leaf of it and laid 3 eggs in dirt 2 cm from sedge and beside *Viola adunca* 1-2 cm (*R. acetosella* 1, 2, 4 [large], 5, 8, 8, 15, 15, 20, common to 80, *P. douglasii* 20, 40, 50, 30-100, 55 to 100 scattered); *P. bistortoides* & *R. acetosella* are both hosts here; Fraser, Grand Co., Colo., July 30, 1992. Pratt et al. (1994) erred in stating that *L. x. editha* is adapted only to *Rumex paucifolius*; this plant does not occur in much of its range, where *P. douglasii* is probably the host it evolved on. **TAXONOMY:** The treatment of *Lycaena xanthoides* in Syst. W N.A. Butt. is very bad. Actually, *L. dione* is a distinct species (differing grossly in unh orange and small solid black round spots etc.) and *dione* is sympatric & synchronic with *vurali*=*montana* (a homonym of European *montana*) at the confluence of Bear Crk. with LaBonte Crk. in Laramie Mts. Wyo. according to Richard Hardesty (though the specimens have been lost), while *vurali* and *editha* may yet be ssp. of *L. xanthoides* (all having the same short narrow unh orange band and pale-centered brown unh spots etc.) that differ only in wingspan and relative size of unh spots. *Pseudonexa* is an intermediate between *editha*X*xanthoides* without any distinctive traits of its own, thus is invalid. P. 675 fails to mention that the unh spots are large in *montana*, smaller in *editha*, and smaller in *xanthoides*, a step-cline, thus their species split was arbitrary and could have been made between *montana* and *editha* just as logically. A published paper (Pratt et al. 1993 [or 1994] "1991", J. Res. Lepid. 30:175-195) claimed that "*pseudonexa*" is just *L. editha* and not intermediates, but that paper was highly flawed. That paper used a discriminant function, which is designed to pigeonhole into one of two boxes, so of course it can't find intermediates! Discr. functions are used only to identify unknowns, so they misapplied that statistical method. Pratt et al.'s (1993) 1st-stage phenogram (fig. 3) only proved you can't distinguish the taxa by 1st-stage (*dione* & *editha* are all scattered on tree, and *rubidus* is mixed into the *editha/xanthoides* too); and their mature larva phenogram (fig. 4) only proved that you can't distinguish the taxa by mature larva either (*xanthoides* dots are mixed into *dione/editha*, *rubidus* dots are mixed into *editha*, Dunsmuir "*pseudonexa*" is actually between subalpine *editha* & Silver Can. *xanthoides*, & p. 183 says 2 Silver Can. larvae were misclassified as *dione*); on their fig. 5 Dunsmuir "*pseudonexa*" is intermediate between high-alt. *editha* & *xanthoides*; their combined adult, 1st, & mature larva tree (fig. 6) put Dunsmuir intermediate between *editha* & *xanthoides* and put *dione* (a separate species) lower down on tree; that paper (p. 189) notes gene flow between *editha*X*xanthoides* at Silver Can. Inyo Co. "near-*xanthoides*"; that paper concludes that populations vary greatly within *rubidus*, *editha*, *dione*, etc.; that paper made the ludicrous claim (p. 188) that Scott mis-measured! the unh spots (in my original paper on "*pseudonexa*") (mine actually have easily measurable mostly-circular spots); that paper claimed that *editha* is entirely confined within the range of *Rumex paucifolius* (actually *paucifolius* does

not occur in C Colo. where *montana* eats *Rumex acetosella* & *Polygonum douglasii* (*editha* always occurs near a creek contrary to p. 675); that paper in general gave us lots of data grinding accompanied by dubious analysis, leaving us with essentially nothing, no actual bits of data we can actually use (mostly-absent and jumbled data is unfortunately the case in that paper and in papers on *Euphilotes* and *A. mormo*, leaving these taxa in chaos); that paper's statement (p. 175) that *editha* & *xanthoides* evolved independently from *dione* is grossly ludicrous! Arthur Shapiro's papers on the N Calif. fauna from Siskiyou Co. (curiously not cited by Pratt et al.) treated these populations as intermediates *edithaXxanthoides*, as follows: Shapiro (1991, J. Res. Lepid. 29:36) stated that the "*editha-xanthoides* intergrade is common at Dunsmuir & extends locally westward along the Callahan-Gazelle Road, but is otherwise absent from the Trinities and Eddies. Its distribution does not correlate very well with climate or vegetation... fails to extend more than about 6 km west of Interstate 5." Shapiro (1991, J. Res. Lepid. 29:148) stated "Phenotypically normal *editha*, indistinguishable from Warner Mountain ones, occur from Little Shasta Meadow down the E slope to Sams Neck-Meiss Lake Road, but at low density. Apparent intergrades to *L. xanthoides* occur [on Ball Mtn.] on the W slope from Kuck's Cabin down, the E-most and highest-elevation intergrades yet discovered. Such populations are abundant in alfalfa fields in Shasta Valley (as at Montague), feeding on weedy docks. Apparent intergrades thus occur within 4.5 km of apparently pure *editha*. A male taken at Little Shasta Meadow on 22.VII.1990 is as large as an intergrade but phenotypically *editha*." W. Patterson (1992 Lepid. News #2 p. 5) reported "small & heavily-marked "*xanthoides*" [perhaps the intergrades] in Trinity Co. Cal. "*Pseudonexa*" is actually intermediate between *editha* and *xanthoides* in size and unh spot size; *editha* and *xanthoides* intergrade in the Dunsmuir area to W slope Ball Mtn., at Mather on W side Sierras, & Silver Can. & Sherwin Summit on E side Sierras. And one has only to look at the close similarity between the figures of "*editha pseudonexa*" (figs. 45-48) and "*xanthoides nigromaculata*" (figs. 41-44) from nearby N Calif. to see the erroneous nature of their claim that *editha* is not a ssp. of *xanthoides*. A. Shapiro sent me a letter in 1986 stating "we have new biochemical-genetic data that support lumping *Lycaena editha* and *xanthoides*". *Pseudonexa* is not just a set of "hybrids" continuously produced by mating *edithaXxanthoides*, because the parents *editha* and *xanthoides* are absent at least in the Siskiyou Co. range of *pseudonexa*, where it represents a stable phenotype produced by past hybridization, in other words intergradation. If *editha* & *xanthoides* are different species, it would be only because of reports like these: A report of "*editha & xanthoides* synchronous, Pondosa [about 35 mi. E Dunsmuir], Shasta/Siskiyou Cos., 17 July" (J. McBurney, 1990 Lepid. News #2 p. 17); were these properly identified?, were the *editha* the "*pseudonexa*" and the *xanthoides* the "*nigromaculata*", thus barely distinguishable?. And Ken Davenport tells me he has collected "*editha* which resembles '*pseudonexa*' [in other words, intergrades--Scott] on June 23, 1986 near Bishop Creek Lodge. I have taken *xanthoides* on the N-facing slope about 2 blocks away [at 9000' on a different date]. I believe both occur as 'residents' though neither one is common. I have also taken male *xanthoides* on E side of Sierra in upper Nine Mile Can., Whitney Portal in Inyo Co. (a female much bigger than *editha*), & Rock Creek Gorge in Mono Co. They are scarce & I don't have much of a series." *Editha* & *xanthoides* are mostly altitudinally separated in the Sierra. John Emmel tells me that in Big Pine Creek *xanthoides* ranges up to 7000' and *editha* starts at 8500'. At Mather the native pop. is intermediate just like "*pseudonexa*" (I caught 3 "*pseudonexa*" males 1 mile S Mather June 11, 1972, and Davenport's Yosemite Butterflies lists other records from Oakley Shields and John G. Pasko from June 24-Aug. 1, though the Sept. 4 record is probably the stray true-*editha*) but in late summer a few *editha* stray down from high alt. (noted in Garth & Tilden Yosemite Butt.), and Davenport notes typical *editha* farther downslope even down to 5000' in the Fish Camp/Sugar Pine area SW outside Yosemite N. Park (which differ somewhat from high-alt. *editha* but don't look like "*pseudonexa*") (*L. xanthoides* is very uncommon in the Yosemite region). Maybe *xanthoides* and *editha* should be treated as bookkeeping species, but more study is needed here.

Lycaena heteronea heteronea Bdv. Female and *Eriogonum subalpinum* found, SW Steamboat Point, Sheridan Co. Wyo., Aug. 3, 1995. Adults associated with *E. subalpinum*; Blue River Cgd., Summit Co. Colo., July 11, 1996. Adults associated with *E. subalpinum*; Green Mtn. Res. dam, Summit Co. Colo., July 11, 1996. Female on *E. umbellatum*, WNW Toponas, Routt Co. Colo., July 12, 1996. Adults assoc. *E. umbellatum*; Game Creek, Minturn, Eagle Co. Colo., Aug. 15, 1997.

Lycaena heteronea gravenotata Klots. Oviposition 12:15 inside base of umbel-subtending *Eriogonum umbellatum* var. *umbellatum* bract; Tucker Gulch, Jefferson Co. Colo., July 16, 1994. Adults assoc. *E. u.* var. *umbellatum*, Tucker Gulch, Jefferson Co. Colo., July 14, 1995. **EGG** white.

Lycaena arota virginiensis (W. Edw.) (= *schellbachi* [Tilden]). Ovipositions 10:30, 10:40 on uns of twigs (not in holes) on top of and in lower part of large *Ribes leptanthum* bush, Wetmore, Custer Co. Colo., Aug. 8, 1994. Ovipositions 10:16, 10:20, 10:21 on *R. leptanthum* stems (2 at base of leaf, 1 at base of leaf and berry); one female landed on *Ribes inerme* (which is evidently not a host) but flew to *R. leptanthum* then flew away; N Foxton, Jefferson Co. Colo., Aug. 26, 1996. Adults assoc. *R. leptanthum*; Lewis Creek, Fremont Co. Colo., Aug. 31, 1996. Adults assoc. *R. leptanthum*; Don K Ranch, Pueblo Co. Colo., Aug. 31, 1996. **EGG** dull green when laid but turns white in one minute!; with very large vertical ribs. Eggs hibernate.

Eumaeini

Satyrium titus titus (Fabr.). Females rested on *Prunus virginiana melanocarpa*, Tinytown, Jefferson Co. Colo., Sept. 2, 1992. Oviposition 11:07, female flew slowly and landed on 15-cm-tall *P. v. melanocarpa* seedling (two other seedlings 10

& 15 cm tall were 5 cm away also) and crawled down to ground and laid two eggs 5 mm from the *Prunus* stem (one under twig 2 mm thick, the other in dirt 1 mm under ground or in hole there), then she flew to *Ceanothus* plant & rested on leaves 3X & basked laterally, then she flew to a 50-cm-tall *P. v. melanocarpa* and fluttered & crawled down to litter & bent abdomen there three times until a branch I had slowly pulled back to view her snapped and she was startled & flew away; ridge SE Shingle Crk., Jefferson Co. Colo., Aug. 2, 1994. **EGG** light-grass-green when laid, 2 hrs. later very-slightly-greenish white, later ochre-white, covered with hundreds of low mounds, micropyle depression wide.

Satyrium acadica (W. Edw.). Oviposition 14:20 *Salix exigua*, she crawled on *S. exigua* stem then was disturbed and flew to 1.5-m-tall *S. exigua* and investigated scars of branches with ovipositor while walking down stem then up stem and up branch 10 cm then down stem then up (to 4 cm below tip) where she laid one egg on base of tiny 5-mm-long unexpanded leaf (in the crotch of this leaf and a cluster of five other 5-8-mm-long leaves--egg was 1 mm from a twig); Wheatridge, Jefferson Co. Colo., July 14, 1993. This record proves that females occasionally oviposit outside of holes if no holes can be found.

Satyrium sylvinus sylvinus (Bdv.). Adults associated with *Salix exigua*, Austin, Delta Co. Colo., July 30, 1993. Adults associated with *S. exigua*, 15 mi. SW Hamilton, Moffat Co. Colo., July 19, 1996. Adults from Moffat Co. have whiter uns, perhaps because this is a sagebrush-populated area and a whiter uns is better camouflage while resting on sage. But the ssp. named in this species—except for *dryope* and *nootka*—do not correspond well with the geographic variation, and all named ssp. other than those two seem to be best treated as synonyms.

Satyrium calanus falacer (Godart)(=*godarti* [Field]). 5 older larvae found on *Quercus gambelii* leaf uns, Tintytown, Jefferson Co. Colo., June 4, 1994. I formerly reported that several adults from Golden Gate Can. (Tucker Gulch) were strays; but I since found a single *Q. gambelii* clump there! (a large old clump about 7 m wide and 4-5 m tall). No *Q. gambelii* present yet one adult found, Wheatridge, Jefferson Co. Colo., July 31, 1993; perhaps *Prunus virginiana melanocarpa* or *P. americana* could be the host here, or a cultivated oak tree nearby, or the adult strayed about 4 miles from the mountains? **OLDER-AND-MATURE LARVA** bright-yellowish-green, a barely-noticeable pronotum near rear of T1, a yellow-cream subdorsal band on T1-A1 changes to oblique (angled posteroventrally) yellow-cream dashes on A2-9 (larva is easily distinguished from *Hypaurotis* because these dashes are far from heart, versus alongside it in *Hypaurotis*), several weak paler oblique dashes on each segment below subdorsal band, lateral ridge is yellow or yellow-cream (edged by darker-green) on T2-A5 or A6 and cream on A6-around rear, underside dark-green, body covered with pale hairs, prepupa turns pale-bluish-green, then light-brownish-red. **PUPA** brown (reddish-brown on abdomen, slightly-reddish-brown on thorax), covered with fine brown mottling except on wings and uns, middorsal band is black on head-T1-2 and wider on T3-A1 & consists of two spots A2 and a weaker wider brown middorsal band A3-8, a wide subdorsal band of brown mottling T2-A7, a large blackish mottled spot on front of T2 and another on A1-2, spiracles creamy, covered with minute white hairs except on wings and uns, nearing emergence the eyes & proboscis ti become black, then next day whole pupa turns black; attached by silk girdle over A1-2 and cremaster; duration 12 days in lab.

Satyrium saepium (Bdv.). Oviposition 11:32 on side of green 1.5-mm stem 6 cm above ground and ~7 cm from end of *Ceanothus fendleri* branch, Tucker Gulch, Jefferson Co. Colo., July 16, 1994. **EGG** white, covered with a thousand spires, micropyle depression wide.

Callophrys affinis ("apama" W. Edw.) *homoperplexa* Barnes & Benj. Oviposition 13:21 *Ceanothus fendleri* flower bud (tucked between bract & bud), Tintytown, Jefferson Co. Colo., June 25, 1993. Preoviposition 11:15 *C. fendleri*, Ralston Butte, Jefferson Co. Colo., May 23, 1994. Preoviposition 11:24 *C. fendleri*, Mt. Falcon, Jefferson Co. Colo., May 27, 1994. Preoviposition 14:33 *C. fendleri*, NW Ralston Butte, Jefferson Co. Colo., May 30, 1994. Oviposition 14:14 between *C. fendleri* flower bud & bract, Tintytown, Jefferson Co. Colo., June 1, 1994. Oviposition 12:01 *C. fendleri* flower bud, Tintytown, Jefferson Co. Colo., June 7, 1994. Female placed on *Eriogonum umbellatum* var. *umbellatum* several times flew to *C. fendleri* and oviposited 11:32 inside bract enclosing flower bud and oviposited 12:43 in crack of flower bud, both on *C. fendleri*, Ralston Butte, Jefferson Co. Colo., June 10, 1994. Two *homoperplexa* pupae found in net bag on *C. fendleri* that was placed around branch with enclosed *Erynnis pacuvius* female June 10, 1994; obviously eggs of *homoperplexa* were on flower buds before bag was placed over branch and the larvae grew to pupation inside bag; pupae hibernate; Ralston Butte, Jefferson Co. Colo., Aug. 15, 1994. Oviposition 14:48 *C. fendleri* flower bud, Tintytown, Jefferson Co. Colo., June 17, 1994. Ovipositions, 1st female laid 3 eggs between bracts & buds 11:46, 11:47, 11:48, then she laid 2 eggs side-by-side on 2nd inflorescence 11:50, 11:50, a 2nd more-worn female laid eggs 11:55, 11:56 on one inflorescence, and an empty eggshell found on this inflorescence, 3rd fresh female laid one egg 12:01 on bud of another inflorescence and empty eggshell found on this inflorescence, all these eggs were between *E. u.* var. *umbellatum* flower bract and flower bud; no *Ceanothus* seen in clearing; Tintytown, Jefferson Co. Colo., June 20, 1994.

Callophrys sheridanii sheridanii (W. Edw.). Oviposition 13:24 side of petiole of one of 5 new leaves in center of small plant, oviposition 13:35 on new leaf underside (blade 14 mm long) next to 4 other tiny new leaves, all *Eriogonum umbellatum* var. *umbellatum*, Tintytown, Jefferson Co. Colo., May 11, 1994. Adults associated with *E. u.* var. *umbellatum*, Mt. Zion, Jefferson Co. Colo., April 23, 1994. Adults associated with *E. u.* var. *umbellatum*, Tintytown, Jefferson Co. Colo., May 4, 1994. **HOSTPLANT** is the very young growing leaves of *E. u.* var. *umbellatum*; older larvae evidently eat the uns of older leaves.

Strymon melinus melinus Hubner (=franki Field). Oviposition 10:12 among very young *Medicago sativa* flower buds of 3-mm-long inflor.; Wheatridge, Jefferson Co. Colo., Aug. 20, 1992. 2 eggs found *Verbascum thapsus* flower buds, Marshall, Boulder Co., Colo., June 30, 1993. 3 eggs found on *Astragalus adsurgens* var. *robustior* flower buds, Crawford Gulch, Jefferson Co. Colo., July 1, 1993. Oviposition 13:02 on main flower pedicel within *A. a.* var. *robustior* flower buds, Guy Hill, Jefferson Co. Colo., July 3, 1994. Preoviposition 10:50 *Astragalus flexuosus* flower bud, Apex Gulch, Jefferson Co. Colo., June 12, 1998. Oviposition 13:35 bluish-green egg tucked on fruit under bract of *Glycyrrhiza lepidota* flower buds of inflor 2 cm long; Wheatridge, Jefferson Co. Colo., July 7, 1998. Oviposition 13:28 on small cluster of flower buds/tiny leaf buds of *Malva neglecta*; Lakewood, Lakewood, Jefferson Co. Colo., July 12, 1998.

Polyommataini

Leptotes marina (Reak.). Adults common in *Medicago sativa* field; Barr Lake, Adams Co. Colo., 5075', Sept. 9, 1996.

Brephidium exilis exilis (Bdv.). Adults associated with *Atriplex canescens*, Austin, Delta Co. Colo., July 30, 1993.

Cupido comyntas comyntas (Godart). Adults associated with *Trifolium repens*, NE Alden, Freeborn Co. Minn., Sept. 13, 1994. Adults associated with *T. repens*, Albert Lea Lake, Freeborn Co. Minn., Sept. 15, 1994. Oviposition 9:45 on *T. repens* flower; oviposition 14:47 *Desmodium glutinosum* flower bud (egg among about 6 buds) after preoviposition on *D. glutinosum* about 20 times and ignoring common *T. repens*; Hall of Humes Lake, Freeborn Co. Minn., July 30, 1999. Adults associated with *Trifolium pratense*; Hall of Humes Lake, Freeborn Co. Minn., July 27, 1999. Female associated with *Lotus corniculatus* on lawn; 3 mi. SW Roland, Story Co. Iowa, July 8, 1997. Adults associated with *L. corniculatus* & *Coronilla varia*; 2 mi. W Hwy 173 exit from I-80, Cass Co. Iowa, July 23, 1999, and 3 mi. W Coulter, Franklin Co. Iowa, July 23, 1999. Adults associated with *C. varia*; I-35 rest stop, 5 mi. S Story City, Story Co. Iowa, July 22, 2004. Adults assoc. *T. repens* on lawn; 3 mi. NE Conger, Freeborn Co. Minn., July 27, 2004. **NEW HOST:** *Desmodium glutinosum*. **1ST-STAGE LARVA** when hatched tan, setae brownish; head chitin-dark-brown.

Cupido amyntula valeriae Clench. 1 egg on calyx, 1 egg on joint at base of flower pedicel, both on *Vicia americana*; 9 eggs found on *Lathyrus polymorphus incanus* (1 on calyx, one 4 mm below pedicel, 1 on stem 2 cm from pedicel, 1 at junction of 2nd-most-distal flower, 3 at junction of lowest flower & stem); Green Mtn., Jefferson Co. Colo., May 19, 1993. Egg found on "bract" at base of *V. americana* pedicel, Van Bibber Creek, Jefferson Co. Colo., May 20, 1993. 9 eggs (3 calyx, one 1 cm below flower on stem, 4 on stem at base of pedicel, 1 under bract at stem junction 2 cm from flower pedicel) found on *V. americana*; 8 eggs (2 on stem at pedicel, 1 on stem 5 cm below flower, 1 on underside of leaf base, 1 on stem 13 cm below flower, one 3 cm below flower on stem, two 1 cm below flower, 1 calyx) found on *L. polymorphus incanus*; larvae ate some *Trifolium* in lab but died eating *Vicia villosa*; Hogback E Red Rocks, Jefferson Co. Colo., June 5, 1993. Preoviposition 13:40 *V. americana*, Green Mtn., Jefferson Co. Colo., May 31, 1994. Oviposition 11:01 small upper flower bud of *Astragalus flexuosus*, Tinytown, Jefferson Co. Colo., June 3, 1994. **HOSTPLANTS:** The preferred hostplants are the tendrill-bearing legumes (peas) *Vicia* and *Lathyrus*, and the small-leaved *Astragalus flexuosus*. *A. flexuosus* lacks tendrils and is not taxonomically close to the peas, but is evidently chosen as a hostplant because it is very common and very palatable (all the legume-feeding butterflies like *A. flexuosus*). Eggs usually seem to be laid close to flowers, which larvae may prefer.

Celastrina lucia sidara (Clench) form *violacea* (W. Edw.). 3 eggs found *Jamesia americana* flower buds, Ralston Butte, Jefferson Co. Colo., May 23, 1994. Oviposition 11:45 *J. americana* flower bud; Lookout Mtn., Jefferson Co. Colo., May 15, 1996. Oviposition 14:06 and 2 eggs found on *J. americana* flower buds, Lookout Mtn., Jefferson Co. Colo., May 21, 1996. Oviposition 12:48 on *J. americana* flower buds, Crawford Hill, Jefferson Co., Colo., June 15, 1995 sidara. Oviposition 12:34 *J. americana* flower bud; Mt. Lindo, Jefferson Co. Colo., May 30, 1997. Oviposition 10:48 *Holodiscus dumosus* flower bud, another female resting on *H. dumosus* flower bud but no egg found (the *Jamesia* flower buds here were mostly too old); Mt. Zion, Jefferson Co. Colo., June 4, 1997. Female landed on *Holodiscus dumosus* flower buds 10:50 but did not lay, Mt. Zion, Jefferson Co. Colo., June 19, 1995. Female on *Prunus virginiana* var. *melanocarpa* flowers 10 min., Tinytown, Jefferson Co. Colo., June 2, 1994. Female form *lucimargina* fluttered about *P. v.* var. *melanocarpa* upper leaves with many 4 X 1 mm galls protruding from leaf tops (and near flowering bush), 1 male assoc. *P. v.* var. *melanocarpa* and 1 male flying about its flowers in gulch; Sowbelly Can., Sioux Co. Neb., May 17-18, 1994.

Celastrina neglecta (W. Edw.) (dogwood feeder and occasional leaf-gall feeder). Adults and *Cornus sericea* (=stolonifera) present (but often not nearby), Sowbelly Can., Sioux Co. Neb., Aug. 23-24, 1993. Male near *C. sericea*; Tongue Can., Sheridan Co. Wyo., Aug. 1, 1995. Female landed on *Trifolium repens* flower and bent abdomen on it 6 sec. but no egg was found, then she flew rapidly away, *C. sericea* common nearby; W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 2, 1995. These Neb.-Wyo. populations are probably the dogwood ecotype. Adults associated with *C. sericea*, I-35 rest stop 2 mi. N Ankeny, Polk Co. Iowa, June 16, 1996, & June 21, 2001. Female bent abdomen 10:30 *C. sericea* flower buds (egg not found), adults common on *C. sericea*; Iowa State Univ. campus, Story Co. Iowa, June 21, 1996. Adults common at non-flowering *Aesculus glabra* tree (bloomed mid May), males even patrolling and chasing at it; 3 mi. NE Conger, Freeborn Co. Minn., July 27-28, 2004. Oviposition 15:30 *Cornus sericea* flower bud; oviposition twice 15:14 on *Prunus virginiana* leaf galls, & 15 other eggshells and one 2nd-stage larva & associated eggshell found on those leaf galls, each leaf ups of this small tree had 30-50 of these 5-mm-long galls; Hall of Humes Lake, Freeborn Co. Minn., June 22,

2001. ~10 larvae 3-8 mm long found on leaf galls on leaf ups of *P. virginiana* (same tree as before); 3-mm larvae were creamy or bluish-green, 8-mm larvae light-green with ~3 darker spots (photos), 4m1f emerged July 12, 1m1f emerged July 13; Hall of Humes Lake, Freeborn Co. Minn., June 27, 2001. **NEW HOST:** leaf galls of *Prunus virginiana*. Actually, David M. Wright wrote to me that *C. neglecta* does occasionally use leaf galls of *Prunus*, and Pavulaan & Wright (2005) report that *C. neglecta* has been found eating cherry leaf galls in PA, VA, and WV (and *Celastrina lucia* [Auctorum] has been found eating them in PA and MA, and *C. ladon* [Cramer] was found eating them in PA) whereas the specialist “Cherry Gall Feeder” (now named *Celastrina serotina* Pavulaan & Wright) frequently eats leaf galls (of *Prunus serotina*) in N.J.. **EARLY STAGES OF PRUNUS VIRGINIANA GALL FEEDER: HALF-GROWN LARVA** pale-green, some larvae greenish-cream, a subdorsal cream oblique dash on each segment T2-A6, slightly darker below & above it, a weaker cream dash near heart-line, a lateral cream band. **OLDER LARVA** (near mature) creamy pale-green, on T2-3-A1-6 heart-band slightly-brownish-dark-green (wider & browner on T2-3, and widened into a brownish spot at rear of A6), a greenish-cream dash beside it that is hooked downward on posterior end, a cream zigzag below it extends posteroventrally a short distance then posteriorly a longer distance then posteroventrally more, a lateral cream dash on each segment forms a lateral band, on A1 this pattern is altered mostly by a darker zigzag extending from the front of top of segment downward on front of segment (widening as it goes downward), then widens and extends posteroventrally to rear of segment (this latter extension is at lower part and below where creamy oblique zigzag is on other segments); T1 differs, pale-creamy-green, the intersegment dark-green between T1-2, an elliptical area on top rear of segment (“collar”) is weakly outlined by a narrow darker line, and a brown middorsal spot edges the front of this “collar”, the front of top of T1 redder-brown; A7-10 creamy-pale-green with a brownish area on top rear, **GREEN MATURE LARVAE** are pretty, as they are patterned green and greenish-cream; in details, ground color green, heart-band green; segments T2-3 & A2-6 have a greenish-cream shrimp-shaped mark below heart-band (tail of shrimp widening posteriorly then body going ventrally to a point then head going anteriorly), a cream lateral dash forms a lateral band along body, spiracles cream and a weak creamier-green spiracular band along body; A1 pattern the same except the shrimp is a boomerang going rearward then narrowing and darkening as it extends downward; lateral cream band is formed of cream dashes, with darker spot just above the narrowed rear of each dash at intersegmental area (a fairly strong spot on A1, then almost none A2, then these spots grow darker posteriorly from A3 to A6 and are darkest at rear of A6 which spot may even be brownish-green); T1 green, but dark-green near front of T1 and dark-green below and barely around “collar”, all spiracles white; A7-10 is one structure, with creamy lateral edge, spiracle white, dark-green on front top, a darker-green middorsal oval behind it with a parallel line near its side, a dark-green patch on top rear of A7-10. **BROWNER GREEN MATURE LARVAE** has ground color browner (olive-brown), with the same pattern of cream shrimplike marks, except the heart-band is brownish (wide brown T2-3 and brown spot on rear of A6 and brown on front top and rear top of A7-10), T1 is mostly brown, and A7-10 has a lot of brown on top of front & rear, the lateral ridge is pinkish-cream, and the spot is brown on top of the lateral A6 pinkish-cream dash. Mature larvae seem to have the pattern less sharp than *C. lucia sidara*, which has the heart band on top of A7-10 especially sharp (a definite band that widens toward rear of body). *C. humulus* hop-ecotype larvae have color forms that are similar to these forms also, but its heart-band seems sharper on A7-10 also. *C. humulus* lupine-ecotype larvae are creamier or paler than *C. neglecta*, and the heart band is sharper also. **PUPA** translucent-appearing grayish-tan on thorax & wings, abdomen light-pinkish-ochre-tan, a black spot on top of head and T1, heart-band narrowly brown and widened into a vague spot on top of A1, a dorsolateral blackish band (consisting of a blackish spot on forewing base, a large blackish diamond-shaped spot on T3 & A1, and irregular blotches on A2-6 that grow in size from narrow on A2 to wider and wide on A6 then a bit on A7, a brown spot at cremaster, wing has weak brown mottling where veins are; of 8 pupae, oen was mottled more strongly than the others, and one had the mottling somewhat weaker than the others so the heart-band was weak on abdomen. Pupae are much paler than *C. humulus* (both the hop-variety and the lupine-variety, though some pupae of the latter are a little grayer/paler yet are still much more chestnut-brown than these *C. neglecta*). Pupae are also much paler than *C. lucia sidara* and the thorax is much paler.

