



TAXONOMIC STUDIES AND NEW TAXA OF NORTH AMERICAN BUTTERFLIES

by

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Abstract. New diversity is reported and discussed among North American butterflies. Several dozen new taxa are named. A new "sibling" species has been found to occur throughout the Rocky Mts., introducing a new butterfly species to most states in western U.S. and to southern Alberta and BC. Several taxa of *Colias*, *Euphydryas*, *Lycaena*, and *Plebejus* are raised to species status. Many name changes are made, and many taxa are switched between species to create several dozen new combinations. The relevance of species concepts to difficult groups of butterflies is explored.

Introduction

This paper consists of miscellaneous taxonomic studies on North American butterflies, some in the northeast, but mostly in the west. Most of the diversity of butterfly fauna in North America is in the western mountainous areas, where the human population is lower, so it has taken longer to study western butterflies, and a lot more study is needed. We have made new findings on many western butterflies, and this progress is reported below. And Scott recently moved his collection out of old dermestid-infested drawers into fine very-tight ones that those beetles cannot enter, and in the process of resorting them found a dozen unnamed subspecies, which are named below.

As we study our butterflies and learn more and more about them, a disturbing pattern has emerged. There is a residue of difficult groups that have lots of problems, and these groups seem to defy all the methods we use to study them, and they also defy all the species concepts that humans have devised in order to pigeonhole them into a checklist in pleasing fashion. This is a problem for lepidopterists, who have the desire to place all of our natural creatures into fixed categories of genus, species, and subspecies. Those categories were designated by Linnaeus and codified by the International Commission on Zoological Nomenclature, without consulting the actual butterflies. It would appear that our butterflies in nature care nothing about species concepts, or populations, or subspecies, or species, or genera (and even to lepidopterists, genera are arbitrary); all an emerging butterfly adult cares about in nature is to mate, and he or she uses a few scent/visual stimuli to accept or reject a possible mate that is encountered, and when mating occurs, everything else that follows that we care about (subspecies and species) happens without knowledge of that butterfly. We have more and more decent theories about how wild animal populations evolve, and yet taxonomic studies more and more bump up against intractable groups that defy all of those theories. Because the butterflies do not care about our species concepts, many of our bugs do not fit the biological species concept, because they have hybridized or introgressed or converged in a manner that appears random or incomprehensible, or they form a rassenkreis, or they are inadequately studied because of haphazard choice of study sites or incomplete or poor research, etc. I have taken the liberty of calling these difficult cases "stenschospecies", a loose species concept that reflects the reality we see in nature, and expresses the disappointment that taxonomists feel when the bugs do not fit into convenient checklist categories. Examples of stenschospecies are *Colias alexandra/occidentalis-christina*, *Pieris "napi"*, *Cercyonis sthenele/meadii*, *Euphydryas chalcedona/colon/anicia/bernadetta*, *Chlosyne palla/acastus/neumoegeni*, *Phyciodes tharos/coccyta/batesii*, *Limenitis lorquini/weidemeyerii*, *Apodemia "mormo"*, *Callophrys affinis/apama/perplexa/dumetorum/sheridanii/lemberti/comstocki*, *Plebejus anna/idas/melissa*, *Plebejus acmon/lupini/chlorina*, *Euphilotes battoides/enoptes*, etc.). The easy taxonomic studies have mostly been done, and a lot of stenschospecies are left. Supposedly "ideal" taxonomic studies have been done on bugs such as *Colias occidentalis-alexandra* and *Apodemia mormo* and *Lycaena dorcas-hellodes* and *Lycaeides* (Vladimir Nabokov has now almost been enshrined as a god complete with an entire book by Kurt Johnson praising his lepidoptera work), but more research has shuffled those stenschospecies in a very different manner (Nabokov's species are scattered to the winds like fall leaves). The "ideal" taxonomic study does not exist because every paper is just a progress report, and stenschospecies will stink up every person studying them even if he does a thorough "ideal" study, because, basically, the bugs have not read the book on the ideal species and subspecies.

There are about 23 different species concepts, and the bugs don't care about any of them. It's like what Laura Ingalls said on the TV show "Little House on the Prairie". Little Laura caught many fish at the pond using doughballs for bait, while grumpy banker Mr. Sprague had caught none with his fancy lures. Laura tried to get Mr. Sprague to use some of her doughballs, but Mr. Sprague retorted "Young lady I have been fishing for more years than you have been alive. My lure is absolutely correct for these waters and I have read many many books on the subject that will prove that it is correct." Laura replied: "Well...., maybe the problem is,...that the fish just haven't read the books." Our butterflies haven't read the books either. Thus the "ideal" taxonomic study may turn out to be shoddy in part, and a shoddy-looking paper may prove to be great. A paper that looked at thousands of specimens may be mostly wrong, as misleading characters may have been emphasized or the analysis was wrong or misidentifications occurred or the larvae & pupae may hold the key (for instance the larvae and pupae showed Scott that *Anatrytone* and *Atrytone*, and *Notamblyscirtes* and the dracula-caterpillar *Amblyscirtes*, were greatly different genera, even though the adult differences were small). With stenospecies, human brainpower is useless, one must merely plod along and let the bugs drag one by the nose, kicking and screaming, to their apparent conclusion, which may be just a checklist of compromised bookkeeping species (defined as a smaller portion of the stenospecies that works in a small part of the range to make a convenient linear presentation in local scientists' checklists, but does not work on a larger map) rather than compromised biological species. Another generation of lepidopterists and several more decades will be required to make sense of stenospecies like *battoides/enoptes*. The reader may think that the word stenospecies is crude and unprofessional. But we have to admit that the stenospecies—and its working slave the bookkeeping species—is just as good a species concept as any other when we realize that species concepts are human constructs, and all are worthless from the bugs' viewpoint. Thus the stenospecies is as valid as any other species concept (just as valid as the "superspecies" concept, which almost no one uses), and adds the virtue of being emotionally pleasing, as the taxonomist can comfort himself knowing that it's the stenospecies' fault that his brainpower is useless and the bugs fail to conform to any logical scheme as they introgress and converge and diverge and mutate in apparently random senseless ways. Since the species concept is an artificial human construct, adding an emotional component gives the stenospecies concept more value from the human standpoint. When I was a kid, I thought butterfly species were real. I gradually realized the problems, and those problems have actually steadily increased. Every year as our knowledge grows, it gets more difficult to pigeonhole the diversity of butterflies into species that people can agree on. Go back and read the list of stenospecies listed above, and you will realize that the problems in all of them seem a lot worse now than they did just a few decades ago. So the idealistic reader who dislikes the term "stenospecies" should just substitute some other more polite term like superspecies (and use semispecies for the bookkeeping species), and continue his/her elusive quest for a satisfactory checklist. But this paper tries to solve some of these difficult cases anyway, despite the difficulties. We also try to solve associated nomenclatural problems that are cursed by troublesome names--toxotaxa.

***Colias occidentalis/alexandra* group: introduction, by J. Scott**

This group is discussed here because it has numerous problems, and we attempt to solve some of them. A fully robust solution to all of them may be decades away, and involve lots of rearing and field study, but at present we have three new ssp. to name and we transfer another name to another species, and we note difficulties in other taxa.