***Celastrina (argentata) humulus* Scott & Wright, hop ecotype.** 3 older larvae (all green with pale green ridges etc. as usual) found on *Humulus lupulus americanus* male flower buds, Wheatridge, Jefferson Co. Colo., July 11, 1992. Ovipositions 11:24, 11:24 two eggs on *H. l. americanus* male flower buds, Coal Creek, Jefferson Co. Colo., July 7, 1993. Mature larva found on *H. l. americanus* male flower buds, Wheatridge, Jefferson Co. Colo., July 18, 1993. Adults associated with *H. l. americanus*, Apex Gulch, Jefferson Co. Colo., May 25, 1994. Adults associated with *H. l. americanus*, Wheatridge, Jefferson Co. Colo., June 9, 1994. Adults associated with *H. l. americanus*, Bull Gulch, Jefferson Co. Colo., June 11, 1994. 3-mm-long larva found, female preovip 11:40, all on *H. l. americanus* male flower buds; Red Rocks, Jefferson Co. Colo., June 14, 1994. Adults associated with *H. l. americanus*, Cherry Gulch, Jefferson Co. Colo., June 21, 1994. Adults associated with *H. l. americanus*, Wheatridge, Jefferson Co. Colo., July 3, 1994. Mature and half-grown larva (tended by small ant) found *H. l. americanus*, Wheatridge, Jefferson Co. Colo., July 18, 1994. Older larva found *H. l. americanus* male flower buds, Coal Creek, Jefferson Co. Colo., July 19, 1994. 1 mature & 3 half-grown larvae found *H. l. americanus* male flower buds, 2 small ants tending larva; Wheatridge, Jefferson Co. Colo., July 10, 1994. Egg found on male flower bud of *H. l. americanus*; Wheatridge, Jefferson Co. Colo., July 7, 1995. 3 eggs found on male *H. l. americanus* flower buds; Coal Creek Can., Jefferson Co. Colo., July 10, 1995. Older larva and half-grown larva found on

male *H. l. americanus* flower buds; Coal Creek, Jefferson Co. Colo., July 27, 1995. 2 eggs found on male *H. l. americanus* inflorescence; Cherry Gulch, Jefferson Co. Colo., July 1, 1997. 2 hatched eggshells found on *H. l. americanus* male flower buds; Indian Gulch, Jefferson Co. Colo., July 2, 1997. Ovipositions 10:20, 12:12 *H. l. americanus* male flower buds; Wheatridge, Jefferson Co. Colo., July 6, 1997. Oviposition 12:50 *H. l. americanus* flower bud; Wheatridge, Jefferson Co. Colo., July 10, 1996. Egg found on male flower bud of *H. l. americanus*; Nighthawk, Douglas Co. Colo., July 6, 1995. Egg found on *H. l. americanus* male flower bud; Wheatridge, Jefferson Co. Colo., July 5, 1998. Oviposition 9:45 two eggs side-by-side on *H. l. americanus* male flower buds; Wheatridge, Jefferson Co. Colo., July 7, 2001. **HOSTPLANT VINE SUBSTRATE:** On the plains *H. l. americanus* vines grow on top of *Salix exigua*, *Salix ligulifolia*, *Ulmus sibirica*, *Prunus americana*, *Alnus tenuifolia*, *Asparagus officinalis*, *Sambucus canadensis*, *Thalictrum dasycarpum*; Wheatridge, Jefferson Co. Colo., July 14, 1993. In the foothills, the vines also grow on *Crataegus* and *Acer glabrum*, and most often grow on talus rocks. **SYSTEMATICS:** According to unpublished work by David M. Wright, this species might belong to the same species as the Cherry Gall Azure *Celastrina serotina* Pavulaan & Wright, which may be the same species as *C. argentata* (Fletcher). The Cherry Gall Feeder is known to eat *Prunus serotina* leaf galls in N.J., but often eats other hosts also (Pavulaan & Wright 2005), including sometimes the flower buds of *P. serotina*, leaf galls of *P. virginiana*, and flower buds of *Viburnum lentago*, *V. nudum*, *Diervilla lonicera*, *Aralia hispida*, *Ceanothus americanus*, *Cornus alternifolia*, *Cornus sericea*=*stolonifera*. Northward in N.B. and Maine & in N Minn. it usually eats *Diervilla* flower buds (Wright pers. comm., and J. Weber Jr. 1999 News Lepid. Soc. 41:61 in Cass Co. Minn.).

***Celastrina (argentata) humulus* Scott & Wright, lupine-ecotype.** 4 eggshells & 1 live egg found on flower buds, prepupa found silked to underside of leaf near inflorescence, a 2nd-stage and a 3rd-stage larva found under leaves near inflorescences, all on *Lupinus argenteus* (white-flowered var. with plane leaves); Tinytown, Jefferson Co. Colo., July 14, 1992.. 8 eggs found on *L. argenteus* (white var.) flower buds, Tinytown, Jefferson Co. Colo., June 23, 1993. Oviposition 11:20 flower buds, oviposition 12:20 on tiny 2 mm leaf below tiny 3 mm inflor., oviposition 11:22 flower bud after landing on 3 other flower buds (this female was small and unh darkedr than usual but worn), and eggs found on other inflor. (6 [incl. 1 on tiny leaf just below inflor.], 5, 2, 1, 2, 1, 1, 2, 1, 1, 1, 1, 1 egg per inflor., many inflor. had none), all on *L. argenteus* (white var.), Tinytown, Jefferson Co. Colo., June 1, 1994. Eggs (2, 2, 1 on 3 inflor.) found *L. argenteus* (white var.), Tinytown, Jefferson Co. Colo., June 3, 1994. 3 inflor. of *L. argenteus* (white var.) had a single egg, Tinytown, Jefferson Co. Colo., June 7, 1994. 1 male found with slight unh lucia patch, females fluttering about *L. argenteus* (white var.); Tinytown, Jefferson Co. Colo., June 17, 1994. Oviposition 10:51 on young flower buds of *L. argenteus* (white var.), Tinytown, Jefferson Co. Colo., June 20, 1994. Oviposition 13:42 *L. argenteus* (flowers bluish-white, but leaves plane and leaf tops glabrous) flower buds, eggs hatched in 5 days; S. Phillipsburg, Jefferson Co. Colo., July 5, 1995. Oviposition 14:43 *L. argenteus* (whitish-flowered var. with plane leaves) on 4 mm new leaf next to 5 mm new inflor., egg hatched in 5 days, 2 eggs and 1 eggshell found on other plant inflor.; S. Phillipsburg, Jefferson Co. Colo., July 5, 1995. Egg found on 19-mm-long flower bud of *L. argenteus* (white-flowered var.); Tinytown, Jefferson Co. Colo., July 22, 1995. Adults assoc. *L. argenteus* blue-flowered var., 1/3 mi. S Phillipsburg, Jefferson Co. Colo., July 5, 1995. Ovipositions 10:25, 10:29, 10:30 on *Verbascum thapsus* flower buds/inflor., 5 other eggs found on nearby (within 8 m) *V. thapsus* inflor., these inflor. were hairy and 2, 3, 3, 4, 4, 5, 6 cm long, 88 other *Verbascum* plants were searched elsewhere and no eggs were found, all eggs were young (bluish-green) and obviously laid by one female who had developed a search image for *Verbascum*, 4 eggs were left on the plants but no feeding damage or larvae were found later, so larvae may not be able to eat this plant; she ignored *Anemone cylindrica* inflor. and *Solidago* inflor.; 5 eggs found on 4, 5, 6, 6 cm long *L. argenteus* (white-flowered var.) inflor.; Tinytown, Jefferson Co. Colo., July 26, 1995; but these *V. thapsus* plants that had the 4 eggs on July 26 were searched Aug. 17, 1995, when no trace of larvae or feeding damage was found, indicating that this might not be a suitable host. And the *Verbascum thapsus* plants were not even exposing inflorescences in a normal year (1996); Tinytown, Jefferson Co. Colo., June 13, 1996. 2 eggs found on 3- & 4-cm-long *L. argenteus* (white-flowered var.) inflor.; Tinytown, Jefferson Co. Colo., June 27, 1996. Oviposition 13:08 on 5-mm-long *L. argenteus* (white-flowered var.) inflor., Tinytown, Jefferson Co. Colo., July 1, 1996. Oviposition 14:50 on 1-cm-long inflorescence, 5 eggs found on inflorescences 2, 2.5, 2, 2 (two eggs) cm long, preoviposition 14:49, all on *Lupinus argenteus* (white var.); Tinytown, Jefferson Co. Colo., June 17, 1997. 2 eggs found on *L. argenteus* (white var.) inflorescences 3 and 3 cm long; Tinytown, Jefferson Co. Colo., July 2, 1997. **NEW HOSTPLANT?:** *Verbascum thapsus* is an occasional oviposition substrate, but may not be a larval host as larvae may not be able to survive on it.

***Glaucopsyche lydamus oro* (Scudder).** Ovipositions *Astragalus flexuosus* flower buds 10:22, 10:26, 10:30, 10:34, 10:36, ovipositions *Lupinus argenteus* flower buds 10:41, 10:43, one old egg found on *L. argenteus* flower bud, preoviposition 12:05 and 2 eggs 2 eggshells 2 tiny larvae found on *Astragalus adsurgens* var. *robustior* flower buds, 15 eggs 4 eggshells found on *Astragalus shortianus* flower buds, 14 eggs found on *Oxytropis lamberti* flower buds; ~30 *Thermopsis divaricarpa* flowers/flower buds had no eggs or eggshells; Chimney Gulch, Jefferson Co. Colo., May 18, 1993. 1 egg found on calyx of flower bud & 1 eggshell found on calyx of older flower, both on *Vicia americana*; 2 eggshells and one 1st-stage larva (inside flower) found on *Astragalus drummondii* flowers; Lakewood, Jefferson Co. Colo., May 18, 1993. 2 eggs & 3 eggshells found on *A. shortianus* calyx; ~200 *Lathyrus polymorphus incanus* plants had no eggs so must be shunned; no eggs found on 2 *Astragalus crassicaarpus* flowers; Green Mtn., Jefferson Co. Colo., May 19, 1993. 2 eggs

found *A. a. var. robustior* calyx, 15 eggs 5 eggshells found *A. shortianus* calyx; *A. shortianus* is greatly preferred to *A. adsurgens*; Van Bibber Creek, Jefferson Co. Colo., May 20, 1993. 4-mm-wide entrance hole of 11-mm-long larval burrow in *Astragalus crassicaarpus* 14-mm pod, Green Mtn., Jefferson Co. Colo., May 26, 1993. Egg found on side of *A. shortianus* calyx, Mt. Zion, Jefferson Co. Colo., May 14, 1994. ~23 eggs found *Lupinus argenteus* (blue flowers with folded leaves), Tinytown, Jefferson Co. Colo., June 3, 1994. Preoviposition 12:10 *A. flexuosus* and eggshell found on its flower bud, Tinytown, Jefferson Co. Colo., June 4, 1994. Oviposition 10:54, 10:55 *Medicago sativa* flower buds, Wheatridge, Jefferson Co. Colo., June 9, 1994. Oviposition 11:19 *A. flexuosus* inflor., Tinytown, Jefferson Co. Colo., June 2, 1995. Preoviposition 10:30 *L. argenteus* (blue flowers) flower buds; upper Jarre Can., Douglas Co. Colo., July 6, 1995. Female near *Vicia americana*, 3 mi. NE Alden, Freeborn Co. Minn., June 20, 1996. Preoviposition *Thermopsis divaricarpa*; Hideaway Park, Grand Co. Colo., July 2, 1996. Male on *Astragalus alpinus*; SE Little Bald Mtn., Sheridan Co. Wyo., Aug. 1, 1995. Oviposition 11:35 on 16-mm long *Lupinus argenteus* inflorescence flower buds; Green Mtn., Jefferson Co. Colo., June 9, 1998. Oviposition 9:47 *Medicago sativa* flower buds 1 cm from stem tip; Wheatridge, Jefferson Co. Colo., June 16, 1998. **NEW HOSTPLANTS:** *Astragalus shortianus*, *A. drummondii*, *A. crassicaarpus*, *Vicia americana*. But *Lathyrus polymorphus incanus* is shunned for unknown biochemical reasons; it is not a host.

Glaucopsyche piasus daunia (W. Edw.). 2 females on *Lupinus argenteus* flowers, Tinytown, Jefferson Co. Colo., June 20, 1994. . Female on *L. argenteus* flower buds, Tucker Gulch, Jefferson Co. Colo., June 29, 1998

Euphilotes battoides centralis (Barnes & McD.). Oviposition 11:29 inside *Eriogonum jamesi* flower (on petal); Red Creek, El Paso Co. Colo., Sept. 1, 1993. **EGG** nearly white, with a slight bluish-green tint esp. in micropyle depression.

Euphilotes ancilla ancilla (Barnes & McD.). Ovipositions 10:00, 10:08, 10:45 inside *Eriogonum umbellatum* var. *umbellatum* flowers (inside petal), N Golden, Jefferson Co. Colo., May 31, 1993. Adults associated with *E. u.* var. *umbellatum*, Green Mtn., Jefferson Co. Colo., May 28, 1994. Adults assoc. *E. u.* var. *umbellatum*, Tinytown, Jefferson Co. Colo., June 30, 1994. Adults assoc. *E. u.* var. *umbellatum*, Tucker Gulch, Jefferson Co. Colo., July 14, 1995. Adults on *E. u.* var. *umbellatum*; Mt. Zion, Jefferson Co. Colo., July 25, 1995. Adult associated with *E. u.* var. *umbellatum*; 5 mi. NE Radium Hot Springs, 7500', Grand Co. Colo., July 11, 1996. Adults associated with *E. u.* var. *umbellatum*, Grizzly Creek Cgd., Jackson Co. Colo., July 12, 1996.

Euphilotes rita coloradensis (Mattoni). Adults assoc. *Eriogonum effusum*, ~4 mi. W Glenrock, Converse Co. Wyo., July 31, 1995.

Plebejus glandon rustica (W. Edw.). Oviposition 12:07 on leaf underside near tip, 7 eggs found on leaf undersides, all on *Androsace septentrionalis* var. *subulifera* (3 with inflor., 1 without; 2 on tiny plants, 6 on larger), Tinytown, Jefferson Co. Colo., June 23, 1993. 2 eggs found on *A. septentrionalis* var. *puberulenta* leaf undersides, Tennessee Pass, Lake Co. Colo., Aug. 13, 1993. **NEW HOSTPLANT:** *A. septentrionalis* var. *subulifera*. **EGG** very-pale-green.

Plebejus melissa melissa (W. Edw.). Egg found *Astragalus crassicaarpus* stem, Red Rocks, Jefferson Co. Colo., June 5, 1993. Female ignored *Glycyrrhiza lepidota*, Wheatridge, Jefferson Co. Colo., July 31, 1993. Oviposition 11:19 *Astragalus flexuosus* leaflet uns after walking down and up stems ~6 times, she never walked near the ground on this sparse-leaved plant because the ground was hot; Tinytown, Jefferson Co. Colo., July 26, 1995. 3 older larvae swept from *Lupinus ?argenteus*, SW Pine Tree, Campbell Co. Wyo., Aug. 17, 1994. Oviposition 13:05, she crawled down *Oxytropis lamberti* leaf and laid egg on uns of leaflet; Foxton, Jefferson Co. Colo., Sept. 4, 1998. **NEW HOSTPLANTS:** *Astragalus crassicaarpus*, *Oxytropis lambertii*. Evidently *Glycyrrhiza lepidota* is shunned.

Plebejus icarioides lycea (W. Edw.). Eggshell on *Lupinus argenteus* (white var.) leaflet, Tinytown, Jefferson Co. Colo., July 14, 1992. Oviposition 15:12 *L. argenteus* leaflet, Guy Hill, Jefferson Co. Colo., June 29, 1993. Oviposition 14:22 *L. argenteus* mature leaf top in center of plant after crawling down there in hot weather, NW Ralston Butte, Jefferson Co. Colo., May 30, 1994. Oviposition 12:00 and egg found *L. argenteus* leaf tops, Kiowa Creek, Elbert Co. Colo., July 4, 1995. Adults assoc. *L. argenteus* (bluish-white var.); near Indian Creek Cgd., Douglas Co. Colo., July 6, 1995. Common near *L. ?argenteus*, Sowbelly Can., Sioux Co. Neb., June 24, 1994. Oviposition 9:03 on top of *Lupinus* sp.? leaf, Sowbelly Can., Sioux Co. Neb., June 25, 1994.

Plebejus saepiolus ?maculosus Austin *X gertschi* dos P. . Adults associated with *Astragalus agrestis*, Green Mtn., Jefferson Co. Colo., May 31, 1994. Adults associated with *A. agrestis*, Crawford Gulch, Jefferson Co. Colo., June 6, 1996. Adults associated with *Trifolium pratense*; Culebra Crk., Costilla Co. Colo., Sept. 7, 1998.

Plebejus saepiolus ?maculosus. Adults associated with *Trifolium repens*, S Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 1, 1995. Adults associated with *T. repens*; Cabin Crk., Bighorn Co. Wyo., Aug. 3, 1995.

Plebejus lupini lutzi dos P. Oviposition 10:42 on outside of yellow *Eriogonum umbellatum* var. *umbellatum* petal, Lookout Mtn., Jefferson Co. Colo., June 13, 1994. Two males near *E. u.* var. *umbellatum*, Indian Gulch, Jefferson Co. Colo., June 18, 1994. Adults associated with *Eriogonum subalpinum*; Blue River Cgd., Summit Co. Colo., July 11, 1996. Adults associated with *E. subalpinum*, Grizzly Creek Cgd., Jackson Co. Colo., July 12, 1996. Adults associated with *Eriogonum brevicaulis*, S side Casper, Natrona Co., Wyo., Aug. 25, 1993, Aug. 24, 1994. Adults associated with *Eriogonum effusum*, Red Rocks, Jefferson Co. Colo., Aug. 17, 1992. Adults associated with *E. effusum*; E of Morrison, Jefferson Co. Colo., Sept. 25, 1997. Adults (ssp. *lutzi*?) associated with *Eriogonum effusum*, S Wheatland, Platte Co. Colo.,

Aug. 18, 1993. Adults (ssp. *lutzi*?) associated with *E. effusum*, W Glenbrook, Converse Co., Wyo., Aug. 25, 1993. 1 female on *Astragalus* sp. (probably not a host); N Mitchell, Sioux Co. Neb., May 16, 1994.

Plebejus lupini (?*spangelatus* Burdick) *cotundra* Scott & Fisher. ~23 eggs (15 on sepals, 6 on petals, 2 under leaves beside inflorescence [1 on blade, 1 on petiole]) found on *Eriogonum flavum chloranthum* (= *jamesi* var. *xanthum* = *flavum* var. *xanthum*), McClellan Mtn., Clear Creek Co., Colo., July 10, 1992.

Hemiargus isola (Reak.). Oviposition 13:01 *Astragalus adsurgens* var. *robustior* flower bud, Guy Hill, Jefferson Co. Colo., June 29, 1993. Adults near *Trifolium fragiferum*, Barr Lake, Adams Co. Colo., Sept. 1, 1994. Ovipositions 14:12, 14:14, 14:15, 14:17 *Trifolium repens* flowers (2 eggs inside flower within petals, 2 eggs visible on outside of petals), hatched July 1; Lakewood, Jefferson Co. Colo., June 26, 2003.

HESPERIIDAE, Heteropterinae

Piruna pirus (W. Edw.). Egg found facing downward on *Dactylis glomerata* leaf (on leaf up, but leaf upside down), Coal Creek, Jefferson Co. Colo., July 17, 1992. Egg found on uns of *Bromus* (*Bromopsis*) *lanatipes* 5-mm-wide leaf 5 cm from leaf tip ~150 cm above ground, Coal Creek, Jefferson Co. Colo., July 18, 1992. 3rd-stage larva found in *B. lanatipes* nest of 2 leaves, both chewed to midvein basal to nest, the two leaves silked together only at nest; 4th-stage larva found in *Agropyron* (*Elymus*) *canadensis* nest of 1 leaf, chewed to midvein for 3 mm just distal to nest (perhaps a new nest, and the larva had not yet chewed leaf to midvein basal to the nest, and on same plant was an old empty nest consisting of the usual tube dangling beyond bared midvein); Tinytown, Jefferson Co. Colo., Sept. 22, 1992. Egg found on *Stipa scribneri* leaf upperside in shade of boulder under Pinon Pine canopy on S-facing slope, Wolf Park, Fremont Co. Colo., June 24, 1993. Egg found *Bromus lanatipes*; preoviposition 10:15 bent abdomen under *Agropyron trachycaulum* leaf; Coal Creek, Jefferson Co. Colo., July 19, 1994. Egg found *B. lanatipes* leaf uns; Coal Creek, fairly sunny spot, Jefferson Co. Colo., July 27, 1995. ~3rd-stage larva (1 cm long) in typical chewed-to-midrib drooping rolled-leaf nest (~10 silk cords fastening rolled-leaf tube beyond bare midrib) on *Agropyron repens*; Wheatridge, Jefferson Co. Colo., Aug. 18, 1998. **NEW HOSTPLANT:** *Stipa scribneri*. **EGG** slightly-greenish cream when laid, turning ochre-cream, hemispherical with a circular depression on top (diameter ~1/6th diameter of egg) containing micropyle, with faint vertical ribs on lower third of egg. Egg smaller than *Poanes zabulon taxiles*, greenish-cream (versus cream in *taxiles*), with circular depression on top (versus flat), hemispherical (versus more tapered on sides), with faint vertical ribs on lower third of egg (versus unribbed).

Hesperiinae

Ancyloxypha numitor (Fabr.). Larva 8 mm long in silked-leaf nest on *Phalaris arundinacea*; Albert Lea Lake, Freeborn Co. Minn., Sept. 15, 1994.

Oarisma garita (Reakirt). Egg found on *Muhlenbergia montana* leaf underside (8 cm up and 8 cm from leaf tip), Coal Creek, Jefferson Co. Colo., July 18, 1992. 2 eggs found on *M. montana* (green egg 6 cm up on 11-cm-long leaf of 5-30-cm-wide clump, egg 7 cm up on 15 cm leaf of other clump); Coal Creek, Jefferson Co. Colo., July 7, 1993. Egg found on *M. montana* leaf underside, Golden Gate Can., Jefferson Co. Colo., July 12, 1993. Oviposition 13:20 every narrow *Carex pensylvanica heliophila* leaf 8 cm above ground and 2 cm from tip (*C. p. heliophila* 0-100, *Poa pratensis pratensis* 10 cm onward, *Stipa comata* 90), Tinytown, Jefferson Co. Colo., June 1, 1994. Oviposition 10:40, she preovip. 10:30-10:40 landed on *C. p. heliophila* & *S. comata* & *Bromus japonicus* head 1X & *Agropyron* (*Elymus*) *ambiguus* 2X, then landed & bent abd. on *B. japonicus* flower head but it bent down under her weight. so she flew 3 cm to *Stipa comata* and oviposited 10:40 10 cm up on 14 cm very narrow leaf of small clump (*S. comata* 17, 35, 40, 40, 40, etc. common, *B. japonicus* 3, 17, 20, 20, 35 etc. common but all one-stalked with virtually no leaf tissue, *C. p. heliophila* 70-90, *Koeleria macrantha* 90, 140, *Agropyron trachycaulum* 90, 90); Red Rocks, Jefferson Co. Colo., June 14, 1994. Female bent abd. to *Poa compressa* but did not lay, Cherry Gulch, Jefferson Co. Colo., June 21, 1994. **NEW HOSTPLANT:** *Muhlenbergia montana*. **1ST-STAGE LARVA** has A10 more tan in color.

Thymelicus lineola (Ochs.). Adult female associated with *Phleum pratense*, *Bromus inermis*; 8 mi. E Hamilton, Moffat Co. Colo., July 19, 1996. Adults associated with *P. pratense* in hayfield, 11 mi. E Hamilton, Routt-Moffat Co. Colo., July 19, 1996. Preoviposition 11:58 *Dactylis glomerata*, she hovered and fluttered down into grasses to about 10-15 cm above ground and landed on stem, no egg found; adults extremely common, and grasses found were *Phleum pratense* very common, *Dactylis glomerata* common in spots, *Bromus inermis* very common, *Poa pratensis pratensis* very common, *Phalaris arundinacea* common at edge of field, *Agrostis gigantea* some, only one giant *Agropyron* sp. clump found on dry edge of field; 6 mi. ESE Pagoda, Routt Co. Colo., July 19, 1996. **HOSTPLANTS:** Based on association, *Phleum pratense* is probably the main host in Colo., as it is in Canada.

Stinga morrisoni (W. Edw.). 2-cm-long larva found in tube of ~6 *Stipa scribneri* leaves (15 cm above ground on 30-cm-tall clump); 2-cm-long larva found on *S. scribneri* in tube of ~5 leaves (10 cm above ground on 20-cm-tall plant); 4 empty nests found on *S. scribneri* (one nest of ~4-5 leaves 1/3 up on 30-cm-tall clump); empty fresh leaf tube of ~5 leaves was ~20 cm above ground on 30-cm-tall *S. scribneri* clump and a red wasp was in clump below nest, I searched clump and found a ~2-cm-long larva in base of clump wedged in among last year's dead culm bases ~8 cm from nest, larva may have been parasitized as 1 of the 3 larvae found at site produced wasps (or possibly heavy hail and rain the night before drove the

larva out of the nest); empty nest with ~2nd-stage-larval head capsule found, and 3 other empty nests found, all on *S. scribneri*; the mature larvae died in hibernation, but are *Stinga* based on larval color pattern, mature larval hibernation, the A7-8 ventral powder glands, and grass host; all were on ridgetop and on N-facing slope just N of hilltop, in sun between Pinyon Pine trees on N-facing slope and NW-sloping ridge, or in partial shade under Pinyons there and on ridgetops; Bear Creek, Chaffee Co. Colo., Aug. 21-22, 1990. *S. scribneri* common but no nests or larvae seen; Cotton Creek, Saguache Co. Colo., Aug. 22, 1990. 2 eggs (1 under green leaf, 1 under dead straw-colored leaf) found on *Stipa scribneri* clump (10 & 15 cm from *Muhlenbergia montana*) on hilltop; *S. scribneri* occurred only on ridgetops; Cheesman Peak, Jefferson Co. Colo., June 10, 1991. No eggs found on *Andropogon gerardii* or *Andropogon scoparius*, W Deckers, Jefferson Co. Colo., June 12, 1991. 11.5-mm-long larva (greenish with yellow-green rear, collar narrow dark brown) with 1.3 mm-wide head (reddish-black but later developed paler stripe beside coronal sulcus and paler cheeks), molted to larva with 1.9 mm-wide reddish-black head with paler coronal stripe, molted to larva with 2.5 mm-wide reddish-black head with dark orange-brown stripe and dark orange-brown cheeks, body pale-brown, head & body with long cream hair) found in nest of ~8-10 *Muhlenbergia montana* leaves and an empty small nest of 3-4 leaves (which larva used when younger) found nearby on same plant, both nests ~5 cm above main congestion of leaves in clump ~8 cm above ground; nr Golden Gate Can. State Park, Gilpin Co., Colo., Aug. 18, 1992. Nine 4th- & 5th-stage larvae found on *Stipa scribneri*; three 4th- & 5th-stage larvae found on *Andropogon scoparius*; four 4th- & 5th-stage larvae found on *Bouteloua curtipendula*; 2 empty nests found on *Bouteloua gracilis* (1 nest had 3rd-stage head capsule, and growing inside this clump was 1 stem of *Bouteloua curtipendula* which had one empty nest; no larvae found on *Agropyron (Elytrigia) albicans* or *Poa nemoralis interior*; W Deckers, Jefferson Co. Colo., Aug. 21, 1992. 5 larvae and 3 empty nests found on *Andropogon scoparius*; 2 larvae found on *Bouteloua gracilis*; 2 larvae & 6 empty nests found on *Bouteloua curtipendula*; 6 larvae (one 4th-stage, 5 mature) & 2 empty nests found on *Andropogon gerardii*; 5 larvae (two 4th-stage, 3 mature) found on *Muhlenbergia montana*; no larvae found on many *Koeleria macrantha*, *Agropyron albicans*, *Carex pensylvanica heliophila*; W Deckers, Jefferson Co. Colo., Aug. 25, 1992. 2 larvae found on *Andropogon scoparius*; one 4th-stage-larva found in nest of ~30-40 hairlike *Festuca arizonica* leaves; no larvae found on *Koeleria macrantha*, *Agropyron [Elymus, "Sitanion"] longifolius*, *Bromus (Bromopsis) lanatipes*, *Muhlenbergia montana*, *Carex pensylvanica heliophila*, *Agropyron (Elytrigia) albicans*, *Danthonia parryi*, *Muhlenbergia wrightii*, *Bromus (Bromopsis) inermis*, *Muhlenbergia racemosa*; Cheesman Peak, Jefferson Co. Colo., Aug. 25, 1992. 2 mature larvae found on *Andropogon scoparius*; 3rd-stage larva found on *Muhlenbergia montana*; empty nest found on *Stipa scribneri*; no larvae found on *Koeleria macrantha*, ~40 *Calamagrostis purpurascens* on N-facing slope, ~20 *Agrostis scabra*, ~10 *Hordeum jubatum*, ~30 *Agropyron [Elymus, "Sitanion"] longifolius*, ~200 *Bromus (Bromopsis) lanatipes*, ~30 *Bromus (Bromopsis) inermis*, ~50 *Agropyron (Elytrigia) repens*, ~30 *Festuca arizonica*, ~15 *Muhlenbergia wrightii*; N Pine, Jefferson Co. Colo., Aug. 26, 1992. 4th-stage larva found on *Stipa scribneri*; 3 larvae (one 4th-stage, 2 mature) found on *Bouteloua curtipendula*; 1 empty nest found on *Andropogon scoparius*; 1 empty nest found on *Muhlenbergia montana*; empty nest (of *Stinga*??) 4 mm long with leaf tips eaten found on *Poa nemoralis interior*; no larvae found on ~40 *Poa nemoralis interior*, ~200 *Bromus (Bromopsis) lanatipes*, ~100 *Agropyron (Elytrigia) repens*, ~30 *Aristida purpurea*, ~100 *Koeleria macrantha*, many *Carex pensylvanica heliophila*; W Deckers, Jefferson Co. Colo., Aug. 26, 1992. No larvae found on lots of *Stipa robusta*, a few *Muhlenbergia racemosa*, ~30 *Poa nemoralis interior*, ~100 *Bromus (Bromopsis) lanatipes*, ~40 *Agropyron (Elymus) canadensis*, ~100 *Koeleria macrantha*, 1 *Calamagrostis purpurascens*, ~10 *Stipa comata*; N-facing slope E Deckers, Douglas Co. Colo., Aug. 26, 1992. 2 mature larvae found on *Bouteloua curtipendula* (a small nest with 3rd-stage head capsule was 45 cm downslope from one larva on *Stipa scribneri* so larva may have started on this); 4 larvae (one 4th-stage, three mature) & 5 empty nests (including one with 3rd-stage head capsule) found on *Stipa scribneri*; 2 mature larvae found on *Andropogon scoparius*; no larvae found on ~30 *Aristida purpurea*, ~10 *Festuca arizonica*, ~50 *Muhlenbergia montana*, ~20 *Stipa robusta*, some *Bromus (Bromopsis) inermis*, ~5 *Sporobolus cryptandrus*, ~50 *Bromus (Bromopsis) lanatipes*, ~200 *Koeleria macrantha*, ~50 *Poa nemoralis interior*, a few *Bouteloua gracilis*; NE Deckers, Douglas Co. Colo., Aug. 26, 1992. Mature larva found on *Bouteloua curtipendula*; no larvae on ~40 *Aristida purpurea*, many *Bouteloua gracilis*, many *Muhlenbergia montana*, *Agropyron (Leymus) ambiguus* many, ~20 *Agrostis scabra*, some *Andropogon gerardii*, a couple *Stipa robusta*, some *Andropogon scoparius*, ~25 *Stipa scribneri*; SW Nighthawk, Douglas Co., Colo., Aug. 27, 1992. 7 larvae & 10 empty nests (most near larvae, 1 nest had 3rd-stage head capsule) found on *Bouteloua curtipendula*; 2 mature larvae found on *Andropogon scoparius*; 1 mature larva & 1 empty nest found on *Bouteloua gracilis* (another empty nest was found on *Bouteloua gracilis* 3 cm from a larva on *B. curtipendula*); 1 empty nest found on *Stipa scribneri*; 1 empty nest with 3rd-stage head capsule found on *Muhlenbergia montana*; W Deckers, Jefferson Co. Colo., Aug. 27, 1992. Two larvae 15 mm long found in silk-tube nests on *Bouteloua curtipendula*; Foxton, Jefferson Co. Colo., Aug. 29, 1994. 2 larvae 19 & 15 mm long found in silk tube nests on *Andropogon scoparius* (head up on one larva, head down on another); silk tube nests with ~2nd-stage and ~3rd-stage larval head capsules found on *Bouteloua curtipendula* clump; Foxton, Jefferson Co. Colo., Aug. 30, 1994. Half-grown larva found in silked-leaf nest on *Muhlenbergia montana*, reared to mature larva with black head; Tintytown, Jefferson Co. Colo., Aug. 3, 1994. **HABITAT.** The species always seems to be found on wooded hills on which pines are dominant (*Pinus ponderosa* or *P. edulis*); the woods are fairly open, and trees are few at some sites where adults are uncommon. Larvae were found in open woods, mostly on SE-, E-, and S-facing slopes, a few on SW-facing slopes, a few on open N-facing

slopes. Females seem to prefer to oviposit near hilltops. **HOSTPLANTS** (7 grasses): *Bouteloua curtipendula* (23 larvae), *Andropogon scoparius* (18 larvae), *Stipa scribneri* (17 larvae & 2 eggs), and *Andropogon gerardii* (6 larvae) are favorite hosts; *Muhlenbergia montana* (8 larvae) seems to be less popular. *Bouteloua gracilis* (3 larvae) is occasionally chosen, often by wandering larvae (although Ray Stanford, pers. comm., saw an oviposition on this species once along Rampart Range Road, Douglas Co., Colo.); *B. gracilis* grows in large clumps but its leaves are short (~4 cm), so females probably prefer to oviposit on taller grasses. *Festuca arizonica* (1 larva) seems to be seldom chosen even though it grows in tall thick clumps, perhaps because the leaves are filamentous so silking together a larval nest would seem to be more difficult (on the other hand, the leaves are so close together that seeing/finding larval nests in nature is more difficult, so some larvae could have been missed, so it might be more popular than this). *B. curtipendula*, *S. scribneri*, and *A. gerardii* have wide leaves, *A. scoparius*, *M. montana*, and *B. gracilis* fairly narrow leaves, *F. arizonica* filamentous leaves. The one common element among all 7 host grasses is that they all grow in large clumps (*Bouteloua curtipendula* has just a few leaves per plant but the plants generally grow in large patches with the plants close together; *Bouteloua gracilis* has leaves much shorter than the others but it grows in large clumps). *Stipa scribneri* was erroneously described as "rare" in a local plant checklist, so I will describe its distribution: it grows on ridges & ridgetops and just north of ridgetops where there is shade at least part of the day, commonly under the canopy of pine or juniper trees. *S. scribneri* is very common in the Arkansas Canyon and hills around the San Luis Valley, where it is the commonest non-riparian "hay" (wide-leaf) grass, and seems to be a main hostplant, and adult *Stinga morrisoni* are also fairly common there. *S. scribneri* is fairly common in the lower Wet Mts. foothills, where *Stinga* is scarce. In the Front Range *S. scribneri* is common on top of the Dakota Sandstone hogback at the edge of the plains (where *Stinga* is absent), fairly common in the South Platte River canyon (on ridges NE Foxton, Reynolds Park, W Deckers, etc. where *Stinga* is fairly common) and in Clear Creek Can., but is scarcer elsewhere in the Front Range (a few plants at Mt. Vernon Historic Site, ridge S Chimney Gulch, ridge N Ralston Butte, some on S slopes in Indian Gulch) where *Stinga* is scarce. I have not found *S. scribneri* on ridges at Tinytown and Crawford Gulch where *Stinga* occurs (is rare); thus the other bunchgrasses must be eaten more often in this part of the Front Range. Grasses other than the 7 known hosts were searched W of Deckers but no larvae were found: *Koeleria macrantha* is common just N of the low ridgetops there, but ~450 plants inspected had no larvae so it definitely is not eaten, partly because it grows in too-small clumps. *Poa nemoralis interior* grows only on N-facing slopes and also has fairly small clumps (~150 searched). Hay grasses are not eaten (~600 *Bromus* [*Bromopsis*] *lanatipes*, ~200 *Agropyron* [*Elytrigia*] *albicans*, ~150 *Agropyron* [*Elytrigia*] *repens*, ~50+ *Bromus* [*Bromopsis*] *inermis*, ~40 *Agropyron* [*Elymus*] *canadensis*, ~30 *Muhlenbergia racemosa*, ~5 *Sporobolus cryptandrus* searched). *Stipa robusta* grows in nice large clumps but mostly on deep-soil flats and was too scarce (~25 seen) to find larvae. *Agropyron* (*Elymus*, "Sitanion") *longifolius* is a possible host but only ~40 plants were seen. *Hordeum jubatum* and *Stipa comata* grow in small clumps and were too scarce near Deckers (~10 each). *Muhlenbergia wrightii* appears suitable but it grows mostly beside valley bottoms (instead of the slopes) and only ~30 were seen. *Calamagrostis purpurascens* grows in nice big clumps but only on shaded N-facing slopes (~41 seen). *Danthonia parryi* grows in nice large clumps but it grows mostly on N-facing slopes and was too scarce. The leaves of *Agrostis scabra* and *Aristida purpurea* are too narrow and the plants too scarce (~20, ~60). The sedge *Carex pensylvanica heliophila* is not eaten (~300 searched) even though it grows in large patches on sunlit slopes. Larvae were found in open woods, on SE-, E-, and S-facing slopes, a few on SW-facing slopes, but none on N-facing slopes, so grasses that grow only on N-facing slopes are not eaten. Females seem to prefer to oviposit near hilltops or upper slopes. **NEST.** Larval nests are typical for Hesperinae, formed of ~3-10 leaves (30-40 of the hairlike *Festuca arizonica* leaves) silked into a tube, and some nests had a leaf looped upward just below the nest (because the leaf grew faster than the other leaves used for the nest, and grass leaves grow from the base so the fastest-growing leaf has to bow outward to accommodate its extra length). The nest is made several cm above the clutter of leaves at the base of the clump if possible: thus on the tall *Stipa scribneri* the nest averages about 11 cm above ground (range 4-30 cm, N=16), on *Andropogon gerardii* (which has few leaves but they are wide so a nest can be made from just a few leaves) 7 cm (1-10 cm, N=6), on the tall *Festuca arizonica* ~7 cm for one nest, on the fairly tall *Andropogon scoparius* 6 cm (minus 2 to 10, N=18), on the moderately short sprawling *Bouteloua curtipendula* 4 cm (2-9, N=16), on the moderately short *Muhlenbergia montana* 5 cm (minus 1 to 9, N=7), and on the short-leaved *Bouteloua gracilis* nests were only 1 cm above ground (minus 0.5 to 4, N=4). About 84% of larvae faced head downward in nest, 16% faced head upward (n=49), perhaps because they crawl into the nest this way and can defecate better this way. **HIBERNATION STAGE:** Mature larvae hibernate, and in lab usually refuse to pupate or feed further and eventually die; larvae found in nature Aug. 21-27 were in 4th-stage and 5th-stage (mature), except for a few 3rd-stage larvae which later produced parasitoid flies that had stunted the larva's growth, so in nature larvae must finish feeding by about mid Sept. and then hibernate. **EARLY STAGES** (based on older larvae found in nature reared to adults, and based on eggs laid by females from near Deckers reared to mature larvae): **EGG** cream, roughly hemispherical, but definitely oval (asymmetrical) in dorsal view and very rounded on the bottom edges (this shape easily distinguishes the egg from other Colo. Hesperinae) and somewhat flat on the very top. **NUMBER OF STAGES:** There seem to be about 5 larval stages based on head widths (~0.6 mm, 0.8, 1.2-1.3, 1.6-2.1, 2.4-3.0). **1ST-STAGE LARVA** cream (probably turning greenish after feeding), a narrow black collar; head black. **3RD-STAGE LARVA** tanish-green (yellowish at joints between segments) with greenish-straw rear, heart-line dark green, longitudinal trachea visible between spiracles, a narrow blackish

collar; head black (in some larvae slightly orangish-black) with short ochre hair. **4TH-STAGE LARVA** body the same, collar and head the same (the paler heads reddish-dark brown with pattern approaching mature larva). **MATURE LARVA** (reared from eggs and from nature) pale-brown (tan), (sometimes slightly pinkish-tan on A7-9 and the rear of A6), semitranslucent esp. on T3-A5(A6) so that the intestines and longitudinal muscles are visible in wide darker gray-tan internal subdorsal areas, a lateral silvery streak of internal tracheae is visible through the translucent exoskeleton, heart-line dark-gray-tan T2-A8 (weak T2 & A8), top of A10 slightly darker (brown) with black spots anteriorly on A10 top, body with fairly long straight ochre hairs, T1 collar is very narrow & black posteriorly and translucent tan on anterior 40%; the usual ventral wax glands on A7-8; head varies from solid black to patterned orange-brown in different larvae, but all have fairly long straight ochre hairs and all have numerous tiny blackish pits on dorsal 2/3 of head and have a middorsal notch. The head variation: type A (~30% of heads, N=~64) head is solid black; type B (~36% of heads) is black with brown stripe near and parallel to coronal sulcus; type C (~27% of heads) is mostly blackish-brown but the coronal stripe and adfrontal areas and the cheeks are all orangish-brown, and the area below the facial pits is orangish-brown just medial to eyes and within semicircle of eyes (mouthparts and adjacent area of head capsule and frontoclypeus are all blackish-brown); type E (~5% of heads) is dark-brown but has extensive orange-brown markings including the coronal stripe, the cheeks and side of head are orange-brown, cheeks are connected to orange-brown rear of head also (except head is narrowly dark-brown beside neck and postgena dark-brown) and cheeks are connected to orange-brown area below pits and medial to ocelli and orange-brown within semicircle of eyes (eyes 1-5 are connected by black on all heads), adfrontal areas orange-brown, 2 vertical ovals on frontoclypeus orange-brown; type D (1 head, another fairly similar) is like (E), but the cheeks are blackish-brown (very slightly paler than the darkest areas) and the side and rear of head is blackish (except the side of top of head is dark-orange-brown as in E); the paler heads (C, D, E) all have a blacker wedge laterally edging the coronal stripe that tapers to a point ventrally, and paler heads all have blackish beside the lower part of frontoclypeus and above mandibles; the heads vary continuously from completely black to patterned orange-brown, and all intermediates exist; the head variation does not differ significantly on the different hosts. The semi-transparent body distinguishes the *Stinga* larva from other Colo Hesperinae. The head pattern of the paler *Stinga* larvae is like that of *Hesperia*, indicating a close evolutionary relationship. But *Stinga* body color is paler than *Hesperia*, *Atalopedes*, and *Polites* (all are dark brown except younger *P. themistocles*), and differs from *Hesperia* and *Atalopedes* by having straight long hair on body and head (*Hesperia* and *Atalopedes* have very short knobbed body hairs and short head hairs, whereas *Polites-Poanes-Ochlodes-Paratrytone* have short to fairly short straight [not knobbed] hairs). **PUPA** head & thorax black with glaucous bloom, wings black at base to dark-brown distally with glaucous bloom, males have stigma outlined on pupal wing, appendages and proboscis blackish-brown with glaucous bloom, proboscis red-brown where it extends 5-7 mm beyond wings to tip of cremaster or middle of A10, T1 spiracle dark red-brown, abdomen grayish-tan (A8-9 light-brown or brown, A8 tan laterally), A1 (& top of A2-3 & weakly on top of A4) has blackish-gray suffusion, abdomen has numerous blackish dots and short transverse dashes (similar to those of *Poanes* & *Hesperia*) (including 1-4 on A1, 4-7 on A2, 6-9 on A3, ~11-15 from dorsal to ventral on A4-6, 9-12 on A7, 2-5 on A8, 1 subdorsal dot on A9), T2 has a dash and 2 blackish dots, T3 a subdorsal blackish dot, A4-6 have a cluster of ~4 lenticles near proboscis, A4 has an orangish chitiny swale between the lenticle cluster and proboscis, distal 4/5 of A10 brownish-black or black-brown on top and bottom (basal 1/5 dark-grayish-tan anteriorly then dark-brown or reddish-brown) with ~10 long hooked red-brown crochets and many red-brown stiff setae laterad of crochets, a few short hairs on abdomen and top of thorax, some long hairs in patches on head (except on orbit); pupal duration ~19-20 days in lab.

Hesperia comma assiniboia (Lyman)(=*ochracea* [Scudder]). Oviposition 9:56, she hovered then landed & bent abdomen on *Andropogon scoparius* but couldn't find a spot so flew 30 cm to *Carex rossii* & bent abdomen, flew to original *A. scoparius* clump, then laid egg on *C. rossii* beside it (*C. rossii* also 60, 60, 80, 80, *A. scoparius* 6-10, 10, 20, 30, 40, *Bouteloua gracilis* 45, 50, 60, 80), then she landed on *A. scoparius* and flew; 12 eggs found on *C. rossii*; 1 egg found on *Aristida purpurea*; 10 eggs were found in sunny spots, 3 in shade; Foxton, Jefferson Co. Colo., Aug. 25, 1994. 3 eggs found on *C. rossii* in shade of pine tree; Foxton, Jefferson Co. Colo., Aug. 29, 1994. 2 eggs found *C. rossii* in shade of Ponderosa Pine; Foxton, Jefferson Co. Colo., Aug. 30, 1994. Preoviposition 11:15 bent abdomen on *Bouteloua gracilis*; Foxton, Jefferson Co. Colo., Sept. 4, 1998. **HOSTPLANTS:** *H. comma* obviously greatly prefers *Carex* at Foxton, because it was very easy to find eggs on *C. rossii*, but quite difficult on *Bouteloua gracilis* and other grasses. *Aristida purpurea* is evidently an occasional host. **SYSTEMATIC RELATIONSHIP:** Recently it has been suggested that *Hesperia comma* is really three separate species, *H. comma*, *H. colorado*, and *H. assiniboia*, based on the belief that these three are sympatric without interbreeding in southwestern Canada (Layberry et al. 1998, copied by Scott 1998b). However, their conclusion is premature. Their claimed sympatry of *H. colorado harpalus* (which name is actually the W slope Sierra Nevada unspotted-unh ssp. of *H. comma*, Scott 1998b, and the ssp. in Canada and NW U.S. with greenish-ochre silver-spotted unh is actually *idaho*) with *H. assiniboia* in Cypress Hills of SW Saskatchewan is obviously based on one record of *assiniboia* misidentified as "*harpalus*", because many *assiniboia* look like *harpalus*, and *harpalus* is unknown east of British Columbia other than that one misidentified record. Thus *harpalus* and *assiniboia* could still be the same species, NOT two separate species. And the latter species is doubtfully distinct from *H. comma*. There is no intergradation or sympatry between *H. comma manitoba* and *assiniboia* in Alberta (Norbert Kondla pers. comm.), and there may be no

intergradation between *harpalus* and *manitoba* in British Columbia either (Kondla, pers. comm.), where the two may be altitudinally separated. It is not clear that *manitoba* and *assiniboia* do not intergrade in Saskatchewan or Manitoba either; Layberry et al. (1998) state that *assiniboia* becomes darker on unh northward (in aspen parkland of the three prairie provinces) so may be confused with *H. comma*, which leaves only the white versus yellowish unh spots to assign specimens into *assiniboia* or *comma*, yet this criteria alone is not adequate, since *assiniboia* farther south (in North Dakota etc.) shows some polymorphism for white versus yellowish spots, thus the “sympatry” is likely to be just polymorphism of spot color. Clearly the splitting of Layberry et al. is premature and much too superficial; careful investigation is needed. The *assiniboia* phenotype occurs on grassland, including an isolated occurrence on the isolated Peace River grassland (that looks a little different), and the *idaho* (not “*harpalus*”) phenotype occurs in sagebrush habitats. Recent information suggests that there are several different types of *H. comma* that overlap in range in BC-Montana etc., but are allopatric, thus a lot more work is required before we can delineate how or whether *H. comma* should be split. In Colorado, *ochracea* looks like *assiniboia*, yet intergrades at higher altitude to the high-mts. ssp. *colorado*, so those are one species in Colo.

Hesperia comma colorado (Scudder). Oviposition 10:48, laid under lower dead narrow leaf of 2-cm-wide *Festuca brachyphylla* clump (*F. brachyphylla* also 5, 10, 30, 70, 70, 80, 80, 100, 100, etc., *Luzula spicata* 20, 40, 60, 60-100, *Deschampsia cespitosa* 25, 35, 40, 50, 75, 80, 90, 100, *Poa alpina* 30, 55, *Carex perglobosa* 40, *Carex phaeocephala* 50, 60, 70, 80, 100); Loveland Pass, 12,200', Summit Co. Colo., Aug. 18, 1995. Egg found on dead leaf in small *F. brachyphylla* clump (*F. brachyphylla* 0-2, 35, 40, 45, *Trisetum spicatum congdonii* 10, 25, 25, 45, *Luzula spicata* 20, 35, *Carex foenea* 12-100, 20, *Carex rupestris drummondiana* 17-25, 25 etc. few, *Poa glauca* 17), 12,100 feet altitude; three eggs found in *Carex rossii* clump (two eggs stuck together fell to litter when I handled this clump, another egg found stuck to dead grass blade in same clump)(*C. rossii* thick 0-40-80 cm, *Carex rupestris drummondiana* 3, 5, 12, etc. to 100, *Poa glauca* 12, 15, 17, 22, *Deschampsia cespitosa* 25, 50, 65, *Helictotrichon mortonianum* 15, 45, 60), 11,900 feet altitude; *Carex foenea* was searched at this site but no eggs were found on it this day, so I think that the shorter more-clumped *C. rossii* is preferred more than the larger less-clumped *C. foenea* (which grows as mostly-single culms from rhizomes); two eggs diapaused, and one hatched in lab and grew to two-thirds-full-size larva and apparently diapaused (head width 2.7 mm) and died in Jan. 1999; Hoosier Pass, Park Co. Colo., Sept. 17, 1998. **NEW HOSTPLANTS:** *Carex rossii* and *Festuca brachyphylla*; *Carex foenea* was previously demonstrated as a host. *F. brachyphylla* grows as very small clumps 2-4 cm wide. **EGG** white, hemispherical, a depression on top, a slight flange around bottom. **1ST-STAGE LARVA** slightly-greenish yellowish tan, tiny setae dark; collar black; neck pale; head black. **2/3-GROWN LARVA** grayish-light-brown like other *Hesperia*, spiracles black, true legs black, neck cream; suranal plate slightly blacker-gray; collar narrow, black; head black, a narrow brown vertical stripe along coronal sulcus, a small brown spot medial to uppermost eye, adfrontal areas brown? **HIBERNATION STAGE:** Eggs and two-thirds-grown larvae hibernate (*colorado* is evidently biennial like other alpine butterflies).

Hesperia comma near *dodgei* (Bell) = **mattoonorum** McGuire. **EARLY STAGES** from Del Norte Co. Calif. (eggs sent by Kenneth Hansen), reared on *Bromus inermis* (larvae grew well) and *Poa pratensis pratensis* (larvae seemed to do less well). **EGGS HIBERNATE.** **EGG** white; a slight recess all around egg just above the slight basal flange around bottom. **1ST-STAGE LARVA** ochre-yellow (surprisingly bright, with a definite orangish tint to the yellow)(slightly greenish on anterior 2/3 due to food), greenish-yellow after more feeding; collar & head black. **2ND-STAGE LARVA** green-tan; collar & head black. **3RD-STAGE LARVA** same as 4th-stage, except heart-band very weak and head all black. **4TH-STAGE LARVA** grayish- (slightly greenish)-light-brown (more ochre at intersegmental joints), heart-band slightly grayer, neck cream on top half in front of black collar, a ventral black sclerite below collar above spiracle; head black with ochre pattern (a long ochre streak beside coronal sulcus, a long ochre adfrontal area, two short vertical ochre streaks on middle of frontoclypeus, an ochre patch on bottom of head medial to eyes which sometimes extends upward medial to dorsal eyes and on some larvae also extends upward to a small or large ochre area on front of lateral part of head). **MATURE LARVA** grayish- (slightly-greenish)-dark-brown, heart-band very-slightly-darker brown, collar black (the sclerite below it now fused to collar with only a groove marking the fusion), T1 cream on top half in front of collar, neck brown; head black with ochre areas like 3rd-stage larva, with variable amount of ochre on cheek of head like 3rd-stage. **PUPA** appendages & wings light-greenish-gray, wing of male has light-brown stigma, thorax mottled brown (light-brown mottled with dark-brown spots), abdomen creamy pink, heart-band light-greenish or grayish on abdomen, eye & orbit brown, T1 spiracle reddish-brown with pinkish-tan felt, a dark-brown transverse stripe across front of head below antenna bases and a second dark-brown transverse stripe across bottom of head, A1-7 top has brown transverse dashes (largest A2-4, smaller A5, weak A1 & A6-7 & almost absent A8), rear of A4-6 (& less so A3) light-olive-green with cream streaks, a narrow brown or tan line across top of A9, labial sclerite light-brown, proboscis tip orange-brown as it extends 2 mm beyond wings to rear of A5, a mound of 5 or so orange-brown lenticles & some setae beside proboscis on A5-6, setae everywhere but on appendages & wings, setae on head-T3 are in pale circle, the narrow cremaster is red-brown & has crochets; another pupa similar but wings grayish-green, abdomen greenish-cream with an ochre tint, heart-band green, green on rear of A4-7, probably 2.3 mm beyond wings to just beyond A5-6 joint; 3rd pupa similar but wings light-olive-green, thorax olive-green darkly mottled with blackish, abdomen pinkish-cream.

Hesperia ottoe W. Edw. ~8 mm larva found in crotch of *Bouteloua curtipendula*, reared on *Poa pratensis pratensis*, pupated Nov. 14, female emerged Dec. 6, 1992; Green Mtn., Jefferson Co. Colo., Sept. 24, 1992. **EGG** cream (perhaps a trace of greenish), no ventral flange (a very slight one). **FIRST-STAGE LARVA** has sublateral lenticles as large as A10 spiracle, SD1 on T2 twice as long as other setae (MacNeill 1964 showed it short, so perhaps individual variation occurs as in *H. viridis*), D1 on A9 three times as long as other setae, D1 very long on A10. **HALF-GROWN LARVA** tan or greenish-tan; head chestnut-brown or blackish with orangish coronal & adfrontal stripes. **OLDER-MATURE LARVA** medium gray-brown or slightly-greenish-brown, A2-9 with a slight reddish tinge, heart-band darker or faint (slightly-darker with paler brown), neck white, collar wide & black with ventral black satellite; head black with cream or tan stripe beside coronal sulcus, and cream or tan stripe laterally edging adfrontal sulcus, a tan ellipse in each side of frontoclypeus, brown above labrum, a brown crescent (concave dorsally) medial to anterior eyes. **PUPAE** vary somewhat from greenish to light-brown. A green pupa had head thorax & basal 1/2 of wings light-gray-green, outer half of wings translucent greenish-cream, (female pupae lack a stigma but male pupae have a tan or dark-blackish stigma even on the first day), basal 2/3 of proboscis & all of legs & antennae are mottled with blackish (but widest part of each leg mostly pale-gray-green), orbit gray-green, head & thorax mottled black & gray-green but mostly black on head with green sulci, head has 2 dorsal light-gray-green patches (1 on either side of middorsal black stripe), orbit light-gray-green, a wide light-gray-green patch on front of head, an inverted W (centered around labrum) on lower front of head, T1-3 light-gray-green mottled with black, T1-2 middorsal cleavage line green, T1 spiracle has a micro-felt structure and changes color with angle of view (brown when viewed anteriorly, straw-yellow from side), abdomen greenish-cream with transverse blackish-brown dashes & dots on A1-7 (including ~3 sublateral, 1 lateroventral, & 1 subventral brown dots on A456)(dots weak on A7, only a couple faint dashes on top of A8), A9 greenish-gray, heartline gray-green on abdomen, A456 have a subventral reddish patch of ~12 lenticles, proboscis orange-brown where it extends 1-1.5 mm beyond wings (to about middle of A5) and lighter red-brown for 3 mm basal to wing tips, cremaster base very wide (a little wider than other *Hesperia*) & light-brown and tip red-brown with ~20 red-brown hooked crochets, abdomen tip moves in loops (when the tip is to one side and moves to other side, tip moves dorsally then laterally then ventrally); this pupa showed no color change until ~12 days when it became less green with abdomen bluish-green-tan, wings tan, orbit dull red, appendages reddish-tan. Light-brown pupae also have thorax & most of wings olive-green on day of pupation, but these pupae soon turn brown: with pale brown on head & thorax, wings tan, orbit brown, (one pupa has abdomen pale pink [esp. dorsally] on day of pupation then turning pinkish-tan [pinkish on front of each segment, pale brown on rear 1/3], intersegmental areas A4-7 orange-brown), another pupa merely tan on abdomen, T1 spiracle pink-tan, the head has black splotchy areas, black specks are on T2-3, black dots are on dorsal wing margin, 3 rows of black transverse dashes are on A2-7 (very faint on A1) that vary somewhat in number between individuals, A456 each has a supraventral hairy mound of lenticles, head hairs ~1/3 mm and straight, proboscis tip & cremaster red-brown, cremaster fairly short (lateral margins convex), proboscis barely extends beyond wings & A4, eye then antenna club turns red before hatching; attached by cremaster at least. Pupae in lab lasted 19-21 days in 2 males, 22 days in 1 female.