To begin with, the taxon *astraea* W. Edwards has been treated as a ssp. of *Colias christina* W. Edwards, and currently is treated as a ssp. of *C. occidentalis* Scudder by some authors. However, examination of the original description and holotype by N. Kondla and later by J. Scott, indicates that *astraea* is actually related to *alexandra* W. Edwards, and does not belong to the Mont.-N Wyo. ssp. of *christina*. This relationship was recently mentioned by Warren (2005) as well.

We have also found several new Great Plains ssp. of *C. alexandra* group, one of which appears to be closer to the Great Basin *edwardsii* W. Edwards than to mountain ssp. *alexandra*.

It seems necessary here to discuss the geographic variation of *C. occidentalis* and *C. alexandra*, because the name "*astraea*" and the new ssp. fit right into the middle of that mess. *Colias occidentalis* and *C. alexandra* definitely are stenospecies. Ferris (1973) lumped all of the component taxa into *C. alexandra*, except for *occidentalis*, following A. B. Klots who had lumped *christina* into *alexandra* back in 1961. Clyde Gillette (1983) was the first to analyze these taxa and realize that many of the taxa that had been lumped into *alexandra* actually belong to *C. occidentalis*, and he later named the Utah *C. occidentalis* as ssp. *wasatchia* Gillette, and distinguished it from sympatric *C. alexandra* (*pseudochristina* Ferris is a syn. of *wasatchia*, as noted below near the end of this section). *Colias occidentalis* in my opinion (and that of Hammond & McCorkle 2003) actually includes a cline of populations including these: 1) *chrysomelas* H. Edw. from the Coast Range of NW Calif., which intergrades with *occidentalis* in S Cascades of Ore. according to Ferris (1993) and Warren (2005); 2) the pure yellow Cascade Mts. *occidentalis*; 3) the ssp. *sullivanii* Hammond & McCorkle (Hammond & McCorkle 2003) in SE Ore. (first collected by Stanley G. Jewett) whose adults are mostly yellow but 5% are orangish at the TL (and 22% are orangish in NE Malheur Co. as the range and wing pattern approach the following populations); 4) variable populations in Crook Co. Ore. and the Aldrich Mts. of Grant Co. Ore. vary from yellow to orange, averaging intermediate, and include every phenotype known in the species, and the females change from mostly yellowish westward to more often whitish (and more orangish too) eastward; 5) ssp. *wasatchia* in Utah and Idaho is rarely yellow but mostly slightly to strongly orangish on upf and part of uph, the orange filling most of upf; 6) ssp. "*astraea*" (actually a new ssp. named below) in the mts. of N-

C Wyo. and W-C Mont. is often yellow but mostly part-orange on upf; 7) ssp. *christina* from N Mont.-Alta.-NWT is usually orange but sometimes yellow; 8) in the final extreme of very orange color, ssp. *krauthii* Klots in Black Hills of NE Wyo.-S.D. and *kluanensis* Ferris in S Yukon are mostly orange on upf (*kluanensis* is very orange like *krauthii* on upf and thus they look similar, but *kluanensis* has the black border wider, the unh is darker green, the uph anal margin is dusky and greener, and the uph orange is narrower, so perhaps the two are independently evolved from some *christina*-type ancestor, or perhaps they share a common origin from some time in the Pleistocene when their ranges might have been one). The orange in *C. occidentalis* ssp. (and *C. alexandra* when present) is absent on the base of upf and on much or most of the base of uph, where it is replaced by yellow (in contrast, other orange *Colias* such as *eurytheme* Bdv. and *meadii* W. Edwards have orange covering all the ups). This inclusive species *C. occidentalis* seems well-supported by clinal intergradation of all adult characters across the continent, as well as by its preference for *Lathyrus* hostplants (sometimes on *Hedysarum* in Black Hills and Man., or on *Thermopsis*, etc.), whereas *C. alexandra* seems to prefer *Astragalus* (and sometimes *Thermopsis*, *Oxytropis*, etc., in Neb. on *Thermopsis rhombifolia* & *Lathyrus polymorphus* according to S. Spomer). In general, *C. occidentalis* ssp. have a number of character states that occur in all ssp.: most adults of all ssp. have a reddish ring around the unh central spot, which often has a satellite spot, unh often has reddish submarginal dots, the unh tends to be covered with more dark scales than *alexandra*, the uph tends to have a strong black smudge extending from base toward tornus, the hw margin tends to be extended outward (a little pointed) at vein M₁, the male black upf border tends to be broader than *alexandra*, and females are white in many ssp. Female ups color: ssp. *chrysomelas* Hy. Edw. and *occidentalis* females are yellow and very rarely creamy, most *sullivanii* are white and few are yellow, the Aldrich Mts. intergrades vary from orangish to yellow to white, *wasatchia* females are creamy-white to yellow but sometimes orange-flushed, most “*astraea*” are whitish but some have a yellowish flush, in *christina* many are white in S Alta. but most are yellow and orange esp. in C Alta., then white increases northward but *christina* becomes mostly orange in NWT as part of the transition toward the orange *kluanensis*, and finally *krauthii* and *kluanensis* are orange like their males. In contrast, *C. alexandra* ssp. in general tend to have little or no red ring around unh central pale spot (though the frequency increases a bit in the new ssp. *altiplano* named below, and is even greater in *edwardsii*), and rarely have a satellite spot or submarginal dots, the uph spot is absent (in most ssp. *alexandra*) to orange in some individuals of all ssp. (and usually orange in some ssp.—this spot is never yellow, a yellow spot is actually just the absence of an orange spot), the unh tends to be grayer with fewer dark scales, the uph black smudge tends to be very small, while the hw margin is more rounded at vein M₁, the male upf border tends to be narrower, the fw margin tends to be straighter, and females tend to be yellow (except at high altitude in Colo. and in W-C BC where females are usually white). Ultraviolet reflection of the ups of male wings is similar in both the *occidentalis* and *alexandra* taxa, and is generally correlated with the amount of orange or faint orangish tint on ups (so uv reflection is not as useful as once thought for distinguishing species). Warren (2005) claims that the lack of orangish (thus uv-reflecting) individuals in Cascade Mts. *occidentalis* means that it has to be treated as a separate species from the eastern taxa (even *sullivanii*) which sometimes express orange, but this is faulty logic, which would require *krauthii/kluanensis* to be considered a separate species also merely because they lack yellow individuals, and for instance would require *Hesperia leonardus* to be split into three species, on the grounds that no ssp. *leonardus* have yellow individuals, and no ssp. *pawnee* have russet individuals. There is actually more difference between *chrysomelas* and *occidentalis* in wing pattern than between *occidentalis* and *sullivanii*, as *chrysomelas* has wider black borders and deeper-yellow unh and slightly darker ups yellow and more unh red marks and often less-pointed fw than *occidentalis*, and virtually every specimen in the mts. just N of San Francisco can be separated from *occidentalis*, whereas nearly 50% of the males of *sullivanii* are difficult to separate from *occidentalis* (Warren [2005] and Dornfeld’s Butt. Ore. document intergradation between *chrysomelas* and *occidentalis*). And Harry (2005) claimed that “*sullivanii* is indeed a ssp. of *occidentalis*” because diapausing part-grown 3rd-stage larvae turn light-brown in *chrysomelas*, *sullivanii*, and *wasatchia*, whereas *edwardsii*, *krauthii*, and *kluanensis* stay greenish like other *Colias*; I don’t think this one character is the key to species taxonomy, but every little bit helps. And even Ferris (1993) placed orange-flushed adults in the Ochoco Mts. of Crook Co. Ore. into “relatively pure” ssp. *occidentalis*; today Scott (and Hammond and McCorkle 2003) considers those orangish adults to be intergrades toward *christina*. It would be nice to have thousands of reared adults from hundreds of odd-looking females, but they are difficult to rear in quantity, and larvae and pupae are rather simple in color thus offer few useful characters (Harry’s photos of *sullivanii* larva and pupa don’t look much different from Hayes [1980] figs. of *alexandra*, although the prefed 4th-stage is oddly dark blue; and *christina* and Utah *alexandra* larvae both have a rosy line along bottom of lateral white band)(my photo of 2nd-stage *alexandra* looks like *sullivanii* but is bluer-green esp. on head).