Hesperia viridis (W. Edw.). 10 eggs found on *Bouteloua curtipendula* leaves ~10-15 cm above base (2 on leaf upperside 8 underside)(3 had Trichogrammatid exit holes, most others produced parasitoid wasps), Wolf Park, Fremont Co. Colo., June 24, 1993. Oviposition 10:45 side of dead *Stipa comata* blade (*S. comata* 0, 5, 12, 15, 20, commonly to 300, *Aristida purpurea* 10, 30, 40, 50, 50, 60, 70, 90, 100, *Bromus japonicus* 3, 8, 20 etc. scattered), flat dry area Cherry Gulch, Jefferson Co. Colo., June 21, 1994. **HOSTPLANTS:** *Stipa comata* is evidently an occasional host. **EGG** cream, without flange. **FIRST-STAGE LARVA** identical to *H. pahaska*, sublateral lenticles as large as T1 spiracle, SD1 on T2 varies from small & spatulate like other setae to up to twice as long as other setae, D1 on A9 small & spatulate, D1 on A10 very long. **MATURE LARVA** dark brown; head & collar black (no cream stripes, unlike *H. ottoe*) and usually with few pale markings, however other individuals had pale areas at A B C (terminology of Scott 1975c), B has a light lateral protrusion at level of middle of frontoclypeus, some heads were pale at G and E. **PUPA** proboscis tip orange and extends just beyond A4 or extends ~2.5 mm beyond legs to A6, head hairs ~0.2-.25 mm nearly straight.

Hesperia leonardus montana (Skinner). Preoviposition 9:40 fluttering around *Bouteloua gracilis*, Foxton, Jefferson Co. Colo., Aug. 25, 1994. Preoviposition 14:52 on *B. gracilis*, she landed on *B. gracilis* 5 times and bent abdomen 3 times, then landed and bent abdomen 10 sec on *B. gracilis* but no egg was found; Foxton, Jefferson Co. Colo., Sept. 4, 1998.

Polites (Yvretta) rhesus (W. Edw.). 1 female on *Bouteloua gracilis* patch, Sowbelly Can., Sioux Co. Neb., May 17, 1994. *Polites sabuleti sabuleti* (Bdv.). Adults associated with *Distichlis spicata* common (most of turf), *Sporobolus airoides* (some plants), *Hordeum jubatum* (some); San Luis, Costilla Co. Colo., Sept. 7, 1998. **RANGE:** The stigma is large in males from this colony, like that of ssp. *sabuleti*. Evidently ssp. *ministigma* Scott (paler with smaller stigma) is limited to the closed basin in the northern San Luis Valley (near Great Sand Dunes and northward), which is not drained by any rivers (incl. CR 50, 0.5 mi. N of CR R, 7700', June 30, 2005 8m1f, and hwy. 285, 0.5 mi. S Russell Lakes SWA, SE field at CR N, 7700', July 2, 2005, 1m4f, both Saguache Co. M. Fisher), whereas ssp. *sabuleti* occurs in the southern San Luis Valley and Taos Co. New Mex., both areas drained by the Rio Grande River. However, recently Mike Fisher found 1m1f of ssp. *sabuleti* (with large stigma and patch) at Russell Lakes SWA (13.5 mi. S of Saguache off Hwy. 285, a little S of the E-W road to Moffat, 7750', Aug. 29, 2003) in the N part of the San Luis Valley in the San Luis Creek drainage, which is a little

disturbing because ssp. *sabuleti* is a colonizing species that has been spreading its range rapidly in C Colo.-Wyo. etc., so one wonders whether it will interbreed with *ministigma* and annihilate it? Probably not, but who knows. Ssp. *sabuleti* has two gen. (but just one L Aug. in this cold place?), *ministigma* one L June-July, so maybe they won't meet?

Polites mardon mardon (W. Edw.). **EARLY STAGES** (Eggs from Del Norte Co. Calif., sent by Kenneth Hansen): Egg to pupa duration 6-7 weeks. **EGG** pale-green when laid, turning light-ochre-yellow, becoming dirty-ochre-yellow with head of larva visible as a dark spot on top of egg (the black ocelli visible on chitiny head), the surface shiny, micropyle area flat (not indented), rounded on lower rim, bottom flat; eggs laid without glue and fall from abdomen. **1ST-STAGE LARVA** pale-yellow, turning greenish-ochre-brown, collar chitin-brown; collar chitin-brown, groove of collar black; head chitin-brown (microscopically covered with thousands of tiny brown dots, even though body has only primary setae). **2ND-STAGE LARVA** greenish-brown, mottled (brown below each of numerous setae), collar dark-brown; head dark-brown, with pale adfrontal area and pale streak along coronal sulcus. **3RD-STAGE TO MATURE LARVA** fairly-dark-brown (often slightly greenish), heart-band dark-brown a slightly-browner dorsolateral band, a slightly-browner supralateral band above spiracles, top of A10 has a blackish (black speckled) middorsal band & a blackish rear rim & some tiny black supralateral dots & a fairly-large black subdorsal dot near front edge (half-grown larvae have blackish anterior band across top), the rear rim of A10 tan or cream-tan above anus, spiracles black, legs black, collar black with a pale middorsal ecdysial line, a large black sclerite at lower end of collar above spiracle, neck gray; head black, with tan streak along coronal sulcus, a weak light-brown adfrontal streak, and a small brown spot medial to eyes. **PUPA** dark-green when new with greenish-tan abdomen, then green with light-brown abdomen; a day later head-thorax-appendages-wings-A1 are glaucous-bluish-gray, abdomen A2-onward is less glaucous-bluish-gray and these segments are brown on middle half of each segment and brownish-tan on front & rear, intersegmental area on rear of A4-6 brownish-tan, middorsal cleavage line dark on vertex-T1-2, heart-band slightly darker (brownier) on A1-7, orbit & adjacent gena brownish-black, some blackish narrow transverse streaks on upper third of abdomen, a black dot posterodorsad of spiracle, a sublateral blackish spot near front of A5-8 (small A8), a cluster of lenticles beside proboscis on A4-6, a blackish spot lateral to lenticles on A5-7, a blackish spot anteroventral to lenticles on A5-7, T1 spiracle brown with orange felt on anterior middle, other spiracles orange-brown or sometimes blackish, cremaster red-brown, proboscis red-brown where it extends 3.5 mm beyond wings to rear of A7, some tan setae everywhere but wings.

Polites draco (W. Edw.). Adults assoc. *Poa pratensis pratensis*; saddle NE Crawford Gulch, Jefferson Co. Colo., June 10, 14, 1992, June 6, 1996. 3 eggs found *Festuca idahoensis* leaf undersides, 1 reared to adult, Fourmile Creek, Park Co. Colo., July 21, 1993.

Polites mystic (W. Edw.). Oviposition (no time recorded), female landed and rested vertically on leaf of *Symphoricarpos* seedling in *Poa pratensis pratensis* sward and an egg fell from abdomen and bounced to right into litter (I pawed through litter but could not find egg) (the host *P. p. pratensis* 2, 5, common to 200 cm, *Juncus arcticus ater* 1-300 common, *Carex emoryi* 15, 45, to 300, *Phragmites australis* 130); Wheatridge, Jefferson Co. Colo., July 11, 1992. Female hovered 13:30 in *Poa pratensis agassizensis* and landed twice, but no eggs found at either spot (eggs might have fallen into litter and disappeared?), Falcon County Park, Jefferson Co. Colo., July 9, 1992. Adults associated with *P. p. agassizensis* flat, Cherry Gulch, Jefferson Co. Colo., June 21, 1994. 9-mm larva (identified later when nearly mature by color pattern before death by parasitoid wasps) found in rolled leaf nest on *Calamagrostis canadensis*, ~70 cm above ground in uniform stand of this 1-m-tall grass; Wheatridge, Jefferson Co. Colo., Sept. 1, 1992. Oviposition 10:35 in wet sedgy area beside cattails, she hovered and landed 3X and grasped a leaf ~8 cm above ground and dropped egg from abdomen, egg fell into 5-cm-wide *Poa pratensis pratensis* clump and moss (*P. p. pratensis* 0-300 cm, *Juncus arcticus ater* 0-300, *J. arcticus* var. *vallicola* 20, 20 sparse, *Scirpus pallidus* 20-100 sparse, *Carex nebraskensis* 25, 100); Marshall, Boulder Co. Colo., July 10, 1995. Male perched at *Poa pratensis pratensis* area NE Crawford Hill, above Tucker Gulch, Jefferson Co. Colo., July 14, 1995. Adults associated with *P. pratensis pratensis*, Apex Gulch, Jefferson Co. Colo., June 25, 1996. Adults associated with *P. pratensis pratensis*, Tinytown, Jefferson Co. Colo., July 1, 1996, July 4, 1997. Female found at *Poa pratensis pratensis-Carex nebraskensis* patch, 2 mi. W Elizabeth, Elbert Co. Colo., July 4, 1995. Male perched in *Poa pratensis pratensis* swale; SW Morrison, Jefferson Co. Colo., June 30, 1997. Female went down into *Agropyron repens* understory twice at 11:39; Wheatridge, Jefferson Co. Colo., July 6, 1997. Adults associated with *Poa pratensis pratensis*, Indian Gulch, Jefferson Co. Colo., July 10, 27, 1998. Female hovered and landed on dead *Poa compressa* stem 7 cm above *P. compressa* sward, bent abdomen down and forward at 12:55 and a green egg appeared on end of abdomen and stayed there for several seconds then fell into litter, I found egg on ground 6 cm downslope from where a vertical fall would have landed it (it landed then bounced 6 cm downslope), this was among *P. compressa* sward (0-400 cm, other grasses were few including *Bromus lanatipes* 35 cm, *Agropyron [Elymus] canadensis* 25, 35, 40, 50, 70, *Poa pratensis pratensis* [mostly 3 florets/spikelet] 15, 65, 70, 75, common 100 onward, *Stipa viridula* 20, 60); Indian Gulch, Jefferson Co. Colo., July 15, 1998. Obviously larvae do make aerial nests when there is little to eat at the soil surface. **NEW HOSTPLANTS:** *Calamagrostis canadensis*, *Poa compressa*. **EGG** fairly-light-green, smooth, hemispherical-conical; laid without glue so falls into litter. **1ST-STAGE LARVA** cream; collar & head black (chitin-dark-brown in alcohol), only two long setae (on each side) on A10.

Polites sonora utahensis (Skinner). Adults associated with *Poa pratensis pratensis*, W Sargents, Gunnison Co. Colo., July 30, 1993.

Polites peckius surllano Scott. Adults associated with *Poa pratensis* lawn; Lakewood, Jefferson Co. Colo., Aug. 19, 2001, and Lakewood, Jefferson Co. Colo., Aug. 8, 2002.

Polites themistocles (Latr.). Adults associated with *Poa pratensis pratensis* lawns, Lakewood, Jefferson Co. Colo., June 9, 1996, and Aug. 19, 2001.

Polites origenes rhena (W. Edw.). Half-grown larva found in *Andropogon gerardii* leaf nest ~5-7 cm above ground, female emerged Nov. 18, 1992; Van Bibber Creek, Jefferson Co. Colo., Sept. 17, 1992.

Polites vibex vibex (Geyer). **EARLY STAGES** (Florida, eggs sent by Jeffrey Slotten). **EGG** probably cream when laid, later yellowish-cream, later with the reddish-brown head visible inside. **1ST-STAGE LARVA** yellowish-cream (a very slight bluish tinge to top of thorax, a very slight pinkish tinge to rear), when fed body is greenish-cream with green innards & yellowish rear, later very-pale-green, heart-band green, A8 spiracle large & black, all spiracles black, 4 setae are long on top of A10; narrow collar & head black. **2ND-STAGE LARVA** greenish-yellow, heart dark-green, collar black with a black satellite sclerite above large black T1 spiracle, A10 spiracle large & black and subdorsal, other spiracles tiny & black; head black. **3RD-STAGE LARVA** fairly-dark yellow-green, heart-band dark-green, a greenish dorsolateral band (due to visible dark innards), collar narrowly black with black satellite sclerite above T1 spiracle; head black, with a weak paler stripe beside coronal sulcus. **OLDER-MATURE LARVA** light-olive-green, heart-band dark-green, a slightly-paler dorsolateral band, spiracles tiny except T1 spiracles large and A10 spiracle large and subdorsal, some tiny black lenticles, some black flecks on top of A10, neck light-green in front of black collar (the satellite sclerite now fused to main collar); head black with ochre areas (long ochre-tan stripe beside coronal sulcus, ochre adfrontal areas, two weak vertical streaks in frontoclypeus, a small ochre spot surrounded by eyes, an ochre patch medial to ventral eyes that extends upward to medial to dorsal eyes, and on some larvae extends upward to a paler area on front of side of head [this paler area is absent on one larva, ochre-brown on most larvae, and mostly ochre on one larva]), mouthparts black. **PUPA** head & top of thorax (or just front half of thorax) greenish-brown or brownish-green, wing bases brownish-green or green (outer half of wings translucent greenish-cream), male stigma darker, abdomen greenish-yellow-cream, many short transverse brown dashes on dorsal half of abdomen, T1 spiracle brownish-orange, abdominal spiracles orangish, mouthparts greenish (paler distally), ~2-5 brown lenticles on each A4-7 segment beside proboscis, proboscis orangish where it extends ~4.5 mm beyond wings to A9 or to middle of cremaster, cremaster pointed with red-brown crochets at tip. Before emergence, pupa abdomen turns orange-brown, and wings turn red-brown with black stigma, head-thorax-mouthparts turn blackish.

Anatrytone logan lagus (W. Edw.). Adults associated with *Bromus inermis* patch where adults are often found; Indian Gulch, Jefferson Co. Colo., July 25, 1995, July 10, 13, 15, 17, 27, 29, 31, Aug. 5, 1998.

Atrytone arogos iowa (Scudder). 2 half-grown larvae found in *Andropogon gerardii* leaf tube nests (sealed on top) formed of 2 leaves chewed to midrib below nest to form 2 narrow stilts; Van Bibber Creek, Jefferson Co. Colo., Sept. 17, 1992. 2 larvae 1 cm long with head downward in typical fall stilt nests of *A. gerardii*; Green Mtn., Jefferson Co. Colo., Sept. 24, 1992. 2 mostly-mature larvae found in rolled-leaf nests of two *A. gerardii* leaves (both leaves chewed to midrib below nest, thus the stilt nest occurs in spring as well as fall); Horsetooth Res., Larimer Co. Colo., May 22, 1993. Pupa found in 4-cm-long nest on *A. gerardii*, the nest not on stilts, the upper 1 cm of the nest full of granular silk clots (through which the adult emerges); Horsetooth Res., Larimer Co., Colo., July 10, 1993. **NEST**: the nest of older larvae generally stands on two stilts both in late-summer-fall and spring, although if a larva makes a new nest for pupation the nest does not stand on stilts.

Ochlodes sylvanoides sylvanoides (Bdv.)(=*napa* [W. Edw.]). Preoviposition 10:50 *Agropyron* (*Elytrigia*) *repens*, Wheatridge, Jefferson Co. Colo., Aug. 28, 1992. Half-grown larva skin (with empty white parasitoid cocoon inside) and head capsule of *sylvanoides* found in 3-cm-long silk nest of ~3 *Agropyron* (*Leymus*) *ambiguus* leaves, Coal Creek, Jefferson Co. Colo., Aug. 31, 1992. Oviposition 11:50 on *Leucopoa kingii* on uns of 4-mm-wide dead leaf 7 cm up (*L. kingii* 35, 70, 80, 100; 100, 130 etc., "Poa" sparse 4-100, *Muhlenbergia racemosa* 70-100, 80); oviposition 11:57 on *L. kingii* on uns of dead leaf 4.5 mm wide and 7 cm above ground (*L. kingii* 0-70); mature larval head capsule found in rolled-leaf silk nest on *L. kingii*; Ralston Butte, Jefferson Co. Colo., Aug. 10, 1996.

Paratrytone snowi (W. Edw.). Ovipositions 10:25 and 10:35 on underside of leaves of edge of probably *Muhlenbergia montana* (det. Scott); (note: one or both eggs could have been laid on *Blepharoneuron tricholepis* [det. B. Scott], because when I recently reidentified the preserved plants, I found 8 portions of *M. montana* clumps also present in the plant collection along with a similar amount of *B. tricholepis* in two clumps, which means that I could not tell the difference between the two grasses at that time; a further indication of the confusion is that Scott 1974a stated "The female hovers over the most common grass on the west-facing slope where oviposition occurred, *B. tricholepis*.", yet a 1992 trip to that site proved that the most common grass there is *M. montana* whereas *B. tricholepis* is spotty; therefore, in view of this incompetent identification and my recent valid host records on *M. montana* and the apparent poor suitability of *B. tricholepis* as a host [*B. tricholepis* has short 2 cm sharp leaves and it would be difficult for an older larva to make a silked-leaf nest among its leaves and soil, so it certainly does not look like a good host], *M. montana* was almost certainly the substrate for both eggs, so *M. montana* should be listed as a host here, and *B. tricholepis* is almost certainly an error,

therefore I am deleting *B. tricholepis* as a host); grasses present at site (in 1992) were *M. montana* very common, *Muhlenbergia filiculmis* very common, *Festuca arizonica* very common, *Koeleria macrantha* common, *Blepharoneuron tricholepis* common in some spots, *Agropyron* [*Elymus*, "Sitanion"] *longifolius* some, *Bromopsis* few, *Stipa robusta* some, *Agropyron* (*Elymus*) *trachycaulum* some, *Poa nemoralis* few; NE Rosita, Custer Co. Colo., July 26, 1970. Preoviposition 12:15 *M. montana* (the newspaper containing this grass also contained a small bunch of *Poa nemoralis interior* with inflorescence, so this record is also compromised and nearly worthless); large W-facing hilltop, Tinytown, Jefferson Co. Colo., July 26, 1978. I searched for eggs at Coal Creek, Jefferson Co. Colo., July 9, 10, 15, 16, 17, 1991, and N fork Clear Creek, Gilpin Co. Colo., July 11, 18, 29, 1991, but no eggs found because adults were scarce. 7 eggs found on *M. montana*: 1 egg pinkish when found, 1 egg with red ring but 12 hours later egg became pinkish (~8 cm up, 5 cm from leaf tip); 5 eggs were cream with red spot on top & red ring around side (1 egg was 6 cm up & 6 cm from tip, egg 10 cm up 6 cm from tip, egg 15 cm up 6 cm from tip, egg 10 cm up 11 cm from tip, egg 6 cm up 5 cm from tip); male pupal shell & mature larval head capsule/cast skin found (both identical to reared *snowi*) in silked-leaf nest ~3.5 cm long of ~10-15 *M. montana* leaves (base of nest ~3 cm above leaf bases), ~12 leaves were truncated by being eaten near the nest, (*Danthonia spicata* was nearby 4-15 cm away from pupa but showed no feeding damage); Coal Creek, Jefferson Co. Colo., July 17, 1992. 3 eggs found on *M. montana*: translucent egg ready to hatch found 10 cm up and 11.5 cm from leaf tip & facing west, egg with red ring found 6 cm up 5.5 cm from tip facing NE, egg with red ring found 13 cm up 14 cm from tip facing SW, Coal Creek, Jefferson Co. Colo., July 18, 1992. 3 eggs with red ring & red dot found on *M. montana* (egg found on near-vertical leaf 8 cm up 6 cm from leaf tip facing N, egg found facing SW 5 cm up 6 cm from leaf tip of vertical leaf, egg found facing N 8 cm up 6 cm from tip on leaf sloping 60° upward); 1 larva hatching from egg ate *Poa pratensis pratensis* in lab pupated Nov. 14, female emerged Dec. 1, 1992; Coal Creek, Jefferson Co. Colo., July 20, 1992; most eggs at this site were on big ~20 cm wide lush *M. montana* clumps without too many inflorescences, most eggs were found on hostplants nearer valley bottom, eggs were scarce farther up slope, eggs are more common near flowers; other grasses searched here had no eggs: *Muhlenbergia wrightii*, *Danthonia spicata*, *Bromus* (*Bromopsis*) *lanatipes*, *Agropyron* (*Elymus*) *canadensis*, *Andropogon gerardii*, *Andropogon scoparius*, *Agropyron* [*Elymus*, "Sitanion"] *longifolius*, *Poa compressa*, *Dactylis glomerata*, *Agropyron* [*Pascopyrum*] *smithii*, *Agropyron* (*Leymus*) *ambiguus*, *Bouteloua gracilis*, *Agropyron* (*Elytrigia*) *repens*, *Bouteloua curtipendula* few, *Stipa comata* few, *Carex pensylvanica heliophila* few searched. No eggs found on *Agropyron* (*Elymus*) *canadensis*, *Bromus* (*Bromopsis*) *lanatipes*, *Andropogon scoparius*, *M. montana*, *Danthonia spicata*, *Agropyron* (*Elytrigia*) *repens*, *Carex pensylvanica heliophila*, *Muhlenbergia racemosa*, *Agropyron* (*Leymus*) *ambiguus*; Coal Creek, Jefferson Co. Colo., Aug. 31, 1992. Egg with red ring & red spot found *M. montana* leaf 2 mm wide angled 60° (egg facing W, 10 cm above ground, 7 cm from leaf tip), reared to pupa with no silk girdle (ate *Poa pratensis pratensis* in lab, pupated Nov. 24, 1 female emerged Dec. 13, 1992); no eggs found on *Muhlenbergia wrightii*, *Danthonia spicata*, *Koeleria macrantha*, Tinytown, Jefferson Co. Colo., July 29, 1992. No larvae found on *Blepharoneuron tricholepis* or *M. montana* etc.; near Golden Gate Can. State Park, Gilpin Co., Colo., Aug. 19, 1992. Egg with red spot & red ring found *M. montana*; Coal Creek, Jefferson Co. Colo., July 19, 1994. No larvae found on very many *M. montana*, many *Festuca arizonica*, common *Poa nemoralis interior*, some *Bouteloua gracilis*, some *Stipa comata*, some *Stipa robusta*, some *Agropyron* [*Pascopyrum*] *smithii*, some *Agropyron* [*Elymus*, "Sitanion"] *longifolius*, some *Bromus* (*Bromopsis*) *canadensis*, some *Oryzopsis micrantha*, few *Stipa* "*Oryzopsis*" *hymenoides*, 1 *Danthonia parryi*; NO *Blepharoneuron tricholepis* seen; W Villa Grove, Saguache Co., Colo., Sept. 25, 1992; this site was studied by Scott (1974a) but no hostplant was determined then; *M. montana* is undoubtedly the host here. No larvae or nests found on many *M. montana*, many *Muhlenbergia filiculmis*, many *Blepharoneuron tricholepis*, some *Bouteloua gracilis*, some *Stipa comata*, some *Agropyron* (*Elytrigia*) *repens*, some *Bromus* (*Bromopsis*) *inermis*, a few *Festuca arizonica*; gulch bottom at Rosita, Custer Co., Colo., Sept. 26, 1992. No larvae or nests found on hundreds of *M. montana*, many *Muhlenbergia filiculmis*, several hundred *Blepharoneuron tricholepis*, hundreds of *Festuca arizonica*, many *Koeleria macrantha*, some *Agropyron* [*Elymus*, "Sitanion"] *longifolius*, few *Poa nemoralis interior*, some *Stipa robusta*, some *Agropyron* (*Elymus*) *trachycaulum*, few *Bromus* (*Bromopsis*) *canadensis*?, *Bromus tectorum* few; NE Rosita, Custer Co., Colo., Sept. 26, 1992. Pupa found in leaf nest on big *M. montana* clump (nest 8-11 cm above roots, the nest formed of dead and green leaves silked into a tube, a growing green leaf formed a loop beside nest because leaf tip was tied into nest, upper end of nest made of bunched knotted silk [though which emerging adult squeezes], pupa upright in nest, no silk girdle and cremaster not attached, female emerged July 3); ~30 *Muhlenbergia wrightii* plants had no nests; Tinytown, Jefferson Co. Colo., June 23, 1993. 5 eggs found *M. montana* (cream egg ~12 cm up on 16-cm-long leaf of 15-cm-wide clump, cream egg with trace of red ring & spot 11 cm up on 17 cm leaf of same clump, egg with red ring & spot 13 cm up on 17 cm leaf of 15-cm-wide clump, cream egg 15 cm up on 20 cm leaf of 25 cm clump, egg with red ring & spot 7 cm up on 11 cm leaf of 5-30-cm-wide clump [the clump just beside *Danthonia spicata*]); shed head capsule & skin of mature larva found at bottom of 3.5-cm-long silked-leaf nest (pupal shell or larva gone) of 15-cm-wide *M. montana* clump (next to *D. spicata* clump)(leaves were eaten on this *M. montana* clump and on *M. montana* clump 30 cm away); no eggs found on many *Andropogon scoparius* and ~10 *M. wrightii* and a few *Andropogon gerardii*; Coal Creek, Jefferson Co. Colo., July 7, 1993. 1st-stage larva found in nest of 3 leaves 7-9 cm above ground on *M. montana* clump ~12 cm wide, larva had eaten 18 mm along side of one leaf and 4 mm along side of leaf that had mostly-eaten eggshell; Tinytown, Jefferson Co. Colo., July 27, 1993. **HOSTPLANT:**

Muhlenbergia montana is obviously the main host, and seems to be the only host. It is the only plant with valid host records, it is always present and is usually the one of the commonest grasses at all *P. snowi* sites, and it ranges to southern Mexico as does the butterfly (and also occurs in California and Guatemala where the butterfly is absent), so is probably the main host throughout the butterfly's range. *P. snowi* is evidently one of the very few Hesperinae that are extremely host-specific (to just one grass species). I once thought that *M. montana* was shunned by all butterflies; but further work proved that *P. snowi* is specifically adapted to it, and *M. montana* is an occasional host of several other Hesperinae-Satyrinae species. Young larvae eventually died in lab after eating clipped *M. montana* leaves, but this evidently happened because the thin leaves spoil quickly in the lab (they lose their gray-green color after only a day and become tan and dry); several larvae were reared to pupae on *Poa pratensis pratensis*, which remains fresh for much longer in lab. The *B. tricholepis* record was based on incompetent plant identification, and it seems too short and tough to be a good host (the leaves are only ~2 cm long and radiate outward as sharp spikes so older larvae would have difficulty silking a nest from the leaves), *B. tricholepis* is absent at most *snowi* sites, it is scarce in N Colo., and it is not common in S. Colo. (although a flora says it is common in montane S Colo. fir forests), so it is unlikely to be an important host there even if it were an actual host.

OVIPOSITION: The female hovers over the grass, flying back and forth about 20 cm above the grass before landing and ovipositing (Scott 1974a reports adult behavior and movements). Most eggs were on big ~20-cm-wide lush *M. montana* clumps without too many inflorescences. Most eggs are laid near a valley bottom and are scarce farther up slopes. Eggs are laid more often near flowers. **NEST:** the usual silk nest is made by silking ~10 leaves into a tube; the larva rested with head upward in the nest sometimes, head down a few times. **NUMBER AND DURATION OF LARVAL STAGES:** The six larval stages have approximate head widths 0.65, 0.9, 1.2, 1.5, 1.9, 2.7 mm; the first four stages have solid black heads, the last two have light brown heads with a black stripe down the front; duration from hatching of egg to pupation is ~105-109 days in lab, pupa lasts 17 days, and adding the egg and pupal duration the life cycle in lab is rather long, nearly 4 1/2 months, so only one yearly generation is possible in nature. **DIAPAUSE** stage is probably 4th-stage larva, based on time of flight during the year; there is no diapause in lab. **EGG** cream when laid, after a day or so developing a sinuous narrow or broader red ring around side and a red spot on top, later becoming pinkish around base (because of body visible inside) and black head visible on top, finally becoming translucent as larva is visible inside about to hatch; shape hemispherical with a slight lateral flange around base, egg slightly oval in dorsal view. **FIRST-STAGE LARVA** yellowish-cream (slightly greenish internally after feeding due to food); collar & head black or blackish-brown. **2ND-4TH-STAGE LARVA** bluish-greenish-tan, A10 tan, collar very narrow & black; head black with short setae. **5TH-STAGE LARVA** tan (gray-green-tan after feeding) with light-brown heart-line, A10 top gray; head light brown (slightly darker brown beside neck), with a median black stripe down front of head (narrowest at top and widest at bottom where it encloses frontoclypeus and adfrontal areas). **6TH-STAGE MATURE LARVA** gray-green-tan becoming tanish-gray-green (grayest subdorsally on A1-A5 & slightly gray on A6)(slightly more tan rearward), A10 light brown (suranal plate rough with tiny black dots), dark-gray heart line on A1-8 (weak T2-3), body with ochre hairs (half as long as on head), a whitish internal lateral row of tracheae is visible, the usual powder glands present on A7-8, collar a hairline long brown sclerite; head light-brown with a black median stripe down front of head (narrowest at top and widest at bottom and completely enclosing frontoclypeus and adfrontal areas)(this stripe has evenly tapered lateral edges on the two female larvae, but on the single male larva the stripe is narrower in the middle so that its lateral edge is parallel to the coronal sulcus and then is angled near top of frontoclypeus so that it parallels adfrontal cleavage line)(this stripe is solid black except the lower part of the adfrontal area is paler brown on the male pupa but not on the 2 females), head blackish beside mandible, the posterior part of postgena is blackish and this black area extends dorsally very narrowly beside neck for about 1/3 of way to top of head, eyes 1-5 are connected by black (are in a black crescent), area between these eyes and the isolated eye 6 is tan, head has long ochre hairs, mandible blackish-brown without teeth. **PUPA** (3 female pupae & 1 male pupal shell) a few hours old greenish-cream anteriorly, abdomen cream. When young to older (1-13 days old), three pupae (1 male shell, 2 females) were darker than the female pupa described below: pupal head is blackish-brown, head pointed (anterior end of pupa forms an obtuse angle in dorsal view), top of head & vertex grayish-blackish-brown, eye & orbit & just anterior to eye dark-brown, labial sclerite present, very base of proboscis brown, appendages brownish-tan, base of antenna & T1 grayish-light-brown, front of T1 has ~18-19 red-brown lenticles, T1 spiracle red-brown, other spiracles chitin-orangish, top of T2 dark-brown or dark-reddish-brown (the Coal Creek pupa has somewhat redder dark areas than the first Tinytown pupa)(a little paler 1/2 or 2/3 back), T2 pale-brown (brownish-tan) or pale-reddish-brown subdorsally & laterally, wings brownish-tan or reddish-brownish-tan basally & cream-tan on outer half (slightly darker than abdomen), the usual middorsal ecdysial cleavage line present on vertex & T1-2, T3 & abdomen tanish-cream (T3 a bit darker) with cloudy fat body deposits visible on ventral half of abdomen, A8 tan on posterior 2/3, A9-10 tan, tan heart-line visible on A1-front of A8 (heart-line slightly darker tan on rear of A456 segments), A10 (cremaster tip) quite rounded in dorsal view with dozens of stiff straight orange-brown hairs laterad of the ~6-10 hooked orange-brown crochets, the lateral and ventral cremaster ridges (sustensor ridges) are light-orange-brown, proboscis orange-brown between wing tips & where it extends (6.5 mm in one female, 8.5-9.0 mm in male pupal shell & 2 female pupae) beyond wings to or nearly to cremaster tip, cremaster orange-brown, A456 have subventral chitiny-tan lenticle patch (~2 lenticles on A4, ~10-12 on A5 & on A6), abdomen has a lenticle in positions of some of the primary setae of larvae; pupa has many orangish hairs (except none on orbit, appendages, wings, top of head, gena, or vertex, & few hairs

on top of T1), a few hairs on side of A8 are slightly hooked in one pupa. However, from 1-13 days old the 2nd Tinytown pupa (1 female) was paler: mostly tanish-cream, except T2 ochre-tan, basal third of wings ochre-tan, head pale-red-brown, middle of orbit dark-red-brown (rest red-brown), base of proboscis tan, antenna club tips tan, A8-10 tan ventrally and light-red-brown dorsally. Nearing emergence (14-15 days old) pupa the same except antennae are a bit orange; a day later (15-16 days old) the appendages & wing bases turn red-brown, the ends of the leg tips turn black. Half to a full day later (15-17 days old) the pupa develops darker pattern: the wings turn orange, T1 is now brown, T3-A1 light brown, abdomen turns light-brown on top of A2-7 (but only on the front 3/4 of A2, front 2/3 of A3, front 1/2 of A4-5, front 1/3 of A6, front 5/6 of A7), all of A8 now brown-tan; a bit later (15-18 days old) the whole pupa turns black, with black wings except some orange spots where the pale spots will be on the adult forewing, abdomen black with tan rings around rear of middle segments (A1 & A2 all black, A3 & A4 have very front edge of segment tan and rear 1/5th of A3 tan and rear 1/3 of A4 tan, A56 are solid black except rear 1/3 of A4 tan, A7 mostly black on top with pale lateral sliver on rear of segment, A8-10 brown on top [but A8 blacker-brown anteriorly on day 16]), on ventral half of abdomen the black is replaced by dark brown (A4567 have front 2/3 dark brown & rear 1/3 tan, A8-10 light-brown), appendages black but both tibiae have brown low ridges and base of proboscis has a brown area. **PUPAL NEST:** Pupa rests head up in 25-30-35-mm-long aerial nest formed of ~10-15 leaves silked into a tube, attached by cremaster but not by a silk girdle, the exit above pupa has ~9 multistrand silk cords loosely closing exit, the nest powdered with wax flakes.

Poanes viator viator (W. Edw.) Half-grown larva found on *Carex lacustris* 1.5-m-tall plants, living in median channel of leaf ups, Hall of Humes Lake, Freeborn Co. Minn., Sept. 13, 1994. Larva in *C. lacustris* leaf nest of 2 leaves silked together for short distance, the larva resting in median leaf channel; Albert Lea Lake, Freeborn Co. Minn., Sept. 15, 1994. ~10 larvae ~11 mm long in *C. lacustris* leaf nests, resting in median dorsal leaf channel, the two (sometimes more) leaves of nest silked together for a distance of 3, 3, 3, 4, 5, 5, 5, 6, 7, 9 cm, larva rests near where uppermost leaves diverge from stalk; Hall of Humes Lake, Freeborn Co. Minn., Sept. 16, 1994. Adults assoc. *Carex lacustris* and *C. aquatilis*; SE Freeborn Lake, Freeborn Co. Minn., July 11, 1997. Adults associated with *Carex aquatilis* (between the *Poa* zone and the *Typha* zone), and *C. lacustris* also present; 3 mi. NE Alden, Freeborn Co. Minn., July 26, 2004. **LARVAL NEST:** Older larvae do make a silk-leaf nest, by silking two adjacent leaves together and resting in the V formed by the upperside of the middle of the leaf whose cross-section is roughly an inverted W. **OLDER-MATURE LARVA** pinkish-tan, heart-band light-brown, a dorsolateral cream band that is edged (widely dorsally, narrowly ventrally) by light-orange-brown, then a weak paler line and a weak darker line above spiracles, a weak brown spot above and another below dorsolateral cream band on T2-3, two brown spots in front of T1 spiracle, spiracles brown (T1 very large, A9 large and supralateral), a small blackish subdorsal spot near front of A10, lateral ridge and underside more tan, body covered with pale hair, collar very narrow, brown; head pale-brown (not orangish) with blackish along coronal sulcus, a blackish area on lower part of frontoclypeus and another smaller blackish spot on upper part, lower face blackish beside frontoclypeus above mandible, a black spot near upper part of frontoclypeus on face, a larger black spot lateral to lower end of coronal sulcus, a blackish subdorsal spot near rear of head, a weak wispy blackish area on side of head near neck, front four eyes in a black patch, ventral eye black, rear eye black.

Poanes hobomok hobomok (Harris). Adults associated with *Bromus inermis*, Hot Springs, Fall River Co., S.D., late May 1994, Ray E. Stanford.

Poanes taxiles (W. Edw.). Egg found on *Bromus (Bromopsis) lanatipes* leaf underside (7 cm from leaf tip, 30 cm above ground, leaf not drooping); egg (produced Trichogrammatid) found on *Agropyron (Leymus) ambiguus* leaf underside (17 cm from leaf tip, leaf 5 mm wide, egg under horizontal point of drooping leaf); Coal Creek, Jefferson Co. Colo., July 17, 1992. Egg found A. (*L. ambiguus*) leaf underside 30 cm above ground 8 cm from leaf tip, Coal Creek, Jefferson Co. Colo., July 18, 1992. Egg parasitized by trichogrammatid found on *B. lanatipes* leaf underside, Coal Creek, Jefferson Co. Colo., July 20, 1992. Oviposition 9:25 she ignored the abundant *Leersia oryzoides* and flew 10 cm beneath overhang of small wood bridge and laid on *Bromus (Bromopsis) inermis* leaf underside (another cream egg found on same 4-mm-wide leaf 2 cm away so possibly she laid 2 eggs there), Wheatridge, Jefferson Co. Colo., July 28, 1992. Dead shriveled 15-mm larva in *Agropyron (Elymus) canadensis* leaf nest; Tinytown, Jefferson Co. Colo., Sept. 22, 1992. Oviposition 9:57 *Muhlenbergia racemosa* narrow leaf (egg 3 cm from tip of 17-cm-long leaf), Tinytown, Jefferson Co. Colo., June 20, 1994. Female bent abdomen on *Stipa scribneri* leaf 10:32 but no egg laid; Indian Gulch, Jefferson Co. Colo., July 10, 1998.

Euphyes vestris vestris (Bdv.). Oviposition 13:50 on shaded side of small *Carex pensylvanica heliophila* clump on top of leaf 2 cm above ground (*C. p. heliophila* 0-100, *Stipa comata* 25, 30, 30, 40, 40-60-100, *Bromus japonicus* 40, 60, *Andropogon gerardii* 70-100), Chimney Gulch, Jefferson Co. Colo., June 9, 1994. Oviposition 11:05 *Carex geophila* (identified as *pityophila*, which is now included in *geophila*) leaf top, Lookout Mtn., Jefferson Co. Colo., June 13, 1994. 3 males found, host may be *Carex emoryi*? or *C. nebraskensis*? here, because I have not seen the small *Carex* species that are used as hosts in the mountains (*C. pensylvanica*, *geophila*, etc.) at this plains site, although they probably occur; Wheatridge, Jefferson Co. Colo., July 24, 1995.

Euphyes dion dion (W. Edw.). 3 half-grown 15-mm-long ~4th-stage larvae found on *Carex lacustris* 1.5 m plants, larvae made a ~20-25 cm long silk-leaf nest starting where leaves diverge, and larva lives in median channel of leaf, larvae eat leaf tips and side of leaves near tip, a loop of leaf noted on one nest (caused by faster growth of that leaf), Hall of Humes Lake,

Freeborn Co. Minn., Sept. 13, 1994. 7 larvae found in *C. lacustris* leaf nests of 2 leaves silked together for ~20-25 cm, the larva resting in median leaf channel; Albert Lea Lake, Freeborn Co. Minn., Sept. 15, 1994. ~10 larvae found in *C. lacustris* leaf nests, larvae rest in median leaf channel ~80-120 cm above ground, the 2-several leaves were silked together for 2, 15, 20, 20, 20, 23, 30 cm, two nests had 1 or 2 leaf loops just below nest; to find larvae one must look for feeding damage to leaf tops or the occasional leaf loops (formed by a growing leaf's tip being tied into the nest, then the leaf base growing to force the loop); Hall of Humes Lake, Freeborn Co. Minn., Sept. 16, 1994. ~10 older larvae found in leaf nests on *C. lacustris*, resting in dorsal median channel of leaf; Hall of Humes Lake, Freeborn Co. Minn., June 11, 1995. Larval nest in *C. lacustris* near top of plant 1.7 m above mud, with the usual loop of faster-growing leaf below nest; 3 mi. NE Alden, Freeborn Co. Minn., July 26, 2004. Adults associated with *C. lacustris* (*C. aquatilis* also present); 3 mi. NE Alden, Freeborn Co. Minn., July 23, 2004. **HOSTPLANT:** *Carex lacustris* is probably the main hostplant, as adults are associated only with it, in wave-protected sedge nooks at lake margins. **LARVAL NEST:** Larvae rest on the dorsal groove of leaf as noted above, and they silk several leaves together for a long distance; larvae can be found in nature by noticing chewed-off leaf ends, and sometimes by the loop of leaf formed below the nest by a leaf that grows faster than the other leaves forming the nest. **HIBERNATION STAGE** half-grown larva. **HALF-GROWN-MATURE LARVA** grayish-green, heart-band green with a narrow creamy line down the middle, covered with pale hair, spiracles black (T1 and A10 spiracles large, A10 spiracle higher on body), neck pale-green, collar very narrow, dark-brown; head yellowish-cream, with the usual black "evil eye" centered on the coronal sulcus on "forehead", and the remaining brownish stripes are brownish-red or are reddish-black in different larvae, including a narrow vertical brownish streak in middle of frontoclypeus, adfrontal sulci brownish, adfrontal cleavage line brownish, a brownish spike extending upward from beside frontoclypeus-adfrontal areas upward to a spike ending near top of head, a wide brownish stripe extending from eyes upward around top of head (this band is widest about halfway up head, and on top of head is weakly and narrowly connected to evil eye by a touch of orange-brown), rear rim of head brownish. **PUPA** black on head-thorax-wings, but tan next to labial sclerite, abdomen dark-smoky-brown (or blackish in some pupae), rear quarter of A4-6 olive-green (but dorsally blackish on some pupae), a pale-olive-green irregular band just above & edging wings on A1 (very narrow)-A2-A4, which continues just beyond wings (edging wings) to beneath proboscis, underside of abdomen mostly pale-greenish from A4 to front half of A8, except a small brown supraventral area on A4 containing lenticles and a large smoky-brown ventral area on A5-6, and A7 is mostly brown on distal 2/3, a greenish-tan dash extends dorsally and a bit anteriorly from spiracle on A4-7 on some pupae, T1 spiracle an orange-brown plateau, other spiracles orange-brown (blackish on some pupae) and surrounded by a small or large pale-greenish area on A4-6, a large pale-greenish area below spiracle on A4-6, proboscis dark-gray where it extends 1.7 mm beyond wings to beyond middle of A5, long orangish-ochre setae on abdomen-thorax-head (most noticeable on side of A7-cremaster); "cremaster" about as broad as abdomen, consisting of ~30 orangish setae (some curved at end, but none hooked) along a curved ridge across end of abdomen, and a long spine pointing rearward at side of the ridge, and a shorter spine medial to it on top of abdomen pointing upward and rearward. **PUPAL NEST:** Pupal nest is also formed in the channel between two sedge leaves, nest ~4 cm long, formed of several leaves silked together, the bottom of the nest closed by a small plug of silk fluff below the pupa and the cast larval skin, top of nest closed by a powdery network mesh escape plug 5-6 mm long consisting of some loose silk threads full of wax flakes from the larval A7-8 wax glands, the nest & pupa covered with some wax flakes; the pupa lacks a silk girdle.

Euphyes conspiciua (W. H. Edw.) = *buchholzi* (Ehrlich & Gillham)(*buchholzi* was originally described as larger, but size is not consistent, and it seems to be a syn.). Adults associated with *Carex* near *aquatilis*; E of Norfolk, Stanton Co. Neb., July 31, 1999. Adults associated with *C. aquatilis*; 3 mi. NE Alden, Freeborn Co. Minn., July 23, 2004.

Amblyscirtes aenus aenus W. Edw. Preoviposition 12:58 *Agropyron* (*Leymus*) *ambiguus*, she landed on leaf that drooped and crawled under horizontal portion of leaf to lay egg but flew to other *A. ambiguus* then disappeared, Coal Creek, Jefferson Co. Colo., July 15, 1992. Mature larval shed skin & head capsule found in *Stipa scribneri* leaf nest, ridge at Fremont Peak, Fremont Co. Colo., May 29, 1993. **NEW HOST:** *Stipa scribneri*.

Amblyscirtes oslari (Skinner). Oviposition 11:20 *Bouteloua curtipendula* leaf underside where leaf is level, Horsetooth Res., Larimer Co. Colo., May 28, 1993. Larva 18 mm long found in silk-tube leaf nest (near 2 old nests on same clump) on *B. curtipendula*; Foxton, Jefferson Co. Colo., Aug. 29, 1994.

Amblyscirtes phylace (W. Edw.). Female near *Andropogon gerardii*, Chimney Gulch, Jefferson Co. Colo., June 9, 1994.

Atrytonopsis hianna hianna (Scud.) (= *turneri* Freeman). Ovipositions 11:06, 13:10 *Andropogon gerardii* leaf undersides; lab larvae ate a little *Digitaria sanguinalis* but died on *Poa pratensis pratensis*; Horsetooth Res., Larimer Co. Colo., May 28, 1993. **EGG** rather round in dorsal view, lower sides vertical with ~24 vertical ribs (many fewer than *A. vierecki*), lower edge without flange but indented a bit above lower edge, micropyle area slightly sunken. **1ST-STAGE LARVA** pale-yellow turning pale-greenish-yellow, heart-line darker (greenish), A9-10 more tan, suranal plate brown, collar black and wide, neck red-brown; head black.

Atrytonopsis vierecki (Skinner). 43 eggs found (16 eggs on underside of leaf, 26 on upperside; 42 on green leaves, 1 on dead leaf; 3 eggs were found on one leaf)(eggs ~5-15 [averaging ~8] cm above ground)(2 eggs produced larvae, all others were parasitized by Trichogrammatid wasps), all on *Bouteloua curtipendula* robust variety *caespitosa* (these plants grew in large [20 cm wide or more] robust clumps with leaves sticking straight up, whereas *B. curtipendula* var. *curtipendula* in

Jefferson Co. grows only in sparse clusters rather than clumps and has leaves that curl limply to the side; this robust var. also occurs in S-C Kans. and southward, and looks to me like it should be a separate species, though it is listed as a "variety" in floras); I searched ~120 *B. curtipendula* var. *caespitosa* plants, ~60 *Stipa scribneri*, ~50 *Sporobolus cryptandrus*, ~40 *Stipa "Oryzopsis" hymenoides*, ~15 *Muhlenbergia wrightii*, 2 *Poa nemoralis interior*, 2 *Festuca arundinacea*, 2 *Agropyron (Elymus) trachycaulum*, and 1 *Oryzopsis micrantha*, but eggs were found only on *B. curtipendula* var. *caespitosa*; gulch at Wolf Park, Fremont Co. Colo., June 24, 1993. **HOSTPLANT:** *Bouteloua curtipendula* var. *caespitosa* is obviously the preferred host. Scott Ellis (pers. comm.) observed one oviposition on *Stipa "Oryzopsis" hymenoides* in SW Colo., but that must be just an accidental host, because I found no eggs on ~40 *S. hymenoides* plants at the same spot where 43 were found on *B. curtipendula*, and *S. hymenoides* is a very tough dry grass whose leaves would be difficult to form into a nest (frequently only the stems remain green) so I doubt that it is a frequent host of any butterfly; *B. curtipendula* occurs in Mesa Co. Colo. southward to Ariz. and in the rest of the range of *A. vierecki*, so is probably the main host throughout the butterfly's range. Males perch in gulch bottoms all day to await females, preferring narrow rocky parts of the gulch, and females prefer to oviposit near those spots as well. **EGG** cream when laid, turning dirty-browner-cream, then frosty-pale-gray as larva develops within (blackish eggs produced Trichogrammatid wasps); egg larger than *Hesperia*, oval in dorsal view, top rounded in lateral view, the lower sides lack a flange and are vertical and covered with ~70 vertical ribs, these ribs weaker than those of *A. hianna*, elsewhere the egg surface is covered with minute bumps between pits, and minute pits occur around top, micropyle area somewhat indented. **1ST-STAGE LARVA** yellowish-cream when hatched, after feeding turning yellow-green in middle of body due to food, A10 a bit tan; collar & head black. **2ND-STAGE LARVA** uniform tan but middle of body green-tan, last few segments ochre-tan, collar narrow & black; head black. **3RD-STAGE LARVA** cream-tan on T1-2 and A8-10, suranal plate light-brown; head dark-brown on front and top, red-brown on sides. **HALF-GROWN-NEAR-MATURE LARVA** pale tan, but T3-A6 bluish-greenish-tan due to food, heart line darker on A1-8, A10 top medium- to light-brown, tracheae between spiracles visible externally, spiracles light-orange-brown, underside pale-tan, collar very narrow and black; head blackish, but blended into much paler color (brown) on side, frontoclypeus and below it slightly paler, head capsule rim above mouthparts brown, eyes blackish. **MATURE LARVA** the same, but the brown head has the black limited to a black triangle on front (the point on top of head in valley, then broadening as it extends down to bottom of face, bottom of black triangle extends laterally to include eyes), a short brown line along coronal sulcus is within the black triangle, rim of head capsule above mouthparts narrowly brown. This head pattern is unique; only *Paratrytone snowi* is at all similar. **HIBERNATION STAGE** undoubtedly mature larva, which died in lab rather than pupate.

Pyrginae

Epargyreus clarus clarus (Cramer). Mature larva in leaf nest on *Amorpha fruticosa* var. *angustifolia*, Sowbelly Can., Sioux Co. Neb., June 26, 1994. One 1st-stage larva in nest of flap folded over leaf of *Glycyrrhiza lepidota*, three 1st-stage larvae found in 4 flap-nests of *A. f.* var. *angustifolia* leaves, Wheatridge, Jefferson Co. Colo., July 11, 1992. Oviposition 12:05 on stem 8 mm wide, five 1st-stage larvae found in flap nests (one larva sucked dry by Hemiptera nymph, one flap was beside eggshell on top of leaf), one ~4th-stage larva found in nest of ~4 leaflets, all on *A. f.* var. *angustifolia*; oviposition ~14:00 beneath middle leaflet, oviposition 14:01 beneath terminal leaflet, oviposition 14:01 under leaflet near end of leaf, all three on *G. lepidota*, oviposition 14:00 under *Apocynum cannabinum* leaflet near *G. lepidota*; Wheatridge, Jefferson Co. Colo., July 13, 1992. 15 near-mature to mature larvae in *G. lepidota* nests; a 2-cm larva found in nest of several *A. f.* var. *angustifolia* leaflets; Wheatridge, Jefferson Co. Colo., Aug. 20, 1992. Mature larva in *G. lepidota* leaf nest, Wheatridge, Jefferson Co. Colo., July 28, 1992. 17 mature larvae found in *G. lepidota* nests; Wheatridge, Jefferson Co. Colo., Sept. 1, 1992. 1 mature larva found in *G. lepidota* nest; Cherry Creek Res., Arapahoe Co. Colo., Sept. 9, 1992. 1st-stage larva in nest of folded-over flap of edge of leaf, 2/3-grown larva in nest of 3 top leaves, all *G. lepidota*, Wheatridge, Jefferson Co. Colo., July 31, 1993. Oviposition 11:15 side of tiny leaflet of young leaf beside tiny *G. lepidota* leaf, Falcon County Park, Jefferson Co. Colo., June 6, 1994. Ovipositions 13:38, 13:39 on uns of *G. lepidota* leaflets; Wheatridge, Jefferson Co. Colo., July 24, 1995. Oviposition 10:42 on leaf uns, oviposition 11:07 on leaf petiole uns basal to leaflets, both on *G. lepidota*; Wheatridge, Jefferson Co. Colo., July 6, 1997. 2 half-grown larvae in *G. lepidota* leaf nests; Wheatridge, Jefferson Co. Colo., Aug. 4, 1997. Two larval leaf nests on *G. lepidota* plant tops; Wheatridge, Jefferson Co. Colo., Aug. 26, 1997. Empty larval nest on *G. lepidota*; Wheatridge, Jefferson Co. Colo., Sept. 26, 1997. Oviposition 14:12 bluish-green egg on uns of base of basal leaflet of *G. lepidota* leaf; preoviposition 12:40 on *Cirsium arvense arvense* leaf next to *G. lepidota* but did not deposit egg; Wheatridge, Jefferson Co. Colo., July 7, 1998. Oviposition 11:45 bluish-green egg on base of leaflet of new (5-cm-long) leaf at top of 40-cm tall *G. lepidota*; Wheatridge, Jefferson Co. Colo., July 28, 1998. Mature larva in silked-multi-leaf nest near top of *G. lepidota*; Wheatridge, Jefferson Co. Colo., Sept. 15, 1998. 9-mm-long larva found in *G. lepidota* leaf nest, Sowbelly Can., Sioux Co. Neb., June 24, 1994. Larval nest (with half-grown larva missing) on *G. lepidota*, SW LaGrange, Laramie Co. Wyo., Aug. 22, 1994. Adults assoc. *G. lepidota*; Tongue Can., Sheridan Co. Wyo., Aug. 1, 1995. *G. lepidota* present at site; W Hidden Basin Cgd., Bighorn Co. Wyo., Aug. 2, 1995. Oviposition 10:36 on *Agropyron repens* leaf uns, 5 cm from *G. lepidota* leaves; Wheatridge, Jefferson Co. Colo., July 3, 1999. Adult found near *Desmodium glutinosum* along road, but this is surely not a host; Hall of Humes Lake, Freeborn Co.

Minn., July 27, 1999. Adult assoc. *Robinia* tree; 2 mi. SW Neola, Pottawattamie Co. Iowa; Aug. 10, 2005. **NEW HOST:** *Amorpha fruticosa* var. *angustifolia*. *G. lepidota* (up to 1.5 m tall), *Robinia* (up to ~8 m tall), and *Amorpha* (up to 3 m tall) are the largest legumes in Colo., so *E. clarus* evidently demands large legumes. Mature larvae make nests at the top of *G. lepidota* plants, the smallest species.

Thorybes pylades pylades (Scudder). Oviposition 14:00 on underside of leaf of *Lathyrus leucanthus*, Red Rocks, Jefferson Co. Colo., May 23, 1977. Adults associated with *L. leucanthus*, Jarre Can., Douglas Co. Colo., May 27, 1988. Oviposition 14:44 on leaf underside of *L. leucanthus* 8-cm-tall seedling, she landed on ~15 larger plants before ovipositing, so females must prefer seedlings; Apex Gulch, Jefferson Co. Colo., May 31, 1990. Oviposition 13:10 *Lathyrus polymorphus incanus* leaf underside near top of plant with flower buds, Green Mtn., Jefferson Co. Colo., June 1, 1993. Preovipositions 10:45, 11:20 *L. p. incanus*, 20 eggs found on *L. p. incanus* (19 on leaf underside, 1 on leaf upperside of twisted leaf, on upper and middle parts of plants); 1 egg found *Vicia americana* (underside of leaflet at base of flower pedicel); Hogback E Red Rocks, Jefferson Co. Colo., June 5, 1993. 7 larvae (one 2nd stage, three 3rd, three 4th) found (resting in J-shape with the head and thorax turned to one side) between two leaves silked together on top of plant, larvae eat tips of these nest leaves and nearby leaves (larvae sometimes eat leaf sides), 3 empty eggshells found on leaf undersides near these larvae, all on *L. p. incanus*; three pupated Aug. 5, 6, 6, and two pupae emerged Aug. 21; hogback E Red Rocks, Jefferson Co. Colo., July 6, 1993. Adults associated with *Lotus crassifolius* (M), 5 mi. NE Goat Mtn., Colusa Co. Calif., June 8, 1974. Colo. *T. pylades* occupies chaparral foothills, where its *Lathyrus* and *Vicia* hosts grow on the slopes, and males perch just off the top of hilltops and ridgetops to await females. **HOSTPLANTS:** pea-vines (plants with tendrils) are obviously chosen as hostplants, since all three Colo. hosts are low pea-type herbs with tendrils (*Lathyrus polymorphus incanus*, *L. leucanthus*, *Vicia americana*). **DIAPAUSE STAGE:** The hosts have mostly long dried up by Sept., so larvae must mature in July or E Aug., and spend a long time in diapause, evidently as mature larvae. **EGG** milky-white, or slightly-bluish-greenish cream, with little color change even in 4 days, except an older egg is slightly-yellowish-cream with a slight pink flush around top of egg; with 15 or 17 vertical ribs. **1ST-STAGE LARVA** light-yellow-cream, with a tinge of russet near rear of body, and a tinge of russet or greenish on thorax, and very faint tan bands; collar & head black. **2ND-STAGE LARVA** yellowish-green, heart-line darker-green, dorsolateral yellow line, lateral yellow line, A10 more tan; collar & head black. **3RD-STAGE LARVA** greenish-yellow (due to numerous yellow points, and numerous microscopic dark-green spots), heart-line dark-green, dorsolateral yellow line, lateral yellow line, A10 light-brown, collar black (edged anteriorly with reddish-brown); head black. **4TH-STAGE LARVA** light-greenish-reddish-brown, heart-line dark-green, a dorsolateral tan line, a lateral tan line, a weak tan line through spiracles, T2-3 legs brown, T1 legs black, collar black (edged anteriorly with reddish-brown); head black. **OLDER-MATURE LARVA** fairly-light reddish-brown (due to numerous ochre points and some tiny blackish background areas), heart-line blackish, a dorsolateral ochre line (slightly edged by darker ground color), spiracles black in a slightly more ochre area, an ochre lateral line (edged by brownish esp. below), prolegs and T3 legs light-brown or darker-brown, T2 legs brownish-black, T1 legs black, suranal plate dark-brown, collar black, neck brown; head black. **PUPA** reddish-brown, the head and T1 darkest, orbit smooth & red-brown, outer 2/3 of wings paler (uniform red-brown in 1 male 1 female, another female has less red-brown on wings which are fairly-light brown), rear of T1 blacker, top of T2 mottled with blackish, rear 2/3 (or 3/4 on one) of A2-4 blacker, rear 40% of A1 blacker, A5-7 have a ridge around segment whose forward & rearward slopes are darker (intersegmental areas between A4-7 light-brown), abdomen can move up & down & side to side, cremaster blackish-brown with black crochets, T1 spiracle black with red-brown felt.