The *alexandra-occidentalis* group is a stenochospecies, as the wing traits are variable and they overlap between species. And *C. alexandra pseudocolumbiensis* Guppy & Shepard (2001) has evidently introgressed some genes from the oranger *C. occidentalis* ssp. The taxon *pseudocolumbiensis* is usually yellow but is very variable and includes orangish adults that are superficially similar to the part-orange adults of *C. occidentalis wasatchia* and *C. occ. “astraea”*. Having collected some *pseudocolumbiensis* in SE BC myself and possessing a nice series from NW Mont. from S. Kohler, I thought for years that it must also be the same species as *christina* and *wasatchia*, because these orangish adults look so similar, as they are not only oranger, but often have orange unh ring and satellite spot and submarginal dots, like *christina* (note here that the actual holotype male of *pseudocolumbiensis* has much less orange than its fig. in the BC book by Guppy & Shepard; the holotype

is actually just a little tinted with orange on uph and very little tinted on upf). But after receiving (pers. comm.) the facts of *Colias* variation and distribution in BC from N. Kondla and C. Guppy, and from S. Kohler in Mont., I had to conclude that *pseudocolumbiensis* does not belong to *C. occidentalis* but instead belongs in the *C. alexandra* group. For one thing, Kondla finds that true *C. occidentalis occidentalis* flies with *pseudocolumbiensis* at China Ridge near Princeton (between Princeton & Tulameen) in SW BC, C. Guppy finds ssp. *occidentalis* occurs near *C. a. columbiensis* near Lilloet BC, so *pseudocolumbiensis* cannot be a ssp. of *occidentalis* (in SW BC, *pseudocolumbiensis* has the outer part of uph darker yellow than the inner part, whereas *occidentalis* is evenly yellow across the whole wing, and *occidentalis* has a strong black uph smudge and wider black upf male border). In extreme SE BC, *pseudocolumbiensis* narrowly overlaps *christina* (Guppy & Shepard's 2001 BC book did not map *christina* from SE BC, but Kondla tells me that one specimen of *christina* from Elk Valley BC is in his coll., and Cris Guppy tells me that he has one from Athalmer BC in his coll.). And in Mont., Kohler's maps show that *C. occ. "astraeda"* (new ssp. named below) flies together with *pseudocolumbiensis* in parts of Granite, Powell, Deer Lodge, Silver Bow, & Lewis & Clark Cos., where he finds that the populations differ in a number of traits: "*astraeda*" is sl. smaller (*pseudocolumbiensis* sl. larger), the unh is usually darker greenish (versus paler), the uph black smudge is much longer (vs. small), uph black border wider (vs. narrow), hw extends outward at vein M₁₋₂ (vs. hw rounder usually), ups orange patches (when present) cover most of upf & uph (vs. only outer part of wings being warmer/oranger), uv on upf (if present) is more widespread (vs. more limited to streak inside black border), ups of yellow individuals is a bit paler (vs. a bit warmer yellow), and females are mostly white (vs. mostly yellow); both "*astraeda*" and *pseudocolumbiensis* are similar in having the uph central spot orange on most adults, the unh spot usually has a reddish rim, this central spot often has a satellite spot, and unh often has submarginal dots (ssp. *alexandra* has the uph spot almost always yellow, the unh spot usually lacks a rim and usually lacks a satellite spot, and submarginal unh dots are rare). Also Ferris (1993) states that *pseudocolumbiensis* seems to transition into *edwardsii* in SW Mont. and S Wash. etc., which suggested to Scott that *pseudocolumbiensis* is a ssp. of *C. alexandra* (in Mont., ssp. *christina* is limited to the extreme north, while *edwardsii* W. Edwards is in SW Mont. and ssp. *alexandra* is a two-generation Great Plains bug, according to Kohler's research and maps, pers. comm., and reported below)(but Kohler's new research reported below suggests that *pseudocolumbiensis* is a distinct species). (Note here that *columbiensis* Ferris from SW BC generally has females that are pure chalk-white sometimes, and usually yellowish-white, and in general displays a whiter shade than other taxa; the *columbiensis* allotype and several yellowish paratypes are actually specimens of *C. gigantea*. But a problem occurs with the names *columbiensis* and *pseudocolumbiensis*, because few specimens are available from the TL of *columbiensis*, so Kondla and Guppy tell me that there is a possibility that the *columbiensis* TL population is actually like *pseudocolumbiensis* and populations farther north (that were considered *columbiensis*) remain unnamed, a possibility that is augmented by the O.D.'s mention of females being lemon yellow "frequently overwashed with pale orange" [C. Ferris, J. Lepid. Soc. 27:70], which probably refers to the *pseudocolumbiensis* phenotype rather than the northward unnamed pops. that evidently lack orangish females. Guppy plans an expedition to study this.)

Here we must also mention a theory of Paul Hammond (pers. comm.). He suggests, following Klots, that Colorado mts. *alexandra* also belongs to *C. occidentalis*, while *Colias edwardsii* may be another species that occurs across lowland western U.S. where it might be sympatric with *C. alexandra*, and he suggests that populations in the Wind River Mts. and NW Wyo. show intermediacy between Mont. "*astraeda*" and Colo. *alexandra* (S. Kohler now shows below that the Wyo. pops. are true *astraeda* and Mont. ones are a new ssp. related to *christina*, named below). This theory would explain the presence of some orangish *alexandra* adults in Colo., which rather resemble *C. occidentalis* "*astraeda*": one male is from Spring Crk., 8700', Gunnison Co. Colo. July 14, 1978, coll. Felix Sperling (noted by Ferris 1993) which Ferris described as having the upf uniformly yellow-orange and the uph more intense yellow-orange but fading toward yellow along costal and anal margins, while other wing characters and uv reflection are like *alexandra*; the second male is labeled just "Larimer Co. 19-v-74 G. Simpson" (in Gillette Museum at Colorado State Univ.; maybe it was caught at Pennock Pass 9100' where he had a cabin) which has the upf slightly orange and the outer 1/2 of uph very orange; the third is a male with rather uniform light-but-distinctly-orangish posterior 60% of upf & outer 1/3 of uph and small postbasal patch on uph, with orange uph spot, and ordinary *alexandra*-like uns except for a red ring, from W of Nederland on Caribou Road 9500' Boulder Co. June 22, 1974 (M. Fisher coll.); the fourth male is from "Colo." (in CNC). Then there are many known Colo. specimens with conspicuously light-orangish outer part of uph, including a male from Jim Creek Cgd., Grand Co. Colo., Aug. 9, 1977 (coll. J. Scott, in Scott coll), plus many in the Univ. Colo. museum: 1m from Poncha Creek, Saguache Co. Colo. 9000-10000' July 28, 1935 L. E. Chadwick; 5m from Rampart Range Rd. 9500', Teller Co.; 1m Woodland Park, Teller Co.; 1m Williams Can., El Paso Co.; 2m Idaho Springs 7500', Clear Creek Co.; 1m Overland Hill, Boulder Co.; plus two in Gillette Museum: 1m Missouri Falls 8200' Gilpin Co. July 11, 1976 Charles P. Slater; 1m (of the new prairie ssp. *altiplano* named below) Piney Creek, 6000', Arapahoe Co. Aug. 5, 1973 Ray E. Stanford. The first three specimens are at least yellow-orange, whereas my specimen is yellow on upf and basal part of uph, and the outer half of uph is merely slightly orange but definitely noticeably orange; I consider my specimen and the latter specimens to be just extreme variants of *alexandra*. Arguing against that theory, it is just as easy to say that these taxa are stenochospecies and share lots of genes, so these oranger specimens may just be oddballs in the population (after all, if *pseudocolumbiensis* can have lots of orangish adults in the *alexandra* species, a few orangish adults can occur in Colo. *alexandra* too). As for the theory, all we have to say is

that Colorado *alexandra* shows very few characteristics that would lead us to conclude that it belongs within any species that includes *christina* or *occidentalis*, and the small series that Scott has from Wind River Mts. looks to him like odd *C. alexandra* with a greater presence of orange unh rings and satellite spots and submarginal dots, and is presumably part of the intergradation of *pseudocolumbiensis* with *edwardsii* that has been suggested by Ferris (and now we know that it is part of the ssp. *astraea* that is newly defined below by S. Kohler).

It appeared to Scott until recently that *columbiensis/pseudocolumbiensis*, *astraea*, *edwardsii*, *altiplano*, and the Mont.-Alta. plains *alexandra* ssp., all belonged within *C. alexandra*. The yellower variants of *pseudocolumbiensis* look like *edwardsii*, and Ferris (1993, fig. 23) suggested that pops. in S Wash.-Idaho-Ore.-N Nev. intergraded clinally from *pseudocolumbiensis* to Nev. *edwardsii*. The red rim around unh spot is strongest in *pseudocolumbiensis* and “*astraea*”, and is weaker in *edwardsii*, and a little weaker in *altiplano*, and weakest of all in *alexandra* which seldom has a reddish rim. All these taxa are variable, and one can find individuals within each ssp. that resemble all the other ssp. in nearly every character, except that orangish adults are only common in *pseudocolumbiensis* and are evidently not known in *edwardsii*, *altiplano*, and the N plains ssp. So finding several different forms in sympatry may be due just to individual variation. Rearing lots of offspring from single females would greatly help determine what is a species, especially if eggs from a mother of a form rare in a locality were reared and the offspring found to resemble the norm rather than that rare form. Unfortunately little rearing has been done, and there are few characters on the wings of *Colias*, and these are very variable, making *Colias* difficult to study. However, Steve Kohler’s new research greatly improves our knowledge of these bugs. He has found single-generation *pseudocolumbiensis* flying near *edwardsii* (which apparently has two generations there considering some early June records) in SW Montana, which seems to require that *pseudocolumbiensis* be treated as a distinct species from *edwardsii*, even though it’s not very satisfying to do so because *pseudocolumbiensis* is a rather uncharismatic “hybridlike” taxon with no unique distinctive traits of its own (it is identified only by averages of its rather variable characters). And if we treat *altiplano* as a ssp. of *C. edwardsii*, and keep the new ssp. from Montana-Alberta Great Plains (named *altamont* below) as a ssp. of *C. alexandra*, then that leaves *C. alexandra* with a two-part range, in the Colo. mts. and then in the Montana-Alberta Great Plains, a rather strange distribution that makes little sense to our logical minds. But this group is a stenochospecies, which by definition doesn’t have to make any sense! After studying Kohler’s new research reported below, Scott is now still convinced that *C. occidentalis* includes *sullivani* and *wasatchia* and *sacajawea* and *christina* and *krauthii* and *kluanensis*, but it seems we now must treat *C. columbiensis* (with its ssp. *pseudocolumbiensis*) as a distinct species. There is some disagreement about whether *columbiensis* and *pseudocolumbiensis* are one species also, because when *pseudocolumbiensis* is compared to *columbiensis* at the north and west part of its range (Williams Lake, Riske Creek, Hanceville, Jesmond, 25 km NW & 20 km NE Clinton, 70 Mile House, etc.), Kohler & Guppy note that they look rather different, as the *columbiensis* have whitish females vs. yellow, and males have sl. more rounded fw outer margin & sl. narrower black border and sl. greener (less warm) unh without submarginal dots; but the S end of the *columbiensis* range needs more sampling where it might mix with *pseudocolumbiensis*. Scott is still somewhat confused about relationships within *edwardsii/altiplano/alexandra/altamont* (two of those are named below). The characteristics of *altamont* do place it clearly with *alexandra*, so evidently the two-part range of the newly defined *C. alexandra alexandra* and *C. alexandra altamont* is real, and has to be explained as a relict from the 17 successive advances and meltings of the continental glaciers that covered most of North America in the last several million years. Kohler notes that in the Big Snowy Mts., Fergus Co. Mont., in the foothills going up to Crystal Lake, *astraea* and *altamont* have been taken together (and not too much farther up the road, *sacajawea* flies), and *astraea* and *altamont* are sympatric in Judith Basin & Cascade Cos. also. Thus it seems we must treat *C. edwardsii* as a different species than *C. alexandra* unless we split *altamont* from *C. alexandra*, which doesn’t seem warranted by the comparison of the latter two taxa. In these *Colias*, the *edwardsii* type evidently dispersed during one of those glacial cycles eastward through the lowlands of Wyoming to populate Nebraska and NE Colorado with *altiplano*, just as the unsilvered types of *Speyeria hesperis* dispersed eastward through Wyoming and populated the Black Hills and the east slope of the mts. in N Colorado, dividing the range of the silvered kinds of *S. hesperis* in two (Scott, Kondla, & Spomer, 1998). Below we list *altiplano* as *Colias edwardsii (alexandra?) altiplano*, because Kohler’s research (and Paul Hammond’s theory) suggests that *edwardsii* and *alexandra* are separate species, and the adjacent-without-obvious-intergradation of *altiplano* and *alexandra* along the mountain front near Denver allows for the possibility that *alexandra* and *altiplano* are different species (notably, their average difference in wing shape may tend to support a species-level difference), but we throw in the question mark because *altiplano* is somewhat intermediate between *alexandra* and *edwardsii*, and the individual variation is fairly large and overlapping, making it rather difficult for us to conclusively prove species-level separation in Colorado.

One thing is now clear in this group. Because orangish ups patches and the associated ultraviolet reflection are known to occur now on as many as four different species in the group (*C. occidentalis christina* & 5 other ssp., *C. columbiensis pseudocolumbiensis*, *C. edwardsii astraea*, *C. alexandra alexandra*), we can throw away the idea that uv reflection is the key to determining the classification of this group.