Thorybes diversus Bell. Adults common associated with *Vicia americana*, in tiny coniferous forest clearings S of Mather, Tuolumne Co., Calif., June 11, 1972. *Trifolium worms kjoldi* assoc. Del Norte Co. Calif. (see next). **EARLY STAGES** (larvae reared from eggs from Del Norte Co. Calif. June 1993, laid in lab on *Trifolium worms kjoldi*, the plant Kenneth Hansen found adults associated with in nature, sent by Hansen): **EGG** probably pale-green when laid, later becoming bright red on top 60% of egg, pale-green on lower 40%, turning blackish before hatching; with 16 pale vertical ribs, top fifth of egg has large polygonal depressions, micropylar area sunken duration perhaps ~8 days. **1ST-STAGE LARVA** green with minute yellow dots (thus sides appear yellish in dorsal view), heart-line darker-green; collar & head black; duration 2-3 days. **2ND-STAGE LARVA** dark-green with minute cream bumps, heart-line darker-green (due to absence of bumps); collar & head black; rests in J-shape (head and anterior part of thorax bent nearly 180° sideways) in silked-leaf nest. **HALF-GROWN-LARVA** granulated yellow (microscopically bluish-green with numerous yellow dots), greenish-yellow on thorax, heart-line darker (grayish), a subdorsal yellow line, a lateral yellow line, suranal plate brown, legs black, neck tan; collar & head black. **OLDER-MATURE LARVA** much darker than younger larvae, very-dark-brown, heart darker blackish, a tan dorsolateral line, spiracles tan, a tan line on lateral ridge below spiracles, proleg tips light-brown, collar chitin-colored (red-brown), neck narrowly tan; head chitin-black. **PUPA** blackish-brown, slightly reddish-brown on top of head, outer half of wings reddish-brown & margin orange-red, rear 3/4 of A1-4 black, front part red (boundary between orange & black very sinuous on A2-4 except middorsally), sides & rear of T3 brown, middle teardrop-shaped area orange-brown, A5-7 have cream spots on front of segment except on top & bottom, rear 1/3 of A5-6 black (front mottled dark-red & orange, rear half of A7 black, A5-7 have a blackish ridge around dorsal half of segment (rear slope of ridge black to edge of segment, front slope reddish), front quarter of A8 reddish and remainder black, lateroventral front of A9

red, and a little ventral red on front & rear of segment, rest of A9 blackish, T1 spiracle an elongate black ridge, a narrow ridge runs all around A5-7, some short stiff hair on front of head (some on top of head, a large hair field on forehead, a small hair patch medial to orbit, a little hill with hair at base of each proboscis beside labial sclerite), and a few hairs on thorax, cremaster blackish, fairly wide, cremaster has some hooks (but may be deformed).

Thorybes mexicana mexicana (Herrich-Sch.). The name of *Trifolium rusbyi* has been changed back to *Trifolium longipes* (yoyo taxonomy: the original name was *T. longipes*).

Erynnis icelus (Scudder & Burgess). Larva 11 mm long found inside nest of 2 *Populus tremula tremuloides* leaves silked together (overlapped) with ~7 multistrand silk cords, larva rested in J-shape (head and thorax bent to side) on underside of dorsal leaf; second empty nest found of 2 *P. t. t.* leaves attached by ~7 cords on one edge and ~5 on other, all on seedling plants; Tinytown, Jefferson Co. Colo., July 27, 1993. **DIAPAUSE STAGE** mature larva. **EGG** cream with scattered tiny yellow spots when laid, when 1 day old turning bright-orange, then red (dark red by 3 days), with 12, 14 vertical ribs.

HALF-GROWN LARVA yellowish-green (the innards greenish due to food), heart-band dark-green, a narrow cream dorsolateral line, a paler line along spiracles (due to internal silvery tracheae), A10 greenish-tan, no collar; head black.

OLDER-MATURE LARVA pale yellow on 4th-stage, pale-creamy-green on mature larva (microscopically dark-green with numerous tiny cream seta bases), A10 a bit rosier-tinted, heart-band darker green, a dorsolateral cream line, spiracles tan; head black, but whole side of face orange-brown, and lower front of face has orange triangular frontoclypeus, (thus adfrontal areas black, bottom of head and labrum and around eyes and rear of head and V-shaped mark on top front of head all black). The heads are different in all *Erynnis* I have reared (*icelus*, *martialis*, *pacuvius*, *telemachus*, *persius*, *afranius*).

Erynnis brizo burgessi (Skinner). Perfect female placed in net bag on *Quercus gambelii* young stems (no leaves yet, just buds) with a female from a mating pair here yesterday, at Tinytown, Jefferson Co. Colo., June 2, 1995, the females laid eggs, and on June 14, 1995 the net bag had ~35 green (sterile from perfect female that was virgin?) and red eggs (from worn female?) on terminal twigs of *Q. gambelii*, leaves were now young (about 1.5-2 cm). On July 26, 1995 the net bag showed a few eaten spots on leaves. On Aug. 17, 1995 the net bag on *Q. gambelii* had 4+ ~4th- and 5th-stage larvae in leaf nests, consisting of a folded-over leaf tied by ~5 multi-strand cords, except larvae molting to 5th-stage were in silked-up bags on one leaf. Larvae eat very little leaf tissue: young larvae skeletonize leaves, then older larvae eat leaves from the side. **EGG** slightly-greenish or yellowish-cream when laid, light-orange (slightly lighter than *E. icelus*) when 1 day old, orangish-red in 2 days, red a day or so later, usually with 16-17 (range 15-18) vertical ribs (many more than *icelus*). **1ST-STAGE LARVA** creamy-tan, with cream T-shaped setae, collar barely noticeable (tan); head black with knobbed cream setae. **4TH-STAGE LARVA** greenish-cream, a greener heart-band, a cream dorsolateral band; head black, with weak ochre patches on side of face and tiny ones near coronal sulcus. **MATURE LARVA** greenish-cream (very-pale-green) due to greenish cuticle and numerous cream seta bases of numerous cream knobbed setae, intersegmental areas yellower, heart-band darker-green, a dorsolateral cream band, lateral ridge may look slightly paler, collar pale-gray-green, spiracles light-brown; head variable, black on some larvae, brown on most larvae (some have a black area extending across face and covering upper part of frontoclypeus), varying to rather light orange-brown or even tan-brown on some larvae (the palest heads have narrow brown interrupted lines edging both sides of adfrontal and coronal sulci), all larvae have the same five pale areas (ochre on most larvae, creamy on the palest tan-brown heads: a pale ochre spot on front of face lateral to top of frontoclypeus, a small pale spot near coronal sulcus on front of head head near top, a pale streak on side of front of face extends diagonally upward and a little laterally, a small ochre spot lateral to the stripe on side of front, a large ochre patch medial to eyes and lateral to bottom of frontoclypeus on lower front of face), the second and 5th patches are sometimes very slightly orangish, and the upper part of the 3rd and the 4th patches sometimes have a trace of orangish, postgenal area dark, membrane above mandible creamy, eyes and mouthparts black; diapausing larva loses its green body color and becomes straw colored (the intersegmental areas peachier). A photo of a mature larva from Ont. (Jim Troubridge) is like one of the Colo. larvae with tan-brown head, but the thorax is light-pinkish, and the rear (rear of A7 to A10) slightly pinkish; the pinkish color is evidently developed during diapause, because *E. pacuvius* mature larvae develop the same pinkish tint on front and rear (but *E. afranius* mature larvae become orange-browner all along body esp. on intersegmental areas; many or most Pyrginae mature larvae become rosier during diapause, but mature larvae of *Pyrgus communis* and *Pholisora catullus* larvae and prepupae of *Epargyreus clarus* become rosier all along the body, not just on front and rear). **PUPA** creamy, the head & mouthparts & top of thorax and cremaster slightly tan-cream, abdominal heart-band slightly darker, two (one above the other) slightly-darker (light-gray) patches on side of A4-8, T1 spiracle large and black, abdominal spiracles tan.

Erynnis martialis (Scudder). Oviposition 13:15 young leaf base of new-growth *Ceanothus fendleri* branch at clump base; mature larva diapaused so was placed in refrigerator Aug. 5, removed ~Oct. 10, pupated Nov. 1, 1 female emerged Nov. 19; Tinytown, Jefferson Co. Colo., June 13, 1992. Female found over *C. fendleri*, Tinytown, Jefferson Co. Colo., June 14, 1995. Preoviposition 12:15 *C. fendleri*; Tucker Gulch, Jefferson Co. Colo., July 14, 1995. Female on *C. fendleri*; Mt. Zion, Jefferson Co. Colo., June 10, 1998. **DIAPAUSE STAGE** mature larva. **EGG** cream, orangish-yellow after 1 day, light-orange after several days, then pale yellow as larva develops inside; with 14-17 vertical ribs (14, 15, 15, 17). **1ST-STAGE LARVA** ochre; head slightly-orangish ochre. **2ND-STAGE LARVA** light-green with tiny white hairs, heart-line darker-green, a faint narrow white subdorsal line, a faint narrow white line along top of lateral bulge; head black. **HALF-GROWN TO MATURE LARVA** light-green (microscopically dark-green with numerous tiny white seta bases)(slightly

tan-green on thorax & A10), heart-band dark-green on T3-A9 (widest A8-9), a subdorsal cream band on A1-9, rear rim of A10 tan, spiracles pale orange-brown and connected by a very-slightly-paler band due to silvery internal tracheae, prolegs tan, legs pale orange-brown; head black with 3 rusty-brown-orange areas on front of head that are weakly connected by brownish-black (one area on upper face below 4-5 big subdorsal cones (tiny "horns"), one area down side of front of face, one weaker area on lower side of face that is slightly connected to the last area). **PUPA** translucent light-tan-green, underside (& wings) pale-olive-green, a small pale-brown spot on anteriormost point of head, a small pale-brown spot on top of head touches antenna and vertex, orbit light-tan, T1 spiracle a large black-felt mound, T2-3 joint tan, abdomen greenish-cream with internal fat clouds visible, top of A1-7 (esp. A2-4) light-ochre-tan-cream, a faint cream subdorsal band on A1-7, heart-band darker (greenish-tan) on T3-A8, tip of proboscis & hind legs light-brown, male sex-mark light brown, cremaster rectangular in dorsal view with ~10 red-brown crochets; nearer emergence the pupa loses all green, top of thorax head & appendages & abdomen tip pale-brown, adult eyes become brownish-red (the eye of adult lies below eye & orbit & lateral part of gena of pupa), antenna club turns orange-brown, an orange-brown spot on each leg anterior to antenna club, the wings & abdomen now cream (no green) except top of abdomen slightly tan-cream; just prior to emergence the head thorax & wings become black with adult wing pattern, & abdomen becomes brown-orange on top; pupa attached upside down in silked-leaf nest by cremaster and by a multistrand silk cord around middle; duration 18 days in lab.

Erynnis pacuvius pacuvius (Lintner). Oviposition 10:37 on 3 mm new leaf at tip of *Ceanothus fendleri* branch with very young leaves; 3 females net-bagged on *C. fendleri* leafy branches to get eggs; Ralston Butte, Jefferson Co. Colo., June 10, 1994. 2 bags on *C. fendleri* had larvae, one bag had 2 mature larvae (one being attacked by ant, the other rosy because about to diapause) and nearly all leaves eaten, the other bag had 3 green larvae and only half the leaves eaten; Ralston Butte, Jefferson Co. Colo., Aug. 15, 1994. Female bagged on *C. fendleri*, Tinytown, Jefferson Co. Colo., June 17, 1994. Bag had at least four 2-mm-long 1st-stage larvae, each one on top of a young 3-mm-long new leaf a branch tip and each one without nest, head aimed toward base of leaf, these are slow-growers also; Tinytown, Jefferson Co. Colo., June 30, 1994. 3 larvae seen in bag in leaf nests of 2 leaves silked together near tip of branches, body not in J-shape, head solid black body greenish-cream; Tinytown, Jefferson Co. Colo., July 21, 1994. Bag had three ~4th-stage larvae in silked-leaf nests near twig tips, Tinytown, Jefferson Co. Colo., Aug. 13, 1994. **DIAPAUSE STAGE** mature larva. **EGG** cream or greenish-cream, with NO color change (unlike most *Erynnis*, though the egg of its close relative *E. martialis* becomes slightly orangish), with 15-17 vertical ribs (15, 15, 17); duration 7 days in lab. **1ST-STAGE LARVA** light-tan, a slight ochre tint on front & rear, becoming green on A1-3 due to food, later becoming yellowish-cream, all of inside green due to food, a wide blackish collar, some short cream setae, suranal plate slightly-browner; head black with some cream setae. **2ND-STAGE LARVA** cream, no collar; head black, with a short bumpy horn on each side of top. **4TH-STAGE LARVA** light-bluish-green, heart-band dark-green, a cream dorsolateral line, no collar visible, neck greenish-cream, rim around A10 creamy; head blackish (or orangish-brown, or brownish-orange in different larvae), with short bumpy horns, and some orange spots (one in front of eyes, one above that, an orange stripe on front of horn extending medioventrally, sometimes an orange patch across front just above frontoclypeus), eyes black, bottom of clypeus black, mandibles black. **OLDER-MATURE LARVA** light-green (slightly yellowish-green in some, slightly bluish-green in many), a green heart-line, a cream dorsolateral line, lateral ridge slightly creamier, no collar visible, neck greenish-cream, rim around A10 creamy; head reddish-brown (due to brown bumps on tan background) with large orange areas (orange patch in front of eyes, a smaller orange patch on front of side of face, a large orange streak extends from front of bumpy horn ventromedially to near adfrontal area, clypeus a little orangish), adfrontal areas tan, a greenish-cream membrane above tan labrum, anterior eyes black, head rim dark-brown on underside behind antenna and below eyes and all across postgena, mandibles dark-brown, rear rim of head black all around head except for a slight middorsal interruption. Diapausing larva turns pinkish on front & rear of body, then entire body turns tan-pink, the thorax grayish. **PUPA** uniform blackish-brown, slightly oranger-dark-brown on A2-7 and on wing tips, intersegmental areas orangish-brown or brown on A4-7, T1 spiracle black, spiracles black on abdomen, long ochre hair (longest on head & T1) except on wings & appendages, proboscis extends to end of wings, black cremaster has ~30 red-brown crochets; pupa rests in nest of silk cords in loose netting, the cremaster attached to silk mesh across bottom of nest, plus pupa rests on a silk Y-shaped sling (the two upper arms of the sling are 7-8 mm long, the lower arm only 2 mm long, the sling supports pupa at T3-A1); pupal duration ~14 days in lab.

Erynnis telemachus Burns. Female placed in net bag on *Quercus gambelii* leafy branch, Tinytown, Jefferson Co. Colo., June 2, 1994, by June 3 had laid 6 or more cream-green eggs, placed on twig tip near leaf petiole (a few on leaf petiole near twig). Bag on *Q. gambelii* had 16+ eggs by June 4 (one of which was turning orange); Tinytown, Jefferson Co. Colo., June 4, 1994. Eggs in bag were all orange, Tinytown, Jefferson Co. Colo., June 7, 1994. Bag had 6+ larvae ~3 mm long skeletonizing leaves in silk nest between leaves, Tinytown, Jefferson Co. Colo., June 17, 1994. ~6 nests noted in bag on *Q. gambelii*, Tinytown, Jefferson Co. Colo., June 20, 1994. Bag had ~6 larvae ~4-mm long in silk-leaf nests, larvae skeletonized leaves, larvae grow so slowly they must not mature til Aug. or mid Aug. in nature and must eat older leaves much of the time, Tinytown, Jefferson Co. Colo., June 30, 1994. ~22 half-grown larvae resting in J-shape found in bag, put in fresh bag because half the leaves had been eaten, they eat chunks out of leaf edges and leave stubby leaf veins sticking out of remaining leaf; Tinytown, Jefferson Co. Colo., July 11, 1994. Bag had about five ~5th-stage larvae which had eaten all the leaves down to the twigs and were resting on cloth; Tinytown, Jefferson Co. Colo., Aug. 13, 1994; on Aug 15 both

jars smelled like aromatic perfume and all larvae were motionless and half were dead or died later, do they put out a perfume that kills others of their kind (cause of death not proven)? **DIAPAUSE STAGE** mature larva. **EGG** cream when laid, turning yellow-cream for a few hours, after a day turning pink then bright-red, with 16-18 vertical ribs (16, 16, 17, 17, 18, 18). **1ST-STAGE LARVA** ochre-tan (cream on rear and neck) or light-orangish-brown, appearing brownish internally (due to food?), some pale setae, collar narrow & black; head black with cream setae. **3RD-STAGE LARVA** pale-creamy-yellow (middle of body a little browner); head black. **4TH-STAGE-LARVA** slightly-grayish creamy-yellow-greenish with a slight ochre tinge, underside greenish-gray, heart-band darker-green, a pale yellow dorsolateral line, a weak yellower tracheal line, collar not visible, neck creamy; head black or blackish-red-brown, with an orange spot on lower face (gena), and a small red-brown patch on front of bumpy ridge, a bumpy ridge (rudimentary "horn") on each side of top. **OLDER-MATURE LARVA** slightly-grayish light-yellow-green (semi-translucent with dark innards, the paleness due to numerous tiny pale seta bases), (when in diapause the mature larva turns tanish-cream), heart-band darker (gray), a light-yellow dorsolateral line, the lateral ridge a bit yellower, collar not visible, neck pale-greenish-yellow; head light-brown (tan), with neon-orange spots (a large spot on lower face [gena] medial to eyes, a smaller patch on side of front of face, a larger patch [tapered to a point on bottom, and widest at bumps] on front of each bumpy "horn" ridge), ventral part of clypeus creamy with a black mark on each lower corner, mouthparts black, underside rim of head is black around antenna and anteroventral part of postgena, and that black area extends upward to cover anterior eyes (the solitary eye is in tan area), the flange forming rear rim of head is dark-brown with a middorsal pale break, the gap between black anteroventral part of postgena and the brown rear rim of head is narrow or wide on different larvae. The neon-orange spots on the head are so shockingly bright that they seem to glow and fluoresce.

Erynnis persius (Scudder). Empty eggshell found on *Thermopsis divaricarpa* petiole, Tinytown, Jefferson Co. Colo., July 14, 1992. 1-cm-long larva found in nest of two *Astragalus canadensis* leaflets, Tinytown, Jefferson Co. Colo., July 29, 1992. Oviposition 10:43 *T. divaricarpa* leaflet underside on 8 cm tall highly-chewed plant; oviposition 11:17 side of stem of 20 cm tall plant with 7 leaves, an orangish egg also found on this plant on base of petiole, both on *Lupinus argenteus* (white flowered var. with plane leaves and glabrous leaf ups); both ovip. eggs hatched May 29 (egg duration 8 days); Tinytown, Jefferson Co. Colo., May 21, 1994. Oviposition 12:57 near base of new unfolded *T. divaricarpa* leaflet distal to petiole near top of plant, Tinytown, Jefferson Co. Colo., June 13, 1996. Oviposition 12:43 on main stem 25-cm up on 33-cm-tall flowering *T. divaricarpa*; Tinytown, Jefferson Co. Colo., June 18, 1997. Oviposition 10:51 on top of base of *L. argenteus* (white flowered var. with plane leaves) leaflet; preoviposition 13:34 she ignored *Astragalus flexuosus* 4X; Tinytown, Jefferson Co. Colo., June 1, 1994. Oviposition 12:42 *T. divaricarpa* young plant at junction of leaf base and two leaflets; oviposition 11:45 *L. argenteus* (white flowered var.) leaf uns of 10 cm plant with rather old leaves; Tinytown, Jefferson Co. Colo., June 22, 1995. Oviposition 13:21 on base of tiny leaf with 6-mm leaflets of 10-cm seedling *L. argenteus* (white-flowered var. with plane leaves); near Indian Creek Cgd., Douglas Co. Colo., July 6, 1995. Preoviposition 10:34 *L. argenteus*; Apex Gulch, Jefferson Co. Colo., June 11, 1999. Female bent abdomen on *T. divaricarpa* but flew, did not land on *L. argenteus*; Apex Gulch, Jefferson Co. Colo., June 21, 1995. Oviposition 12:47 uns of *A. flexuosus* stem where inflorescence joins two leaves; Tinytown, Jefferson Co. Colo., May 31, 1996. Oviposition 13:00 on *A. flexuosus* leaflet seen by Mike S. Fisher, W of Golden Gate State Park, Gilpin Co. Colo., July 3, 1999. **NEW HOST: *Astragalus canadensis*** (the plant is rare in Colo., and each year only 1-15 plants were seen at Tinytown, the only place I have seen the plant, and I have not seen it there for about 6 years). **EGG** usually has 14 vertical ribs (13-18). **MATURE LARVA** head has a small black spot beside coronal sulcus, a trait also visible in a photo of *persius* by Marc Minno (Emmel et al. 1992).

Erynnis afranius (Lintner). Oviposition 9:50 *Thermopsis divaricarpa* stem, N Golden, Jefferson Co. Colo., May 31, 1993. 7 larvae (three 2nd or 3rd stage, two 3rd, two 4th) found in nests of several *Lupinus argenteus* (or *lasalensis*?) leaves silked together near top of small to mature plants, 1 adult reared; John Brown Can., Mesa Co. Colo., July 29, 1993. **EGG** usually has 13-14 vertical ribs (12-16 in Jefferson Co. Colo.). **EARLY STAGES** from Mesa Co.: **2ND-STAGE LARVA** similar to 3rd-stage; head black, some larvae have an orangish streak on top side of face and an orangish spot on side of face. **3RD-STAGE LARVA** yellowish-green, heart-band dark-green, a dorsolateral yellow line, A10 greenish-tan; head black, often with a long orange-brown streak on upper corner of face, an orange-brown spot on side of face, an orange-brown spot in front of eyes. **MATURE LARVA** slightly-yellowish green (darker green than most Jefferson Co. larvae) with usual dark-green middorsal band and cream dorsolateral line; head black, with 3 orange or brownish-orange areas that are weakly connected by orangish-black (a large orange patch from upper end of adfrontal area extending to upper corner of face, a small orange patch on side of face, an orange patch in front of eyes that may connect to lower corner of frontoclypeus (the head is blacker and the patches orange than most Jefferson Co. larvae, although a 1991 Jefferson Co. larva has a head as dark). **PUPA** same as Jefferson Co., heart-band darker-green, before hatching appendages and rear of abdomen turn reddish-brown and eyes turn black, then whole pupa turns black; pupa suspended in nest on silken girdle (around wings) which is shaped like a tuning fork (attached on both upper arms and at base of short lower handle).

ERYNNIS: SUMMARY OF IMMATURES (tables 1-2). **EGGS** have about 12-20 vertical ribs, and the number is rather variable within each species, although some species seem to differ in average number: *E. icelus* seems to average fewer ribs (fewer than *brizo*), and *E. telemachus-juvenalis-tristis* may average more ribs. All species lay cream eggs, which

turn bright red or orange in all species, except *E. martialis* eggs turn only light-orange, and *E. pacuvius* eggs undergo almost no color change. **OLDER LARVAE** of most species have been reared by myself (7 species), and by others (Allen 1997, Tveten & Tveten 1996, Emmel et al. 1992, Minno & Emmel 1993, Wagner, 2005, Allen et al. 2005). Mature larvae always have a whitish-green body (pale because of numerous cream seta bases). The collar is pale (not black) in all species. All have a darker-green heart-band. All have a narrow pale dorsolateral band, which is usually cream, but may be yellowish-cream, and the color seems to vary individually somewhat (diapausing mature larvae seem to become rosier in body color as happens in other Pyrginae such as *Pholisora* and *Pyrgus*) and so does not seem to vary taxonomically very significantly; the only oddity is the orangish-yellow spot in the band on the rear of each segment in *E. zarucco terentius*. The **MATURE LARVAL HEAD** pattern and shape are different in nearly all species, so are quite useful for identification (Table 1). The surface of the head is covered with a network of raised lines (ridges like miniature eskers) in *E. icelus/brizo*, while in the other species the head is covered with small bumps. There is a large squat **BLACK W** on the face in *E. baptisiae/lucilius/afranius* (sometimes brown in *afranius*) and *E. zarucco terentius/funeralis*, whereas the W is absent in the other species. Above the black W on the forehead, there is a pair of blackish spots/bumps (one on either side of the coronal sulcus) in *E. persius*, *E. baptisiae/lucilius/afranius*, and *E. zarucco terentius* (but not in at least some *funeralis*), whereas the pair of black spots is missing in the other species. The lateral part of top of head is extended upward a little in all species to form a transverse ridgelike mound topped with some tiny bumps (*E. martialis* has the largest bumps); this mound is higher than usual in *E. baptisiae/lucilius/afranius*, and *E. pacuvius* has the mound extended into a low wide "horn" covered with bumps. On Table 1, the pale (yellow to orange) patches on head are numbered thus: 1 on front of head lateral to top of frontoclypeus; 2 on vertex (front of top of head lateral to coronal sulcus)(patches 1 and 2 are often joined into a combined patch labeled 1-2); 3 on side of front of head; 4 a small area lateral to 3 nearly on side of head, above eyes (3 and 4 are often joined into a combined patch labeled 3-4); 5 on gena (lateral to clypeus, medial to eyes); 6 on frontoclypeus. In addition most species have a pale area behind the anterior eyes and around the solitary eye, though this area is black in some (*icelus*, *martialis*, *zarucco*, *tristis*). The extent of pale coloration on the head varies individually to a considerable extent, so may not be a very good taxonomic character, although the head seems to average paler in *E. icelus* and *E. juvenalis/telemachus/horatius*. In *E. juvenalis/telemachus/horatius*, pale spot #1 is absent, whereas it is present on the other species. The dorsalmost eye is always creamy with a ventral black patch, whereas the eyes below it are black. **MATURE LARVAE HIBERNATE** in all species, and the body loses green--becomes yellowish-cream--in all species; *E. brizo* was noticed to develop a peach color on thorax and rear, and an Ont. mature larva has rosy thorax and rear, even though its middle is greenish; and *E. pacuvius* became rosier on front and rear while its body was green, evidently when nearing diapause; *E. afranius* becomes more orangish-peach on front and rear and on intersegmental areas. **PUPAE** are generally green, though a few species are tan or brown or black; all have the large black T1 spiracle, and a slightly-darker heart-band. **ERYNNIS EVOLUTION**. Using the above data on *Erynnis* oviposition and immatures, together with other data on adult morphology and the operation of the valvae during mating, we can formulate a rather robust picture of how the *Erynnis* evolved. This should prove helpful, because Burns (1964) was uncertain about the origin of *E. martialis-pacuvius*, *E. zarucco-funeralis*, and the *E. persius* group.

From the above data, some useful taxonomic characters can be extracted. *E. icelus-brizo* oviposit on seedlings, unlike the others, whose larvae seem to eat new growth of older plants and mature larvae may end up eating mature leaves. Eggs change from cream when laid to orange or red in most species, but only darken to light orange in *martialis* and barely darken to tan in *pacuvius*. The older larva head has esker-like ridges in *icelus-brizo*. The older larva head has a blackish spot beside coronal sulcus in *persius/lucilius/baptisiae/afranius* and in *zarucco* (but not *funeralis*). The front of the older larva head has a blackish blotch shaped like a butterfly (a bit like a W) in *lucilius/baptisiae/afranius* & *persius* (merely dark brown) and *zarucco/funeralis*. The older larva head has larger "horn" bumps in *martialis-pacuvius*. The older larval head lacks pale patch #1 (beside coronal sulcus) in *juvenalis-telemachus* & *horatius*. The older larva head has the pale patches orangish in most species, but they are bright neon-orange in *juvenalis-telemachus*. The older larva head ground color is somewhat variable but seems to be dark in most species, but is light to dark in *icelus-brizo*, and is pale in the oak feeders *juvenalis-telemachus-propertius-horatius-tristis*. The pupa is hairier in *martialis-pacuvius*.

A new character seems useful to help deduce their evolution. During mating, the valvae operate in peculiar fashion, as they squeeze the female's abdomen about once per second as mating proceeds, without damaging her scent-producing organs. Scott (1978) reported that in *E. persius*, the male bends his left valva in its middle and scrapes it across her sternum! Numerous observations on *persius* and other *Erynnis* have been made since (I have found ~25 mating pairs of *persius*, and fewer of the other sp.). In *persius*, the male flexes his **left** valva inward (the middle and lower processes bend inward) and scrapes it across her sternum 7 about once per second, while the upper process of left valva hooks dorsally over the right edge of her sternum 7, and the right valva lower process presses the membrane just above her sternum 7 inward. *E. telemachus* scraping is similar. In *E. pacuvius*, the male squeezes her abdomen as usual, but his fairly-short left valva merely grips her abdomen and his **right** valva scrapes moderately over the left side of her reddish sternum. In *E. martialis*, the left valva is fairly short and stays bent a little as he holds her abdomen in position, or bends and scrapes less often, while his right valva (which has an orangish-tinted pointed tip) bends and scrapes-squeezes the membrane anterior to her lamella often (both valvae press on the membrane anterior to her lamella, not on lamella itself). In *E. brizo*, both of his

Table 1. *Erynnis*: distinguishing characters of larvae.