A note on the synonymy *wasatchia=pseudochristina*: Ssp. *wasatchia* Gillette was named *pseudochristina* Ferris later by Ferris, who asserted that *pseudochristina* is the older name because Ferris claimed that Gillette back-dated his *wasatchia* original description. Specifically, Ferris (1993) states on p. 91 that the *pseudochristina* O.D. was mailed May 22, 1989,

while the *wasatchia* O.D. was imprinted May 17, 1989 and the few libraries known to have date-stamped its receipt received it June 18 1989 to as late as 1990, and Ferris wrote “it has not been possible to verify the actual mailing date of publication for the name *wasatchia*”. John Pasko (e-mail to Todd Stout) believes he actually received Gillette’s “Autumn 1988” O.D. issue after Ferris’ (but was that because Gillette was busy and sent issues to A- people first and only much later got alphabetically down to the P’s?). Scott accepts the name *wasatchia*, as it has an earlier imprint date even though the exact date of mailing has not been determined in an unbiased way to some people’s satisfaction because each author claims priority; most importantly, it is clear that Gillette did the original research on the taxon and Ferris’ work was derivative (and records at the Univ. Utah library show that Ferris borrowed Gillette’s MS thesis right after publication), thus Gillette’s research has obvious priority. There is controversy here, but N.Kondla notes this: “Article 21.2 says it nicely. Article 21.4 only comes into play if the date of publication is found to be incorrect....my reading of the Code is that *wasatchia* is the correct name”.

(Another note to all lepidopterists: please do not publish any more names starting with *pseudo*-, as every one of them lately—*pseudochristina*, *pseudocolumbiensis*, *pseudodumetorum*—has fallen into cursed taxonomic hell, as detailed in this Papilio issue.)

Ssp. “*astraea*” from Mont. and N Wyo. is similar to *wasatchia* from Utah, but seems to differ sufficiently to constitute a different subspecies in most people’s opinion. The unh of “*astraea*” usually seems to be greenish-gray, versus more greenish-yellow in *wasatchia*; the upf black dash seems more oval in *astraea*, a much thinner narrow crescent in most *wasatchia*; the orangish on “*astraea*” covers less of the ups (about the extent of *christina* but paler), whereas in *wasatchia* the orangish extends farther (about as much as in *krauthii*, but much paler) and the orangish on uph seems to blend more into the basal color; “*astraea*” females are mostly white (as are many near-*christina* females from S Alta., although C Alta. *christina* females are mostly orange), whereas *wasatchia* females vary from orangish to yellow to white. Thus, “*astraea*” needs to be renamed. It is named below by Steve Kohler, who has a fresh view of the classification of these *Colias*, a view that is quite valuable as nearly all the confusing taxa seem to fly in his state of Montana.

***Colias edwardsii astraea* NEW COMBINATION, by Steve Kohler, Plates II-III**

The original description of *astraea* (Trans. Amer. Ent. Soc. 4:61, “Feb.” 1872): *Colias alexandra* n sp. Wm. H. Edwards. Male. Expands 2”, upperside pale ochraceous, very little tinted with orange on disks of secondaries from cell to marginal border and from base to hind margin of secondaries below cell, this color being not decided but only a tint; the border of primaries pale black, of medium width, erose within, very little advanced on costa and sending out a short and attenuated spur on inner margin; border of secondaries very narrow, erose within; and unusually long, extending from above upper sub-costa 1 nervule to below lower median; discal spot of primaries a short black streak; on secondaries wanting. Underside of primaries yellow nearly as above, without orange; of secondaries yellow densely covered with black scales so as to obscure the whole surface; discal spot of primaries very narrow, black, enclosing a few yellow scales, of secondaries white, as in *alexandra*, without a ring; no spot on costal margin; a scarcely perceptible pink tint at base; legs yellow, the tibia and tarsi faint pink; palpi yellow tipped with pink. (Antennae wanting in the specimen described.) From a single % taken near the Yellowstone Lake by the Hayden Expedition, in 1871. On the underside this species is nearest *alexandra*; on the upper of a different shade of color from any of our species. (end of original description)

The *astraea* holotype (figured in black-and-white by F. M. Brown 1973 on p. 73 and located at the Carnegie Museum in Pittsburgh) seemed to Scott to be very similar to ordinary *alexandra*, with ordinary dark ups borders, an ordinary unh color, the unh central spot a simple ringless pale spot as in typical *alexandra*, no uph central spot, etc.; nothing suggesting that it differs from *alexandra*. Kondla disagreed that it represented typical *alexandra*, and concluded that it was not a *christina* from study of the O.D., Brown’s illustration, and examination of specimens he had collected near Yellowstone. The O.D. suggests that *astraea* differs from *alexandra* by having the upperside a different shade of color. However, the uph orangish color is “only a tint”, and examination of the type by Kondla & Scott confirmed that this color is just a slight tint, in the same location on the uph where in many/most *alexandra* there is an orangish tint (the same location of the wing that reflects ultraviolet light, as the oranger pigment reflects uv). We all agree that there is nothing in the holotype to suggest that this specimen represents the *christina*-like ssp. that occupies central Montana and the Bighorn Mts. of Wyo., which has been wrongly called *C. christina* “*astraea*”.

To me, the *astraea* holotype photo in Brown (1973, p. 73) actually compares more favorably with photos of the lectotype of *C. edwardsii* (p. 66) and the neotype of *C. emilia* (p. 68) and others from the Crump Lake, Oregon series (p. 69) than it does with the lectotype of *C. alexandra* (p. 60). The dark wing borders are narrower on *astraea*, *edwardsii* and *emilia* than on *alexandra*. The species name *alexandra* should only be applied to those populations that have yellow wing fringes, a discal hindwing spot that is yellow dorsally and silver or pearly white ventrally with no ring, and a ventral hindwing ground color of grey-green with dark over-scaling. The name *C. alexandra alexandra* should only be applied to the single-brooded Colorado mountain populations that are basically yellow dorsally with fairly wide dark wing borders in the males, have a yellow dorsal hindwing discal spot and a grey-green ventral hindwing with dark over-scaling and a silvery-white discal spot with no ring (plate I shows male from Pioneer Resort, 8800’, Gunnison Co. Colo., July 1, 1975, R. E. Stanford). Concerning the dorsal hindwing discal spot, Kondla (1995) stated that the North American literature has

traditionally held that this discal spot is concolorous with the ground color, but close examination shows that in fact there is no discal spot in the vast majority of *alexandra*. My observations support Kondla's statement. Microscopic examination of this area of the wing shows no difference in color of the wing scales. Because the whitish discal spot on the ventral hindwing shows through when looking at the upper wing surface, it gives the illusion that there is a spot of yellow there that is slightly paler than the surrounding wing color. When reference is made to this 'spot' throughout the following discussions, it means that there appears to be a yellow spot, when in reality, the spot is lacking.