Species	Head Three "Horn" Bumps	Head Dark Color	Head, Color of Pale Spots/Patches	Head Pale Patch Shape	Head Postgena	Head Blackish "W" Butterfly Blotch on Lower Front
<i>icelus</i>	absent	pale-black or pale-brown	orange-brown or tan	1 (1-2), 3, 4, 5 weak, (6)	rather dark	none
<i>brizo</i>	absent	black to tan-brown	ochre to creamy or orangish	1,2,3,4, 5 strong, 6	pale	none
<i>martialis</i>	three big cones	black	orangish-tan with creamy bumps	2 large, 3-4 large, 6	black	none
<i>pacuvius</i>	three on big hill	brown	orangish	1-2,3,4, 5,6	pale	none
<i>juvenalis</i>	weak	light-brown or tan	neon-orange, or neon-ochre	2,3-4,5, 6 weak	weak orangish	none
<i>telemachus</i>	weak	light-brown	neon-orange	2,3-4,5, 6 weak	weakly orangish	none
<i>propertius propertius</i>	weak	light-brown	pale-orange	1, 4 or 3-4,5	dark?	none
<i>horatius</i>	weak	light-brown	orange	2,3-4,5	dark?	none
<i>tristis tristis</i>	a low mound	pale-brown or orange-brown	pale-orange	1 weak, 2,3-4,5, 6	dark-brown	none
<i>zarucco terentius</i>	weak	blackish-brown or brown	orangish-yellow	1-2,3-4, 5,6	black	present
<i>funeralis</i>	weak or small	black or brown	yellow, or ochre, orange	1-2,3-4, 5, ?6 weak	fairly dark	present
<i>persius</i>	small	dark-brown or black	cream	1-2,3-4, 5,6	cream	present (brown)
<i>lucilius</i>	small	black	whitish to orange-brown (or none)	1-2, 3-4, 5, 6 weak (or none)	dark?	present
<i>afranius</i>	small	brown	ochre to orangish	1-2,3-4, 5,6	pale (orangish etc.)	present
<i>baptisiae</i>	small	black or light-brown	ochre (sometimes absent)	1-2,3-4, 5, 6 weak (all weak in some)	dark?	present

Table 2. *Erynnis*: distinguishing characters of larvae, pupae, and eggs.

Species	Head Black Spot near Coronal Sulcus	Body dorso-lateral stripe	Egg Ribs	Mature Egg Color	Pupa Colors	Pupa Hairs
<i>icelus</i>	absent	cream	12-14	dark red	green, or reddish-brown	short hairs
<i>brizo</i>	absent	cream, or pale yellow	15-18	red	tanish-cream (brown or dark-green)	few, very short
<i>martialis</i>	absent	cream	14-17	light orange	greenish-tan (green or brown)	hairy
<i>pacuvius</i>	absent	cream	15 (17)	tan-cream (no change)	black (brown intersegm. on abdomen)	hairy
<i>telemachus</i>	absent	cream	16-18	bright red	----	----
<i>juvenalis</i>	absent	cream, or yellower on front or all along in each segment	16-18	red or pinkish-red	tanish-cream (reddish-brown front) (dark-green or brown)	sparse, fairly short
<i>propertius propertius</i>	absent	----	---	----	pale (?green)	----
<i>horatius</i>	absent	cream, or yellower on front in each segment	13-(?)	orange (pink or reddish)	pale-green, often black front; dark green to brown	short hairs
<i>tristis tristis</i>	absent	yellowish-cream	18-20	deep-orange	olive-gray, wings much darker	short hairs
<i>zarucco terentius</i>	present	cream, with orangish-yellow spot on rear of each segment	---	orange	light-green	short hairs
<i>funeralis</i>	absent	yellowish-cream	12-16	orange	vivid green, yellowish clouding on wings	short hairs
<i>persius</i>	present	cream	14 (13-18)	orange	dull olive-green, abd. pinkish-brn.	short hairs
<i>lucilius</i>	present	cream, or yellowish-cream	12-15	pink or red	pale-green	----
<i>afranius</i>	present	cream	13-14 (12-16)	reddish orange	light-green, turning smokier anterior	short hairs
<i>baptisiae</i>	present	yellowish-cream	---	pink	pale-green (green to brown)	short hairs

valvae bent in the middle to squeeze her abdomen, but his right valva bent more often and bent farther, but neither valva scraped fully across the female sternum. Thus it appears that *E. icelus-brizo* are **ambidextrous**, while *E. martialis-pacuvius* have become **right-handed**, and the remaining species have become **left-handed**.

Burns' (1964) study of *Erynnis* provided good morphological traits. He gave no figures unfortunately, so for reference look at the genitalia drawings in Scott (1986, fig. 71). Subgenus *Erynnis* (*icelus*, *brizo*, & *mercurius* in America, plus *tages* & *marloyi* in Eurasia) have the male right & left valvae nearly symmetrical, whereas subgenus *Erynnides* (all the other American species) have the valvae very asymmetrical. The subgenus *Erynnis* lacks translucent white fw spots (present in *Erynnides*), and has a chainlike row of upf postmedian spots, unlike the *Erynnides*. All *Erynnis* species have a transverse dorsal belt of scent scales on tergum 7 of females (see Scott 1986 fig. 39 on p. 58 for these pheromone structures). All except *E. mercurius* have a costal fold on the leading edge of the fw of males. *E. icelus-mercurius*, plus *E. zarucco-funeralis* and *persius-lucilius-baptisiae-afranius*, have a tibial tuft (a plume of scent scales on the tibia of the hind leg of males), which *E. brizo* and *E. martialis-pacuvius*, and the *juvenalis*-group lack. The females of all species, except *E. icelus-mercurius-brizo* and *E. martialis-pacuvius*, have a pair of scale-tuft "hair pencils" on the underside of the female abdomen (on the membrane between sternum 6 & 7). Burns showed that numerous species independently developed white hw fringes in the S (toward Mexico) portion of their ranges, an interesting convergence.

ERYNNIS EVOLUTIONARY TREE. Now we can construct the phylogenetic tree. The first group to split off the ancestral line was subgenus *Erynnis*, which developed oviposition on seedlings, eskerlike ridges on the larva head, the fw lost the translucent white fw spots and gained a chainlike postmedian row on upf. *E. brizo* fed on oaks, and lost its tibial tuft, while *mercurius* branched off the *icelus* line and lost the costal fold. *E. icelus* fed on Salicaceae and legumes. The ancestral line then became subgenus *Erynnides* as it developed more asymmetrical valvae, and those valvae developed handedness during mating (one is bent more than the other). The *martialis-pacuvius* line evidently branched off here, and turned to *Ceanothus* as hostplants, lost the tibial tuft, the valvae became right-handed (the valvae are not as asymmetrical as the remaining *Erynnides*), the eggs lost most of their color change, the larva head developed larger "horn" bumps, and the pupa became hairier. *E. martialis* branched away and lost the middle process on both valvae, while *E. pacuvius* completely lost the egg color change. Meanwhile in the ancestral *Erynnides* line, the valvae became even more asymmetrical and became left-handed, and the female developed hair pencils between sternum 6-7. Then the *zarucco-persius* line branched off evidently, and this line became legume feeders, the larva developed a black spot beside coronal sulcus, plus a blackish W on front of head. The *E. funeralis-zarucco* line branched off here, and developed unique valvae (left valva middle process became knoblike, right valva lower process shortened). *E. funeralis* split off and developed its narrower fw (to help it migrate?, as it seems to have the greatest dispersal of any *Erynnis* sp.), and it lost the spot beside coronal sulcus (or that spot is individually variable), while *E. zarucco* was the other branch (its upf resembles *E. baptisiae* somewhat). (I list *funeralis* as a separate species from SE U.S. *zarucco terentius* here because the fw shape differs [I lumped them in my book because the genitalia and hosts etc. are the same], although noone has investigated this situation fully so there is no good information on whether they hybridize where they meet.) On the *persius*-group branch, the right valva upper process became hoodlike in shape. *E. persius* branched off first, and developed a large keel on the inside of the middle process of the left valva, and hairier male upf. *E. lucilius-baptisiae-afranius* is the other terminal branch here, a messy group recently speciated as they are often difficult to identify and replace each other geographic somewhat (there are records of *lucilius* now from northern Canada that are evidently properly identified--often by Burns himself--but are an unmapped unpublished mystery). Back on the ancestral *Erynnides* line, the final branch became oak feeders, the tibial tuft was lost (evidently independently from the same loss in *martialis-pacuvius* and *brizo*) the middle process of left valva became foot-shaped, the larva head ground color became pale, and the pale patch #1 on the larva head was lost. This branch split into *juvenalis-telemachus* and *propertius-horatius-tristis*. The *juvenalis-telemachus* branch developed the pale circle near the unh apex, the right valva upper prong became a hook, and the larva head pale patches became bright neon-orange. The other branch split into two branches, *propertius-scudderi* which has a narrower upper process of left valva, and *horatius-tristis* which developed a wider dorsal process of the left valva and a stubbier lower process of the right valva. *E. scudderi* is a mystery species, and almost nothing is known about it not even its host (presumably oaks as it is in an oak-feeding group—the way to raise the immatures that eat bushes/trees is to place females into net bags around young oak leaf branches, and return repeatedly to harvest the immatures), so I'll just leave it near *juvenalis* & *horatius* where Burns placed it based on a few similarities of the genitalia etc., though even that is peculiar as the left valva is mouselike with funny little "ears".

It's obvious from the data that there are four groups of *Erynnis*: *icelus-brizo*, *martialis-pacuvius*, *zarucco-funeralis-persius* group, and *juvenalis-telemachus-propertius-horatius-tristis*. Many characters support those branches. The only points of possible controversy are how those groups are related, specifically whether *martialis-pacuvius* is a sister group of *icelus-brizo* or of the last two groups, and whether the *zarucco-persius* group branched off before or after the *martialis-pacuvius* group. Two to three characters support the placement given above for each of these branches. The above evolutionary scenario was deduced from morphological-behavioral-ecological characters. Today, it's getting less and less expensive to sequence DNA, so it will be interesting to compare the above tree with that derived in the future from DNA. But I am not necessarily expecting superficial sampling of DNA to yield good results, as the study of long strings of

mtDNA of *Phyciodes* that I assisted provided few useful results as the mtDNA was quite variable and overlapped greatly between species, see Wahlberg Oliveira & Scott, System. Ent. 28:257-273, 2003. Actually mtDNA is not linked with the genes that cause reproductive isolation, so mtDNA haplotypes can spread rather easily between all the taxa that rarely hybridize, and so mtDNA would seem to be a very poor choice for studying phylogeny.

Pyrgus centaureae loki Evans. Oviposition 12:15 on *Vaccinium cespitosum* next to *Potentilla diversifolia* (W), and preoviposition on another *P. diversifolia* plant, Loveland Pass, Summit Co. Colo., July 17, 1977. Preoviposition 10:53, she landed on *Dryas octopetala hookeriana* and landed next to *P. diversifolia*, Loveland Pass, Clear Creek Co., Colo., July 19, 1989. Oviposition 10:34 *V. cespitosum* leaf underside (*V. cespitosum* 4-100 common, *Potentilla diversifolia* 3, 4-10, 10, 20, 17-50 thick, 80, *Trollius laxus* 6 onward, *Polygonum viviparum* 6, *Gentianella acuta* 7 onward, *Erigeron ursinus* 20, *Caltha leptosepala* 10, *Pedicularis groenlandica* 6, *Castilleja rhexifolia* 20, *Viola labradorica* 8, 9, etc.); preoviposition 11:15 rested on *Salix brachycarpa* 2X; Loveland Pass, Summit Co., Colo., Aug. 2, 1993. Oviposition 11:33 *V. cespitosum* leaf underside (*V. cespitosum* 0-100 common, *Sibbaldia procumbens* 1-5, 7-25, 15, 22-55 onward, *Potentilla diversifolia* 12, 30, 80, 100, *Arnica rydbergi* 4-100 common, *Sedum ?rhodanthum* 8, 20, ?*Gentianella acuta* 1, 3, 5, 7, etc. common, *Viola labradorica* 4, 7, 10, 15 etc. common, *Erigeron ursinus* 6, 20, 25 etc. common); Loveland Pass, Summit Co., Colo., Aug. 11, 1993. Oviposition 13:28 on *V. cespitosum* basal leaf underside (*V. cespitosum* 2, 5, 5, 10-100 cm common, *Trifolium parryi* 8, 8, 15, 30, 60, 100, *Agoseris glauca* 9, 12, 15 common, *Senecio fremonti* 10, 20, 30 etc., *Viola labradorica* 8, 8, 15, 20, 20, 35 etc., *Potentilla diversifolia* 35, 45, 80, 100, *Sibbaldia procumbens* 35-100, 100, *Artemisia* sp. 17, 20, 25, 30, 35, 40, 50 etc.); same female bent abdomen 13:30 on *V. cespitosum* but flew when her abdomen contacted *Antennaria parviflora*; Loveland Pass, Summit Co., Colo., Aug. 12, 1993. **HOSTPLANTS:** Obviously *Vaccinium cespitosum* is a hostplant, because all four ovipositions I have seen were on it, and young lab larvae ate *V. cespitosum* well and preferred it to *Potentilla diversifolia* and *Sibbaldia procumbens* (older larvae were given and ate *Fragaria virginiana glauca* and [usually] cultivated *Fragaria* in lab). *Potentilla diversifolia* must be deleted as a host record (even though it is probably an occasional or frequent host in nature) since there are no records; Scott (1992) claimed that this was the real host, based on its proximity to the 1977 egg rather than to the actual *V. cespitosum* oviposition substrate, but the data now show that females INTEND to lay eggs on *V. cespitosum*. Lab larvae do eat various Rosaceae, and *Potentilla* and *Fragaria* are known hosts elsewhere (Michigan, Maryland), but my data show that *P. centaureae* is much more polyphagous than was previously thought. It is **yet another polyphagous bog butterfly**. **DIAPAUSE STAGE** mature larva. **EGG** yellowish-cream, ~21 vertical ribs. **1ST-STAGE LARVA** yellowish-gray, later greenish-gray due to food (body covered with tiny cream setae), heart-band darker gray, suranal plate long (narrow side-to-side) and blackish, a wide black collar; head black with long cream setae. **2ND-STAGE LARVA** light-brown, turning yellowish-green, heart-line brown, two cream-tan dorsolateral lines close to each other, collar black (narrow from side-to-side); head black. **HALF-GROWN LARVA** light-greenish-brown, middorsal darker-brown line edged by tan, a slightly-darker brown dorsolateral band edged by two tan lines, suranal plate dark, spiracles orangish, legs black; collar & head black. **OLDER-MATURE LARVA** light slightly-olive-greenish-brown, heart-line darker-brown, a slightly-darker brown dorsolateral band edged by two tan lines, A10 little darker than rest of body (no dark suranal plate), legs black, collar brown with a dorsal transverse dark-brown dash with a blackish lenticle below it and a long black linear sclerite near rear of top of collar; head black.

Pyrgus ruralis ruralis (Bdv.). Adults (present in prior years) associated with *Potentilla (gracilis) pulcherrima* (hundreds of plants), *Potentilla hippiana* (1 plant seen), *Potentilla pensylvanica* (~1 plant seen along hwy.); nr Golden Gate Can. State Park, Gilpin Co., Colo., Aug. 18, 1992. Probably *P. pulcherrima* is a host here, based on adult association.

Pyrgus xanthus W. Edw. Two empty nests found on *Potentilla hippiana* (1st nest formed of terminal 4 [of 7] leaflets bent upward and silked together, 3 of these leaflets much-eaten; 2nd nest formed of terminal five [of nine] leaflets, one subterminal left-side leaflet twisted upward and over to two leaflets on left side of leaf and two other leaflets silked to edge of nest, three leaflets eaten); SW Como, Park Co., Colo., Sept. 25, 1992. Two empty nests found on *P. hippiana* (in 1st nest, a green terminal leaflet folded over the two other terminal leaflets [one drier] and a leaflet just basad also silked into the nest, three leaflets basal to the nest were mostly-eaten on the nine-leaflet leaf)(in 2nd nest, the terminal three leaflets of a green leaf were bent over three leaflets of a drier leaf to form the nest, and four green leaflets basal to the nest were heavily eaten)(both leaves had nine leaflets each); *P. hippiana* common, *Potentilla pulcherrima* fewer, one hybrid *P. hippiana* X *pulcherrima*, *Potentilla pensylvanica* commonest (one blooming); Rosita, Custer Co., Colo., Sept. 26, 1992. Empty nest (on an 11-leaflet leaf, three terminal leaflets and the edge of a 4th were bent upward and silked together to form the nest, four leaflets basal to the nest were heavily eaten) found on *P. hippiana*, which was common; NE Rosita, Custer Co., Colo., Sept. 26, 1992. Adults associated with *P. hippiana* (2 male *P. xanthus* coll. Ray Stanford, plant det. J. Scott), 4 mi. S Elbert, Elbert Co. Colo., May 1993. **HOSTPLANTS:** Though no larvae have been found on *P. hippiana*, five empty nests were found on it which could have been made only by *P. xanthus*, and adult association is strong with *P. hippiana*, so it is a host; I will treat it as a less popular host than *P. pulcherrima* because females prefer to oviposit inside flowers, and *P. pulcherrima* blooms during the flight period, whereas *P. hippiana* blooms later (in July).

Pyrgus communis communis (Grote). Ovipositions 12:20, 12:32 on tiny immature leaves, oviposition 13:53 on tiny petiole of immature leaf, all on tiny *Sphaeralcea coccinea* plants so the larva must hope the leaf grows along with the larva;

E Morrison, Jefferson Co. Colo., Sept. 14, 1992. Ovipositions 12:40 at junction of root and very young leaf of seedling, 12:42 on underside of tiny young leaf at center of seedling, 12:43 on underside of small leaf of tiny seedling, egg found under small leaf of this seedling, all on *Malva neglecta*; Wheatridge, Jefferson Co. Colo., Sept. 16, 1993. Adults associated with *M. neglecta*; Wheatridge, Jefferson Co. Colo., Aug. 27, 1994. Oviposition 11:27 *M. neglecta* mature leaf uns; Red Rocks, Jefferson Co. Colo., July 22, 1997. Oviposition 12:39 *M. neglecta*; Lakewood, Jefferson Co. Colo., Aug. 31, 1997. Oviposition 11:16 on ups of grass blade (?*Digitaria sanguinalis*) 4 mm from *M. neglecta* 2 cm wide leaf (she landed on the leaf and crawled across it, bent abdomen forward & laid egg on the grass); Lakewood, Jefferson Co. Colo., Sept. 6, 1999. Adults associated with *Sphaeralcea neomexicana*; San Pablo, Costilla Co. Colo., Sept. 7, 1998. Pupa found in silked-leaf nest in lettuce *Lactuca sativa* var. *crispa* (not a host) leaf in garden, ~4 cm above ground, male emerged Aug. 16, Lakewood, Jefferson Co. Colo., Aug. 12, 2003. **DIAPAUSE STAGE:** mature larva. **EGG** yellowish-cream, ~31 vertical ribs. **1ST-STAGE LARVA** yellow-cream, heart-band slightly darker, setae brown, suranal plate black and narrow side-to-side, legs black; collar and head black. **HALF-GROWN LARVA** slightly-dark-cream, heart-band brown, a dorsolateral tan band edged by two cream lines; collar & head brown. **OLDER-MATURE** yellow-green, heart-band dark-green, a green dorsolateral band edged by two yellowish lines, a weak paler band encloses ochre spiracles a weak paler lateral band, legs black, collar widely black on rear and narrowly black on front with middle light-red, neck blackish; head black with numerous cream setae. **DIAPAUSING MATURE LARVA** the same except top of abdomen (including dorsolateral band) suffused with bright pinkish-red (the contrast with green sides makes larva very pretty). **PUPA** olive-green on thorax & wings, A1-4 greenish-tan on one pupa and tan on another, (another pupa tan all over and just a little olivaceous-tinted on mouthparts and wing bases), A5-10 tan, T1-head tan, some transverse brown dashes on top of head, a dark-brown W (the outer arms short) on front of top of head, a brown streak beside labial sclerite, orbit brown, a middorsal brown line on T1-2, pupa covered with numerous black spots including a conspicuous near-middorsal and a subdorsal row of spots and a row of small spots below spiracles (and tiny brown supraventral spots on abdomen), edges of proboscis & legs and joints of antenna and edges of wing veins dark-brown (these brown lines on appendages & wings are much stronger on one male than on others), T1 spiracle blackish-brown, A2-7 spiracles black, A8 spiracle a black slit, cremaster dark red-brown with many red-brown crochets, pupa covered with long white hair except on wings.

Pholisora catullus (Fabr.). 13 mature larvae & 9 half-grown to 2/3-grown larvae found on *Amaranthus retroflexus* (few plants were searched yet they had many larvae); 1 mature and one 2/3-grown larva found on *Chenopodium berlandieri* (few plants had few larvae); 3 half-grown larvae found on *Amaranthus palmeri* (1 plant had 3 larvae); hundreds of *Atriplex heterosperma* plants had no larvae; Barr Lake, Adams Co. Colo., Sept. 3, 1992. 26 larvae (half mature, half 4th-stage) found in *A. retroflexus* leaf nests; 4 larvae (2 mature, 2 4th-stage) found in *A. palmeri* leaf nests; no larvae found on ~6 *C. berlandieri* or many *A. heterosperma*; Barr Lake, Adams Co. Colo., Sept. 8, 1992. 5 larvae (three 4th-stage, two 5th-stage) found on *A. retroflexus*; no larvae found on ~2 *A. palmeri*; no larvae were found on ~40 *C. berlandieri*; Cherry Creek Res., Arapahoe Co. Colo., Sept. 9, 1992. No larvae found on *A. retroflexus*, *C. berlandieri*, or *C. album*; NW Aurora Res., Arapahoe Co. Colo., Sept. 9, 1992. 1 mature larva & 7 empty nests found on *A. retroflexus* (the favorite); one 3rd-stage larva & 3 empty nests found on *C. berlandieri* (many plants checked); 5 eggshells (4 on leaf tops, 1 beneath) and 1 empty nest found on *Amaranthus albus* (4 plants checked); Green Mtn., Jefferson Co. Colo., Sept. 10, 1992. Larval nest seen on *A. retroflexus*; no nests or larvae found on few *C. berlandieri* and none on many *Atriplex patula*; 120th X I-76, Adams Co., Colo., Sept. 15, 1992. No larvae found on many *A. patula*; Wheatridge, Jefferson Co. Colo., 1991-1992. 25 larvae (most mature) found on *A. retroflexus* (very common on this plant); 2 mature larvae on *Amaranthus blitoides=graecizans* (many plants had fewer larvae); 2 larvae (1 mature, one 2/3 grown) found on *C. berlandieri* (many hundred plants searched); no larvae found on ~10 *C. album*; no larvae found on 1 *Atriplex ?patula*; Van Bibber Creek, Jefferson Co. Colo., Sept. 17, 1992. 2 near-mature larvae in rolled *A. retroflexus* leaves, Oak Creek Can. (S of Canon City), Fremont Co. Colo., Sept. 1, 1993. 2 small & 3 large larvae on *A. retroflexus*; 1 larval nest on *A. blitoides*; Van Bibber Creek, Jefferson Co. Colo., Sept. 4, 1993. 2-3 empty leaf tube shelters found *Amaranthus palmeri*; Barr Lake, Adams Co. Colo., Sept. 1, 1994. Oviposition 10:15 center of leaf top of *Chenopodium* sp. seedling, I-76 SE Crook, Logan Co. Colo., June 13, 1995. Leaf nests on 2 *A. retroflexus* plants; Barr Lake, Adams Co. Colo., 5075', Sept. 9, 1996. **HOSTPLANTS:** *Amaranthus retroflexus* is obviously the most frequent host, and other *Amaranthus* are also popular (*A. blitoides*, *albus*, *palmeri*); *Chenopodium berlandieri* is sometimes eaten. *Atriplex heterosperma* & *A. patula* are shunned even though in overall appearance they look suitable. Previous Colo. records of *Chenopodium album* were evidently misidentified *C. berlandieri* (misidentification was certainly true for the former record from Green Mtn., where I recently found that *C. berlandieri* is eaten, not *C. album*), because *berlandieri* is more common and has larger leaves that resemble my recollection of the plants that I previously identified as "*C. album*", and recent searches of both *Chenopodium* species produced larvae only on *berlandieri*; therefore I am removing *C. album* from the Colo. hostplant list. Larval nests are most common near the top of the plants. **EARLY STAGES** from Colo.: **EGG** brownish-red on top with ~9 (7-8 in Ont.) prominent wide vertical ribs on top of egg, and more vertical ribs (~19) on side of egg, all these ribs connected by many cross-ribs, sides reddish-cream, a reddish-gray sunken micropyle area. **1ST-STAGE LARVA** orangish-light-yellow, collar black, neck red; head black. **MATURE LARVA** dull grayish-green, yellow-green in intersegmental areas, a tiny pale dot beneath each of the numerous short knobbed tan hairs, heart-band green, a weak yellow-cream suprspiracular band, T1 cream (yellowish anteriorly),

collar black (divided by cream middorsally), legs blackish; head black with short tan hairs. **MATURE LARVA IN DIAPAUSE:** the integument becomes somewhat crimson-green, so that where the body bends—where the semi-transparent integument piles up in folds so less of the green internal tissues are visible--the integument becomes bright crimson; thus the body becomes quite crimson where the integument piles up and slightly-reddish-green where the integument is stretched. **PUPA** reddish-brown, T1 & head blackish, orbit & appendages & wings orange-brown, but pupa covered all over with a bluish-white waxy bloom, so that pupa appears whitish with blackish grooves and pits and seta bases, intersegmental areas A4-5, A5-6, A6-7 orange-brown, the protruding T1 spiracle red-brown with black center, numerous setae on head, top of thorax, and abdomen (the setae are shorter [$\sim 1/3$ mm in length] than those of *P. mejicanus* [Scott 1992 erroneously stated the setae were $1/2$ mm long]).

Hesperopsis libya lena (W. Edw.)(=*confertiblanca* J. Scott 1992). Male *confertiblanca* resemble the male *lena* (Edw.) lectotype figured by F. Martin Brown (1975)(from "Montana"), so I will consider *confertiblanca* a synonym until proven otherwise.

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Discussion

The study of hostplants of central Colorado butterflies is now rather mature, so that random observations are now unlikely to demonstrate anything new. Confident conclusions can now be made. Many surprising hostplant associations were found, especially among grass & sedge feeders. One grass/sedge feeder eats any kind of grass or sedge. One chooses its grass hosts by bunchgrass shape rather than plant taxonomy. Some species—the haygrass guild--choose many different taxa of haygrasses, but not turfgrasses or bunchgrasses. Some species prefer sedges in the shade, while others prefer the same kind of sedges in the sun. Some choose only marsh sedges. Some choose only one grass species, evidently due to some biochemical peculiarity. Some butterflies lay eggs without glue. Some shoot their eggs off into space with glue. Some glue their eggs into holes in twigs. Some lay eggs on dead leaves. Some lay eggs on dead twigs.

These behaviors seem odd to us, but each species seems to survive well with its own peculiar behavior, as enough aspects of its behavior and ecology have adapted to the peculiar host/oviposition choice to enable the species to survive. But overall, predicting the hostplant specificity of a butterfly before it has been studied seems difficult, and the details of hostplant specificity almost seem to be random, when viewed from afar, as all kinds of odd choices and behaviors are scattered about among the species. It would seem that a given butterfly can survive eating almost anything, as long as it is allowed to adapt to that food and develop adaptations of egg placement and time of flight and habitat etc. that correspond to that food. Butterflies elsewhere are even known to eat plant/animal detritus, aphids, ant larvae, etc.