Characters distinguishing *edwardsii*, here considered a species separate from *alexandra*, are narrower dark wing borders dorsally, wing fringes pink, especially on the forewing, and a hindwing discal spot that can be orange as often as appearing yellow (plate II shows *edwardsii*: male Tybo Can., Hot Crk. Range, Nye Co. Nev. July 15, 1983 G. T. Austin; female 1 mi. E Kings River, Kings R. Valley, Humboldt Co. Nev. Aug. 24, 1984 G. T. Austin). Ventrally the hindwing color is more yellow, densely covered with black scales, and the discal spot is usually surrounded by a red-brown ring (see Fig. of a typical nominate *edwardsii* from Nevada). Brown (1973) mentions that he had Peter Herlan examine the *edwardsii* specimens in the Nevada State Museum, Carson City, Nevada from the general vicinity of Virginia City/Carson City. Of 84 males and 18 females examined, 2 percent of males and 11 percent of females showed prominent orange dorsal hindwing discal spots. Two of the 10 males and 4 of the females in the "neotype series" have such spots. The original descriptions of both *edwardsii* and *emilia* call for males without discal spot on the upper side of the hindwing. I examined a large series of Nevada *edwardsii* in Las Vegas in the collection of George Austin some years ago and noticed that several males and a considerable number of females had the orange discal spot. Populations in NW Wyoming in the area around Yellowstone Lake and from the vicinity of Green River Lakes in the Wind River Mountains have a high percentage of specimens with a red-brown ring around the unh central spot, and in this respect resemble *C. edwardsii* W.H. Edwards more than *alexandra* (which does not occur in the Yellowstone area), so *astraea* is here considered the ssp. name for the *edwardsii* (separated at species level from *alexandra* as described above) populations from these areas as well as adjacent areas in south-central Montana. Plates II-III illustrate 3 pair from Park Co. NW Wyoming locations in the general area of the type locality, as well as one male from Green River Lakes in Sublette Co., and a pair from Silver Bow and a female from Madison Counties, Montana.

The following material in the collections of Kohler, Kondla, and Scott was examined and found to belong to *astraea* (data for plate specimens is also noted). **WYOMING: Park Co.:** Dead Indian Hill, ~<8673', 2 Aug. 1982, 3 males 2 females, N.G. Kondla coll. (*astraea* 7-10 on plate III); 4 mi. E. of Painter, 13 Jul. 1983, 1 male, 14 Jul. 1983, 2 males (*astraea* 1 on Plate II), S. Kohler coll.; SE of Cooke City, 27 Jul. 1935, 1 male, C.C. Albright coll. **Teton Co.:** Rim Station, 6 Jul. 1966, 1 male, S. Kohler coll. **Sublette Co.:** Clear Creek Canyon, NE of Green River Lakes, 19 Jul. 2005, 3 males (*astraea* 2 on Plate II), S. Kohler coll.; Clear Creek Can. near Slide Falls, Wind River Mts., Aug. 10, 1980, 5m2f, J. Scott coll.; An additional series of specimens from vic. Green River Lakes in the collection of Steve Van Campen from San Diego, California was also examined; Doubletop Mtn., Wind River Mts., Aug. 9, 1980, 1f, J. Scott coll. **Big Horn Co.:** Antelope Butte Ski Area, 2550m=8366', Bighorn Mts., Aug. 3, 1995, 1f, J. Scott coll. **MONTANA: Broadwater Co.:** Avalanche Gulch, 6.5 mi. up, 8 Jul. 2005, 2 males, S. Kohler coll.; Confederate Gulch, 8.5 mi. up, 16 Jul. 2005, 1 male, S. Kohler coll. **Cascade Co.:** Monarch, 26 Jun. 1934, 1 male, H.E. Nelson coll.; 5 mi. N. of Manchester, 3500', 30 Jul. 1994, 1 male, C. Harp coll. **Deer Lodge Co.:** Forest Rd. 683, 2 mi. E. Silver Lake, 30 Jun. 1998, 1 male, 8 Jul. 1998, 3 males, 19 Jul. 2004, 1 male, 27 Jul. 1993, 1 male, S. Kohler coll.; N. Georgetown Lake, 11 Jul. 1985, 2males 1 female, 12 Jul. 1985, 1 male, S. Kohler coll.; Storm Lake Rd., 5 Aug. 1991, 1 male, S. Kohler coll. **Jefferson Co.:** Boulder River Rd., SW of Basin, 27 Jun. 1994, 1 male, S. Kohler coll.; Indian Cr. Rd., SW of Basin, 5 Jul. 1994, 1 male, S. Kohler coll. **Judith Basin Co.:** Forest Rd 120 at Forest Rd. 262, Little Belt Mtns., 19 Jul. 1994, 1 male, C. Harp coll.; 10 mi. S. of Geyser, Little Belt Mtns., 13 Jul. 1994, 2 males, C. Harp coll. **Lewis & Clark Co.:** Elkhorn Cr., Beartooth Game Range, 22 Jun. 2005, 1 male, 7 Jul. 2005, 8 males, S. Kohler coll.; Cottonwood Cr., Beartooth Game Range, 22 Jun. 2005, 2 males, S. Kohler coll.; Sucker Cr. Rd., 4800', 4 mi. NE Lincoln, 26 Jun 2001, 1 male, 29 Jun. 2001, 1 male, 25 Jul. 2000, 1 male, S. Kohler coll. **Madison Co.:** Camp Cr. Rd., 4-6 mi. E. of Melrose, 18 Jun. 2001, 1 male, 10 Aug. 2005, 1 male (*astraea* 4 on Plate III), S. Kohler coll.; S. of Camp Cr. Rd., 2-3 mi. E. Melrose, 12 Aug. 2005, 2 males, S. Kohler coll.; Standard Cr. Rd., Gravelly Range, 29 Jul. 1999, 1 male, S. Kohler coll. **Meagher Co.:** White Pass, 6000', 8 Aug. 1992, 1 male, B. Vogel coll. **Powell Co.:** Blind Canyon Rd., 4 mi. E. Seeley Lake, 19 Jun. 1992, 2 males, S. Kohler coll.; Swamp Cr. Rd., 5 mi. E. Seeley Lake, 23 Jun. 1992, 1 male, 25 Jun. 1992, 2 males 1 female, 14 Jul. 1992, 1 female, S. Kohler coll.; 1 mi. W. Priest Pass, 5 Jul. 1990, 1 male, S. Kohler coll.; below Morrell Lookout, 7415', E. Seeley Lake, 27 Aug. 2001, 1 male, S. Kohler coll. **Silver Bow Co.:** Camp Cr. Rd., 4-5 mi. E. Melrose, 4 Jun. 2004, 7 males, S. Kohler coll.; Barrel Spring trail, 6100', 4 mi. E. Melrose, 7 Jun. 2004, 7 males 2 females, 12 Jun. 2004, 6 males 2 females (*astraea* 5 on Plate II), 14 Jun. 2004, 2 males 1 female, S. Kohler coll.; Barrel Spring trail, 4-6 mi. NE of Melrose, 10 Aug. 2005, 10 males (*astraea* 3 on Plate III) 2 females, 12 Aug. 2005, 7 males 3 females, 7 Sep. 2005, 2 males 1 female (*astraea* 6 on Plate III), S. Kohler coll.; Soap Gulch, NE of Melrose, 9 Jul. 2005, 4males 1 female, S. Kohler coll.; Rocky Ridge trailhead, Divide Cr., 2.5 mi. W. of Feely, 19 Jun 2003, 1 male, S. Kohler coll.; Basin Cr., S. of Butte, 19 Jul. 1994, 2 males, S. Kohler coll.; Divide Cr., 6 Aug. 1975, 2 males, S. Kohler coll.

Both yellow and white females are present. Most localities appear to have just a single yearly generation, with the exception of the Camp Creek area east of Melrose in Madison and Silver Bow Counties, Montana, where fresh specimens have been taken the first part of June and in August and early September. This is a very dry, almost desert area of foothills and lower canyon.

Material farther west in Montana and Idaho, west of the Continental Divide, is closer to nominate *edwardsii*; a little larger, with a lighter unh and a greater percentage of specimens with a yellow-appearing discal spot on the dorsal hw than an orange spot. Both yellow and white females are present and they appear to have a single generation. Material examined includes: **MONTANA: Beaverhead Co.:** Tom Creek bog, E. of Lakeview, 9 Jul. 1996, 1 male, S. Kohler coll.; nr. Lemhi Pass, 20 Jul. 1982, 1 male, S. Kohler coll.; Birch Cr., NW of Dillon, 2 Jun. 2004, 1 male, S. Kohler coll. **Granite Co.:** N. of Phillipsburg, 26 Jun. 1990, 1 male, S. Kohler coll.; SE of Phillipsburg, 13 Jul. 1994, 1 male, S. Kohler coll. **Lake Co.:** Rollins, 6 Jul. 1976, 1 male, S. Kohler coll. **Mineral Co.:** St. Regis, 24 Jul. 1973, 2 males, S. Kohler coll. **Missoula Co.:** N. Fork Howard Cr., 18 mi. W. of Lolo, 9 Jun. 1992, 1 male, 5 Jul. 1997, 1 male 2 females, 20 Jul. 1998, 3 males 2 females, 25 Jul. 1995, 6 males 1 female, S. Kohler coll.; Blue Mountain Rd., W. of Missoula, 11 Aug. 1975, 1 male, S. Kohler coll.; nr. Lolo, 11 Jul. 1975, 1 male, S. Kohler coll.; 10 mi. E. Seeley Lake, 21 Jul. 1978, 2 males, S. Kohler coll.; Miller Cr., nr. Missoula, 14 Aug. 1980, 1 male, S. Kohler coll.; Butler Cr., off 9-Mile Cr. Rd., 3850', 1 Aug. 1995, 1 male, S. Kohler coll.; Frenchtown, 30 Jun. 1976, 1 male, S. Kohler coll. **Ravalli Co.:** Railroad Cr., 4950', off Skalkaho-Rye Rd., 25 Jun. 2001, 1 male, S. Kohler coll.; 3-Mile Cr., SE of Florence, 25 Jul. 1997, 1 male, S. Kohler coll.; Bass Cr., SW of Florence, 23 Jul. 1974, 1 female, 24 Jul. 1972, 1 male, S. Kohler coll. **IDAHO: Lemhi Co.:** 4 mi. W. Bannock Pass, 19 Jul. 1990, 1 female, S. Kohler coll.; above Bannock Pass, 24 Jul. 1991, 2 males, S. Kohler coll.

These *edwardsii* are sympatric at several locations with *C. pseudocolumbiensis* west of the Continental Divide in Montana, and the *C. edwardsii astra* are sympatric with *C. christina* n. ssp. at several locations east of the Continental Divide in Montana. They are also sympatric in at least 3 locations in central Montana (Cascade, Fergus and Judith Basin Counties) with the new 2-generation northern Great Plains subspecies of *C. alexandra* described below.

One source of confusion about what insect should be associated with the holotype of *C. astra* is the additional material labeled "*astra*" in the Edwards collection at the Carnegie Museum. Brown (1973) lists four males and a female from the Judith Mountains [Fergus Co.], Montana. Two of the males are labeled "*astra*", one male "*christina* v. *astra*", one male "*christina*", and the female "*christina* v. *astra*". This female was illustrated in "The Butterfly Book" (Holland, 1931), Pl. 68, fig. 27 as a type, but Brown disputes Holland's claim, calling this specimen a pseudotype. Though this female could possibly represent *C. edwardsii astra*, the dark color of the hair-like scales of the thorax, abdomen and wing bases suggest it is the Montana subspecies of *christina* to be described below. Other Edwards "*astra*" at the Carnegie Museum are two bred males from Laggan, one labeled "*christina* form *astra*", the other "*christina astra* form"; one male "*astra*" from B. Am.; 2 males "*christina* var. *astra*" from Banff. One of these was illustrated by Holland in "The Butterfly Book" Pl. 68, fig. 26, and claimed to be a type by Holland. Not so, according to Brown (1973); it is also a pseudotype. Surely all of this Canadian material represents pale orange individuals of *C. christina*, as noted by the wide dark wing border of the fig. 26 individual and the large prominent hindwing discal orange spot.

Edwards' *C. christina christina* material at the Carnegie Museum includes two bred females of the same Laggan lot as the "*astra*" males mentioned above. There are 3 males and one white female labeled "*christina*" from Judith Mts. [Fergus Co.], Montana. According to Brown (1973), one of the males is *C. eurytheme* Boisduval, and the others are intermediate between true *christina* and *astra*, and also most likely represent the west-central Montana and NW Wyoming orange and yellow ssp. previously known as "*astra*", which is discussed and given a replacement name below.

***Colias christina sacajawea* Steve Kohler, NEW SUBSPECIES, Plates I-II**

As it was shown above that *astra* is actually a subspecies of *C. edwardsii*, this replacement name is necessary for the *C. christina* ssp. from west-central Montana and the Bighorn Mountains of N Wyoming, known for many years as "*astra*".

Definition. This subspecies is most similar to nominate *C. christina* in the extent and placement of the orange color (when present) of the upper surfaces of the wings of the males, but in shade and intensity is most similar to *C. christina pseudochristina* Ferris. At its strongest expression, the orange of *sacajawea* is not as dark or intense as *C. christina christina* or *C. christina krauthii* Klots. Only about half of males at or near the type locality have the extent of orange as exhibited in the holotype (fig.); a lesser percentage have at least some orange flush, but around 40 percent of the males have no orange dorsally, the ground color being yellow. This variation is shown in the photos of two paratype males (figs.). When present as in the holotype male, the orange of the upper forewing is weaker near the costal margin and ends rather abruptly as it nears the wing base, where it is replaced by yellow. On *christina* and *pseudochristina* the orange extends further toward the costal margin, and on *krauthii*, the orange usually extends completely to the costal margin as well as extending into most of the wing base area. On *pseudochristina* the orange does not end as abruptly as it nears the wing base, but extends further towards the thorax with a more gradual blend to yellow. On the upper hindwing the orange of *sacajawea* is limited to a patch adjacent to the outer black border, which extends toward the base of the wing, ending abruptly near the distal end of the discal cell, in the vicinity of the discal orange spot. On *christina* this hind wing patch