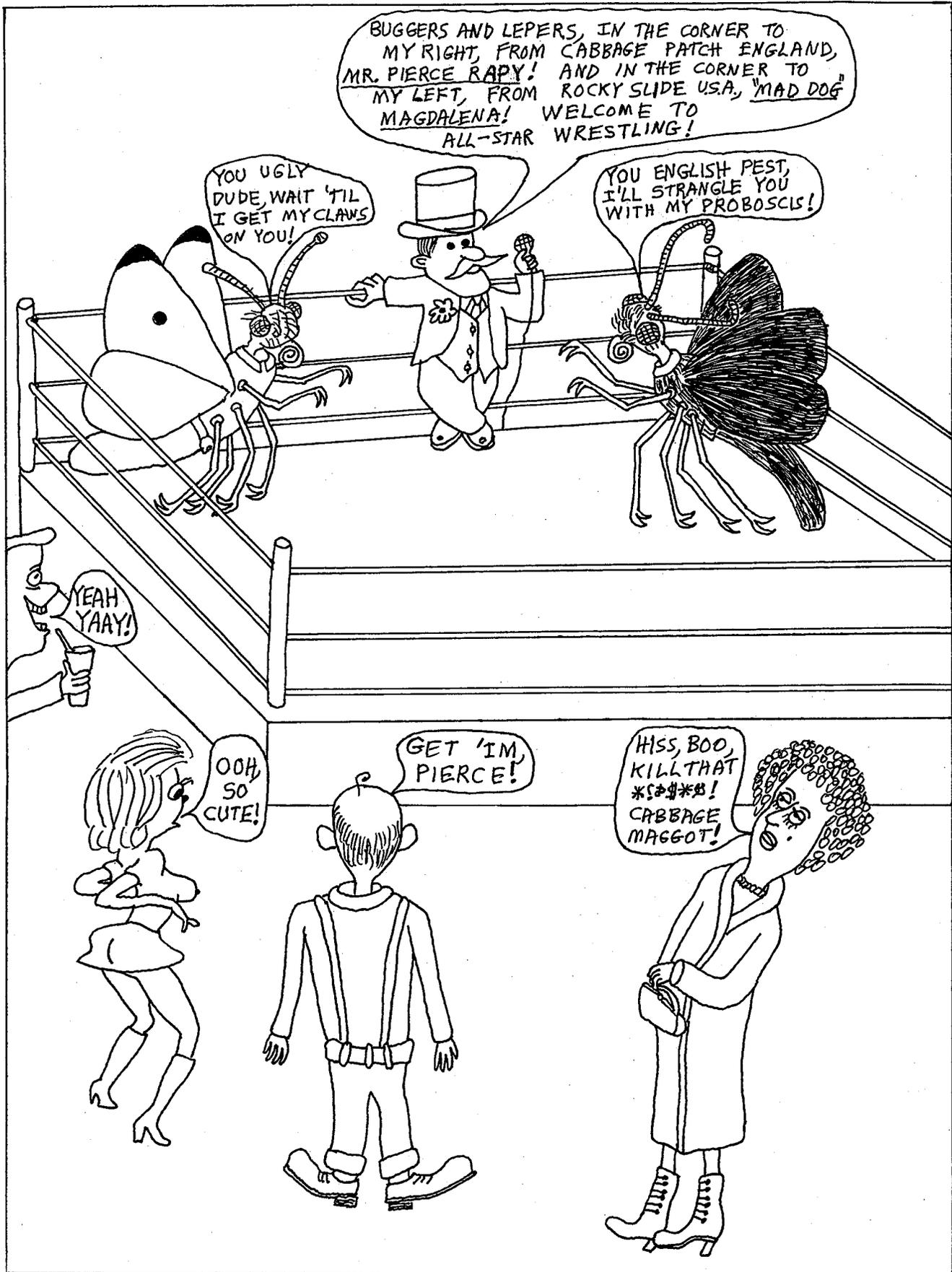
Literature Cited

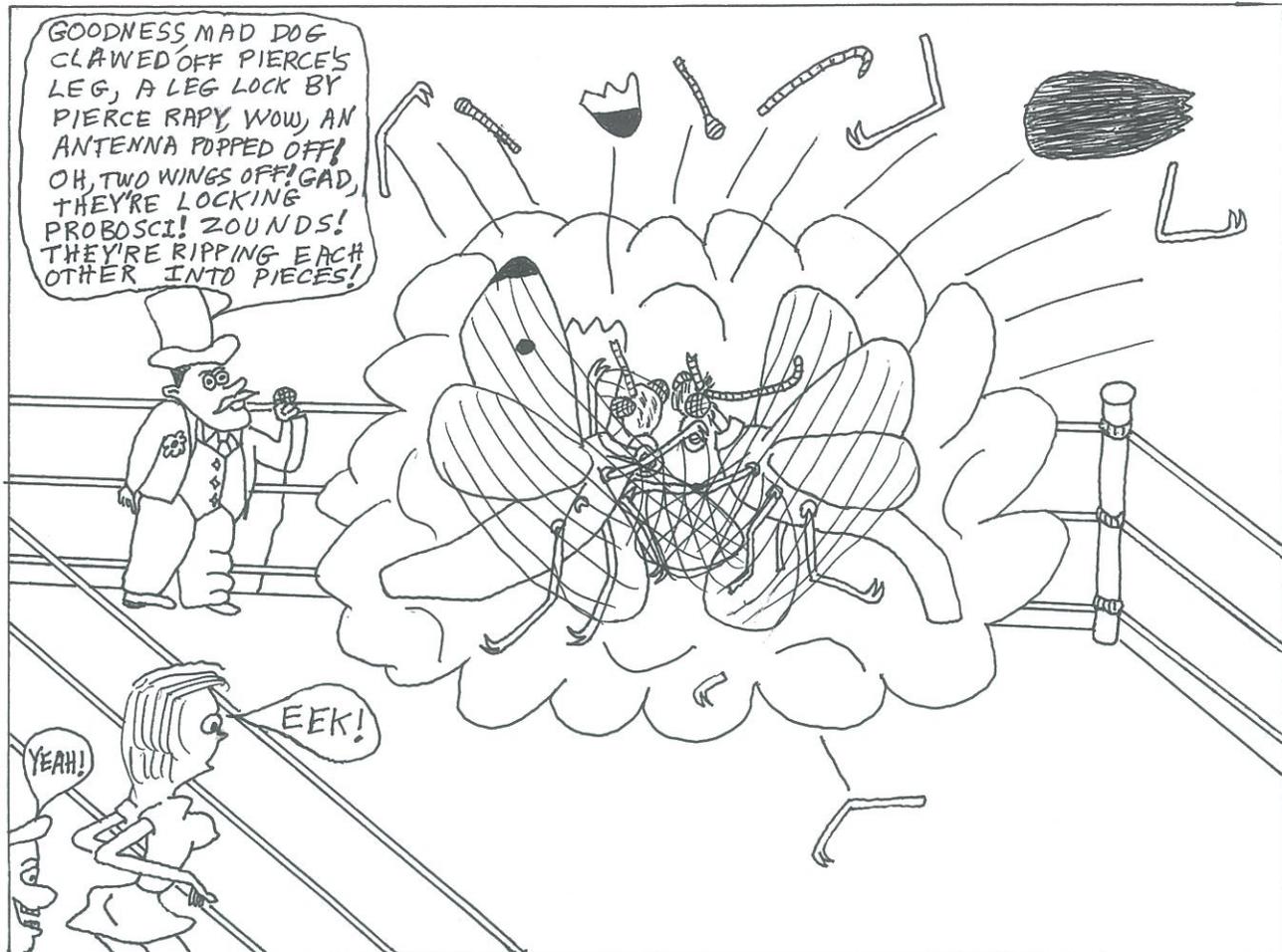
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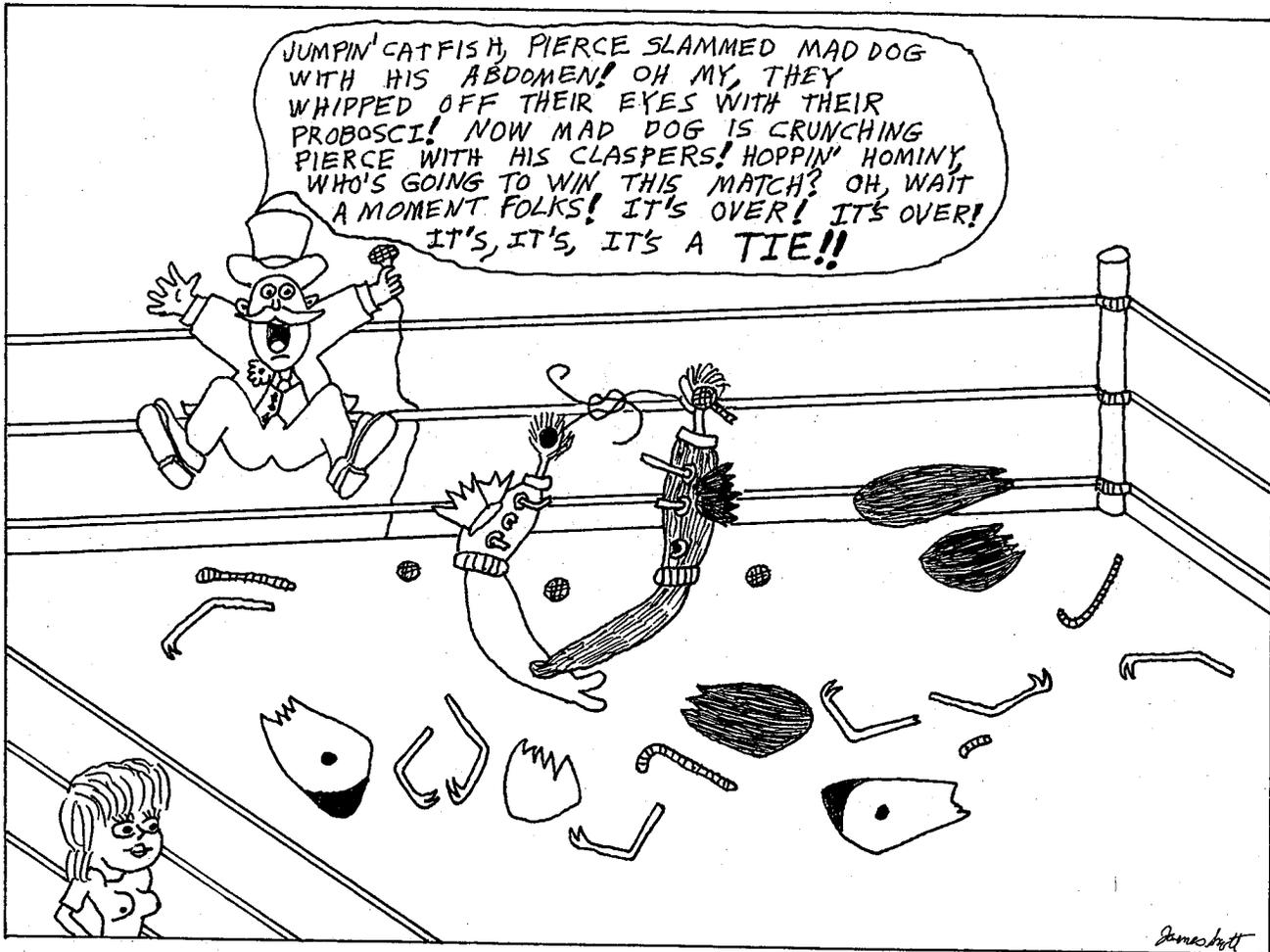
Papilio Bonus:**TERRITORIALITY IN BUTTERFLIES**

In my papers on mate-locating behavior (1974, Mate-locating behavior of butterflies, *Amer. Midland Naturalist* 91:103-117; and 1975, Mate-locating behavior of western N. Amer. butterflies, *J. Res. Lepid.*, 13:1-40), I argued that butterflies should not be called territorial, because they lack offensive weapons with which to fight, they are not “pugnacious” or “aggressive” as some people write, and the approach of the male toward passersby is basically an investigative maneuver to determine whether the passerby is a receptive female or not (male butterflies need to approach closely to the passerby because their vision for shapes is not great and they need to get close to use odor etc. for identification).

But I was wrong, horribly wrong. At last, truly territorial butterflies have been found. (Turn the page.)







A SERIOUS DISCUSSION OF TERRITORIALITY IN BUTTERFLIES, AND NEW MATE-LOCATING TERMINOLOGY

The cartoon shows what would happen if butterflies really were ferocious and attempted to actively defend their "territory". Obviously, butterflies are not morphologically equipped for any kind of physical attack or defense, with their fragile wings, easily broken-off legs and palpi, long proboscis rather than jaws, non-pinching claspers, etc.

Now we can engage in a more serious discussion of mate-locating behavior. Some people's definition of territoriality is so loose—permitting cooperative avoidance or slight time-and-motion interference to substitute for active fighting defense of a territory—that butterflies do qualify as being territorial. One can hardly argue with that definition, that defines butterflies as being territorial. If someone defines butterflies as being territorial, then of course they are territorial using that definition. But the word territoriality was devised originally for vertebrates. When we watch a 2000-pound bull elephant seal in his beach territory, lumbering down the beach to intercept interloping males that try to mate with females in his harem, and viciously biting those males (and squashing any females or pups that get in his way), we recognize that the male is keeping and actively defending his territory. In contrast, a male butterfly rests at a site that is genetically fixed in his species where mating occurs, and waits for a female to arrive, and the female flies to that spot because her genes tell her also that it is the genetic mating site of the species. The male waiting at that spot investigates passing butterflies (and other insects and falling leaves etc.) in order to see if they are receptive females, and he usually returns to that site because it is the genetic mating site and he remembers where to land, whereas passing males also know it is the genetic mating site, but they don't know where to land and they sensibly would prefer a similar site that is unoccupied so they don't have to bother with chasing the first male all the time while they wait for females. Scott (1974) showed how the behaviors that have been interpreted as territorial (pursuits, vertical flights, previously-present males remaining longer than new males, etc.) have simpler explanations in terms of mate-locating behavior, flight inertia, predator-avoidance behavior, etc. Other authors claim that if a male spends more time interacting with another male of his species than with another species, that means

they are territorial; but there are many simpler explanations for that too. There has been an absence of careful study of what happens in visual and odor communication when butterflies come close to each other. For instance, the male *Papilio machaon*-group has a perfumelike male pheromone on the wings which females presumably like, but how can it be used in male-male encounters, because how would one male know if he smelled that pheromone that it was produced by the other male and not by his own wings? People trained at Cornell University were some of those who wrote that *Papilio polyxenes* etc. are territorial, and that University was the leading center for determining the chemical identity of moth pheromones; so why have they never bothered to study or identify or even gas-chromatograph the *Papilio* pheromone?

At any rate, I fail to see any great similarity between a dangerous bull elephant seal and the mate-locating male butterfly, but I do see huge differences. The bull is actively and viciously defending his spot and his females that live there too. The male butterfly is waiting for his female and doesn't have any females there. Any definition of territoriality that includes both these as being the same phenomenon, seems to me to be rather useless. That's the theoretical trouble with using the word territoriality on butterflies. Butterflies are small in size and have weak vision, and much of their mate-locating behavior serves to bring them into areas of the habitat where mating success is better than random, which is actually a form of cooperation, unlike the vertebrate system of deliberate interference and competition among large animals that can see and hear where their competitors are and what they are doing. Vertebrates have long lives, and can see other members of their species well, and have a lot of brain intelligence, so they become involved in a game of strategy and intimidation and conquest with others they can identify as distinct individuals, who understand and play the same game. Butterflies have short lives, they can't see others of their species too well because they are small and their vision for pattern and shapes is inferior to the vertebrate eye, and their brainpower is rather weak, so they do not recognize each other as distinctive individuals, and basically are trying to minimize the time it takes to find a mate, they are not trying to win that vertebrate game. Anthropomorphism is a problem here, as people who write about butterflies naturally assume that butterflies have the same motives as humans.

Also, vertebrates have lots of weapons. Vertebrate males can puff up to giant size, spread their wings to look bigger, peck with their beak, rake their foot spur, stamp their feet or paw the ground, sing, bellow, roar, rear up on hind legs, rip up bushes or push down a tree, butt heads, impale with horns, kick, grab, bite, slash with claws, or even make the water "boil" (alligators). What can butterflies do on offense that is like those things? Umm, umm.....nothing. A butterfly is about the least-equipped to fight of any animal on earth. If the butterfly even touches anything substantial like a twig or a stout leaf, what happens?, scales fly off, the wing edge is torn, a chunk of the wing flies off, or if there is contact with a stiff object a leg pops off, a labial palp breaks off..... Butterflies must try to avoid contact to keep from falling apart. One can judge the age of a butterfly reasonably well by assessing the percentage of scales that have been lost and the amount of damage to wing margins, caused mainly just by air turbulence as they fly. After flying around for several weeks the average butterfly looks like a total wreck, and after 3-4 weeks the wings are stubby torn ruins half their original size. Any statement that mate-locating behavior of butterflies is like that of ferocious male sea lions is absolutely ludicrous.

Other people have used the lek word on butterflies, which means that they think that butterfly behavior is similar to that of Prairie Chickens or ungulates such as the African Kob, in which males pick an arena and fight to see who can be in the best central position, where the females go to mate. I don't see much similarity between those animals and butterflies either. Those vertebrates are large so they watch each other easily and fight and jockey for position, and the females can see all the males and compare them, in what amounts to a thinking game of strategy, whereas butterflies are small and can't see all the other participants in the game. The only thing these territorial vertebrates and butterflies have in common is that natural selection has shaped their behavior, but that is the obvious process that has shaped most other traits of them too, and natural selection has produced quite different methods of mate-location in vertebrates and butterflies.

Additionally, if a female butterfly does come and mating occurs, the male butterfly is out of commission for an hour or a day or so, when other males mate-locate there, unlike the vertebrate system when the male can mate quickly and keep his dominant place in the hierarchy. The male butterfly may be able to return after an hour and mate with another female, but he then has to stay joined to the 2nd female essentially until the next day to give him time enough to manufacture another spermatophore for transmission to the female during mating, so he is out of commission for a day then too. How can a male be territorial if success (mating) guarantees his absence from the "fray"?

Another huge problem with applying the word territoriality to butterflies is that it is impractical. It is not "operational". The male can do the so-called territorial behavior, and then fly to another spot altogether dozens or hundreds of meters away, and repeat the same "territorial" behavior there. When I marked and released butterflies of perching species and patrolling species (for my Ph.D. thesis, when I should have been getting an M.D. degree that leads to adoration and riches and quality wife), I found that population movements of the perching species varied a lot between species and were as great as some patrolling species (Ecology 56:1367-1377, 1975). R. Rutowski found that the perching butterfly *Asterocampa leilia* looks territorial at first glance but the males stay at one spot only 30 minutes or so (J. Res. Lepid. 26:1-12, 30:129-139, J. Lepid. Soc. 51:197-207, all with other authors). The casual observer would call all the perching species "territorial", and sure enough, numerous authors describe them as "pugnacious" etc. in the literature. But careful study shows that many of these are NOT territorial even with the most liberal definition of the word. So to label a butterfly territorial, you must not only show that males have perching behavior to await females, you must also do a laborious mark-resighting study for a

week or two to actually prove that the males stay in one spot. You can't just find a perching species and automatically call it territorial. This means that the word territoriality is not operational—it is not practical for use by lepidopterists, because very few species will ever be subject to laborious mark-recapture studies, which were popular in the 1970s and 1980s but aren't done much anymore (there have been several research fads since then, including electrophoresis, and everyone is doing DNA now). So even the reader with the liberal definition must not misuse the word territoriality on bugs, without doing the week-long mark-recapture study to prove it.

In contrast, Scott's 1974 mate-locating behavior paper defined the words perching & patrolling in a practical, operational, manner, that is easily applied to butterflies with minimal fuss. One must merely observe males in nature and watch them investigate/chase/pursue others, and note whether the male was resting or flying prior to the interaction, and note the location where they did that, and the time of day when they did it. It doesn't take weeks, it just takes hours, or days. (Although the most difficult part of the complete description of a species' mate-locating behavior is determining the time of day of mate-locating behavior, because afternoons might be cloudy or too hot to observe normal behavior for instance, so it may take awhile to accumulate suitable observations during all parts of the day. Some butterflies such as a *Vanessa* and *Hypaurotis* only mate-locate in late afternoon and early evening, while others such as *Poladryas* and *Notamblyscirtes* only mate-locate in morning, for example.) If one watches male butterflies carefully and knows what to look for, one can determine mate-locating behavior in a speedy practical way for hundreds of species quite readily, as we see in my 1975 paper and my 1986 book *Butterflies of North America*.

There is another practical reason why the use of the word "territorial" on butterflies is objectionable. Many of the people who use this word on butterflies manage to describe in their publication how males look for females (perching, versus patrolling), but they often fail to describe where in the habitat they do it, and they very often fail to state the hours during the day that the butterflies mate-locate. These authors are so focused on proving the existence of territoriality, that they fail to give an adequate description of mate-locating behavior. Use of the word territoriality seems to be a definite impediment to proper reporting.

Thus the word territoriality as used in vertebrates very doubtfully applies to butterflies in any meaningful way, is totally impractical to use and can't be part of regular lepidopterological practice anyway, and impedes the proper reporting of mate-locating behavior.

However, there is a definite problem with my current system of describing the mate-locating behaviors of butterflies, a problem that has caused a lot of people to want to use the word territoriality for butterflies. The problem involves a defect in the human brain. This brain defect involves the use of language by people. Some time around 50,000 or 30,000 years ago, anthropologists think that evolving humans became less apelike and became more like modern people by developing some innovation in the organization of the brain, that somehow allowed them to use language to speak with each other and tell each other where the berries and elk and enemies are located. Those early humans then could hear the spoken news from people returning to camp, and hunt big animals much better and exterminate lots of them (the Woolly Mammoths, Mastodons, Giant Sloths, American horses, Giant Beaver, etc. etc.), which evidently allowed them to exterminate the stronger and bigger-brained neanderthals as well. Anyway, maybe that was when the human brain decided that if some phenomenon or thing has a name, then it actually exists, even if it doesn't; and likewise, the human brain decided that if some phenomenon or thing lacks a name, then it does not exist, even if it does.

To explain this more carefully, the interesting word territoriality exists, so people think that the phenomenon exists too, so when people use the word on butterflies, then they and other people start to think that the butterflies are truly territorial and are fierce and pugnacious. Also, my words perching and patrolling are not very charismatic words, and a lot of people use the word "perching" for merely resting (Webster's Dictionary gives half a dozen meanings for "perch", and "vantage point" is only part of one of them), and use the word "patrolling" for merely flying (Webster defines "patrol" mainly for a security guard's route), so those words are confusing and don't excite people into believing that those types of mate-locating behavior even exist. So they don't use those words, and instead search for great words to use, and they turn to the charismatic word territoriality, and, oila', we have territorial butterflies plastered all over the journal pages, while most lepidopterists ignore the study of mate-locating behavior completely, and some lepidopterists misuse my terms perching and patrolling (notably in *Butterflies of Arizona* and the Kaufman Focus Guides *Butterflies of North America* books, in which the author aggravatingly claims that males of some species patrol to find females, when the male was really doing perching behavior to await females and then just flew around a bit before settling down to await more passerbys).

But this problem was my fault, because in 1974 I used the word perching behavior and patrolling behavior, when I should have invented some fancy charismatic new words that would excite people and would stick in their brains, so that they would actually study mate-locating behavior and report it in a bug-friendly manner, rather than ignore most aspects of mate-locating behavior and try to compare butterflies to bull elephant seals and horn-crashing bighorn sheep.

In my 1986 book I phrased the words "perch to await females" and "patrol to seek females" to explain them better, but that fix was still not enough.

So let's remedy that problem right now. We need new exciting names. For a decade or two I have been leafing through latin dictionaries and other dictionaries to try to find new names, but what I found was rather awkward or unwieldy or didn't seem quite right. For example, the latin word *Volo*=fly, and *venor*=hunt, and *scrutors*=search, so could we call males

that patrol to seek females volovenors or voloscrutors, or does that describe a hawk better? And advolo=fly to, so are males that perch to await females advolos or maybe they are quiesexpectos from quies=rest & expecto=await? Aucupor=wait & watch, so are perching males aucupors or aucuporadvolos? Dozens of words can be dredged up and devised, all of them unfortunately unwieldy and awkward, with the meaning a little vague or wrong, and the way to combine them to form a more precise meaning in doubt.

Some very simple combinations of words seem best. For males that perch to await females for mating, let's forget about using just the word "perch", because many/most people use it for "sit" or "rest" or a leaf "resting site". But we can use it as part of the word, as the sit/rest/resting site is part of what the male mate-locating butterfly does, but not all. So let's use the combination Rest/peRch -to-awAIT females, or RAIT. A male that is resting to await females for mating is doing RAITING behavior, and males doing that behavior are RAITERS, and males that perch on hilltops to await females RAIT on hilltops. Why not just use the words perch to await females? Because those words are not charismatic enough to get people to use them, and are still ambiguous, as someone who uses the words perch to await females might mean that the male (such as a hepialid) is putting out a pheromone and is just waiting there for the female to find him, which is a totally different mate-location system. And we can't use rest to await females because males are not resting in the sense of sleeping (they are resting in the sense of not flying), they are not waiting like Cinderella for a mate to find them and kiss them awake, they are quite alert and are carefully watching for passerbys. The word rait sounds better than pait (from Perch to awAIT females), and is shorter than perait (from PERCh to awAIT females). Rait is a brand-new word with an unambiguous precise meaning, which I think is charismatic enough to gain widespread acceptance.

But what about those perching males that awarely "rest" on a twig in a little clearing for awhile, then fly out to investigate some unproductive bug or bird or leaf, then instead of going right back to their resting site and landing, they instead fly about the immediate area for a bit before landing to see if some female has flown into the area? This happens quite a bit in some species such as *Pyrgus communis* and *Papilio polyxenes*. Let's use the combination FLY to awAIT females, or FLAIT. A male that is flying around a small area as well as perching at the same spot to await females for mating is doing FLAITING behavior, and males doing that behavior are FLAITERS, and males that patrol a bit as well as perch on hilltops FLAIT on hilltops. (This is the word the author mentioned above was looking for.) If a male rests and flies to await females on hilltops, he is both raiting and flaiting there.

For males that fly rather continually to seek females, let's forget about the word "patrol", because to most people it describes a rifle-toting guardsman walking around his camp perimeter to repel vandals (or an army soldier with machine gun slowly going along his route to eliminate revolutionaries), so let's use the combination FLY to sEEK females, or FLEEK. A male that is flying to search for females for mating is doing FLEEKING behavior, and males doing that behavior are FLEEKERS, and males that patrol along gulches to find females FLEEK in gulches.

Oh, and one more thing. We can't forget the moths! After all, butterflies are just one group of pretty day-flying Ditrysia moths. Most moths mate-locate by having the female emit a scent (pheromone), usually at night, when the male flies around (hopefully across the wind) to detect the scent, then he zigzags upwind through the scent plume (using the "stereo" scent-detection capability of his two antennae) until he reaches the female, whereupon he releases another aphrodisiac pheromone and mating ensues. So let's use the combination of the male FLYing to locate the female by scENT, or FLENT. A male flying to find females is thus FLENTING, and such males are FLENTERS, and if they do it just at special areas or just during part of the night they FLENT there or then. Day-fliers like *Hemileuca* flent to locate females, and can be trapped in cages containing virgin females. There is some published literature on the zigzagging methods used by flenters to determine the location of the pheromone plume and the female.

These four new words have an unambiguous precise meaning, as none of them are in Webster's unabridged english dictionary, and none are in german or french or spanish or latin dictionaries. We need these words to kick-start the study of mate-locating behavior in butterflies in a non-anthropomorphic manner.

To summarize these new words and their definitions:

RAITING (RAIT, RAITERS)—males resting, waiting, and watching at a genetic mating site for females to arrive for mating. Such males fly out to investigate passerbys to see if they are receptive females.

FLAITING (FLAIT, FLAITERS)—males flying around a small area before resting again, to wait for females to arrive for mating.

FLEEKING (FLEEK, FLEEKERS)—males flying throughout the habitat or flying far through a genetic mating site to search for receptive females for mating.

FLENTING (FLENT, FLENTERS)—males flying far to find a scent (pheromone) that the female emits to lure the male for mating. (In Hepialidae, the females flent to find the pheromone-emitting males.)

These words just describe how the males and females of a species organize their system to find each other. A complete description of mate-locating behavior also includes where they do it in the habitat, such as on hilltops, or on gulches, or on top of the hostplant bushes, etc., and when they do it, such as in early morning, or all day, or late afternoon-evening, etc. To determine these things, one must merely go out in nature and watch males, especially when the males appear to

investigate or chase other butterflies or other animals or objects, and note what the male was doing before then and where he did it and when.

Now, readers, go out in nature and study mate-locating behavior, and publish your results about those raiters, flaiters, fleekers, and flenters! There are enough data known by now that show that mate-locating behavior can differ greatly between very closely-related species, thus it can serve as excellent characters for taxonomy. For instance dozens of species pairs are now known in which one species mates on hilltops, and the close relative mates in gulches, and I have named several new butterflies recently which mate-locate in those opposite sites. A lot of mate-locating data on thousands of butterfly species still needs to be gathered and reported. It hasn't appeared in European butterfly books for instance, perhaps because the old perch and patrol words did not excite Europeans and did not translate to their languages very well, so there's a lot of work to do there.

(Error correction: in the first paragraph of the Methods section of Scott (1975) this sentence was a printer's error that should be deleted: "In patrolling species, interactions occurred predominantly when resting males investigated moving objects.")

Scott, J. A. 1974. Mate-locating behavior of butterflies. *Amer. Midl. Nat.* 91:103-117.

Scott, J. A. 1975. Mate-locating behavior of western North American Butterflies. *J. Res. Lepid.* 14:1-40.

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