extends a little further toward the base of the wing, and even further on *krauthii*. The dorsal hind wing discal spot on *christina*, *pseudochristina* and *krauthii* is almost always vivid orange, but on *sacajawea*, though normally vivid orange, it is sometimes a lighter shade of orange and occasionally appears yellow. The dark wing borders of *sacajawea* are of similar width as *christina*, and the wing fringes are pink. The black scaling, extending in a “smudge” outward from the base of the both wings dorsally is not as obvious or extensive on *sacajawea* as it is on *christina*. On the under side of the forewing, males of *christina* have more and darker orange than *sacajawea*, and it extends out further toward the tip of the wing. Yellow and pale orange *sacajawea* usually have little if any orange on the under forewing. On the under hindwing of *sacajawea*, the color is a more greenish-orange, compared to the muted orange of *christina*. A dense overscaling of black scales produces the greenish tones of both subspecies but the orange shows through more vividly on *christina*. The hindwing discal spot is pinkish-white on *sacajawea*, surrounded by a red-brown ring, and there often are faint to somewhat prominent submarginal spots and sometimes a small satellite spot next to the discal spot. The ring around the discal spot of *christina* is usually more reddish. The females of *sacajawea* are usually white above, as in the allotype female (fig.), with the discal spot varying from dark to light orange, but sometimes have an orange flush or can occasionally be yellow with an orange flush, as in the two female paratypes illustrated (figs.). They have vivid pink wing fringes, and a weak dark wing border on the forewing that is usually lacking on the hindwing. Females of *christina* are usually yellow above, with a strong orange flush and dark orange discal spot, but can be lighter, and females of *pseudochristina* are usually pale yellow with a slight orange flush and somewhat lighter discal spot. The coloration underneath of the females of *sacajawea* is similar to the males. **Name.** This subspecies is named for Sacajawea, the young Snake Indian (Shoshone) wife of Charbonneau, interpreter for the Lewis and Clark Expedition. She and her husband, along with her two-month-old son, had joined the expedition at Ft. Mandan, North Dakota, and were with the party as they left the Great Falls of the Missouri River in Montana July 15, 1805 and made their way up the river toward Three Forks. On July 16 they camped at the northern foot of the Big Belt Mountains and on July 19 were at the Gates of the Mountains, just a few miles from the type locality (De Voto, 1953). Not far from there is Sacajawea Mountain, named in her honor. Her knowledge of the upper Missouri and its inhabitants (her people), contributed greatly to the success of the expedition. It is possible that, as they passed through this area, she could have observed the butterfly named for her. **Range.** Found from extreme southern Alberta southward in the mountains of west-central Montana, as far as Beaverhead County to the west, and as far as the Judith and Snowy Mountains in Fergus County to the east, and southward through central Montana into the Bighorn Mountains of north-central Wyoming. The holotype, allotype and most of the paratypes are from the Big Belt Mountains in Lewis & Clark, Broadwater and Meagher Counties. In extreme southern Alberta, east of the mountains, *sacajawea* flies on topographic prominences that don’t really qualify as mountains, but are not low, dry prairie either (Kondla, 1995 and pers.comm.). Specimens examined from north of the Teton River drainage, in Pondera County Montana, appear, in some ways, closer to *C. christina christina*, having a little darker shade of orange on the males, and the single female is yellow with a strong orange flush. All are a deeper shade of orange underneath. **Types.** Holotype male—Elkhorn Creek, Beartooth Game Range, Lewis & Clark Co., Montana, 7 July 2005, S. Kohler coll. Allotype female—White Gulch, 6000’, 24 mi. NNE of Townsend, Broadwater Co., Montana, 12 August 1990, B. Vogel, coll. **Paratypes** (and data for plate paratypes)—**MONTANA: Broadwater Co.:** Mount Baldy, 6000’, 15 mi. NE Townsend, 8 Jul. 1999, 1 male, B. Vogel coll.; White Gulch, 6000’, 24 mi. NNE Townsend, 12 Aug. 1990, 2 males 2 females (PT3 on Plate II), B. Vogel coll.; Avalanche Gulch, 5100’, 1 Aug. 1993, 1 male 1 female, B. Vogel coll.; Confederate Gulch, 8.5 mi. up, 16 Jul. 2004, 3 males, S. Kohler coll.; Confederate Gulch, E. Canyon Ferry, 23 Jul. 2002, 1 male, S. Kohler coll.; Avalanche Gulch, 6.5 mi. up, 8 Jul. 2005, 44 males (PT1 on Plate II), S. Kohler coll. **Lewis & Clark Co.:** Elkhorn Cr., Beartooth Game Range, 21 Jun. 2005, 4 males, 22 Jun. 2005, 15 males, 29 Jun. 2005, 4 males, 7 Jul. 2005, 68 males (PT2 on Plate II), S. Kohler coll.; Cottonwood Cr., Beartooth Game Range, 22 Jun. 2005, 12 males, 7 Jul. 2005, 4 males, S. Kohler coll.; Sucker Cr. Rd., 4800’, 4 mi. NE Lincoln, 27 Jun. 2001, 2 males, 14 Jul. 2004, 1 female (paratype PT4 on Plate I), S. Kohler coll.; nr. Marysville, 14 Aug. 1975, 1 male, S. Kohler coll.; Spring Cr., NW Lincoln, 14 Jul. 2004, 1 male, S. Kohler coll.; nr. Lincoln, 16 Jul. 1976, 2 females, 21 Jul. 1971, 3 males, S. Kohler coll.; nr. Marysville, 13 Aug. 1975, 1 male, S. Kohler coll.; Skelly Gulch, 6800’, 16 mi. NW Helena, 24 Aug. 1991, 3males 2 females, P. & D. Anderson coll.; 25 Aug. 1991, 1 male, B. Vogel coll. **Meagher Co.:** end Avalanche Gulch, crest Big Belt Mtns., 3 Jul. 1994, 1 female, B. Vogel coll.; White Pass, 6000’, 8 Aug. 1992, 2 males, B. Vogel coll.; Forest Rd. 211, 6 mi. E. White Sulphur Springs, 16 Aug. 2005, 2 males, S. Kohler coll. The holotype male, allotype female, 2 male and 2 female paratypes will be deposited in the Monte L. Bean Life Science Museum, Brigham Young Univ., Provo, Utah. The remaining paratypes are in the Kohler collection. **Additional material examined.** **MONTANA: Beaverhead Co.:** nr. Moose Park, Hwy. 73, Pioneer Mtns., 3 Aug. 2004, 2 females, S. Kohler coll. **Big Horn Co.:** nr. Pryor, 10 Jul. 1972, 1 male, J. Dewey coll. **Carbon Co.:** East Rosebud Canyon, 5400’, 8 mi. S. of Roscoe, 19 Jul. 1989, 1 male, B. Vogel coll.; nr. Jimmy Joe Campground, East Rosebud Canyon, 9 Jul. 1997, 1 male, S. Kohler coll.; nr. Red Lodge, 30 Jul. 1974, 1 female, S. Kohler coll. **Cascade Co.:** Monarch, 26 Jun. 1934, 1 male, H.E. Nelson coll.; Monarch, 16 Aug. 1934, 1 female, C.C. Albright coll.; Kings Hill, Little Belt Mtns., 27 Jul. 1992, 1 female, S. Kohler coll. **Deer Lodge Co.:** Forest Rd. 683, 2 mi. E. Silver Lake, 8 Jul. 1998, 2 males, 19 Jul. 2004, 1 male 5 females, 27 Jul. 1993, 3 males, S. Kohler coll.; N. Georgetown Lake, 11 Jul. 1985, 2 males 1 female, 12 Jul. 1985, 2 males 1 female, S. Kohler coll.; below Storm Lake Pass, Anaconda Range, 26 Jul. 2000, 1 male, S.

Kohler coll. **Fergus Co.:** Little Snowy Mtns., 29 Jun. 1989, 1 male, 13 Jul. 1976, 1 male, 21 Jul. 1975, 4 males 1 female, S. Kohler coll.; nr. Crystal Lake, Big Snowy Mtns., 26 Aug. 1975, 6 males 3 females, 23 Sep. 1975, 1 male, S. Kohler coll. **Golden Valley Co.:** E. slope Lost Peak, Big Snowy Mtns., 6500', 4 Jul. 1992, 1 male, B. Vogel coll. **Granite Co.:** N. of Phillipsburg, 26 Jun. 1990, 1 male, S. Kohler coll.; nr. Skalkaho Pass, 1 Aug. 1988, 1 female, S. Kohler coll. **Jefferson Co.:** Boulder River Rd., SW of Basin, 8 Sep. 1993, 1 female, S. Kohler coll. **Judith Basin Co.:** vic. Yogo Peak, 5 Aug. 2004, 1 male, S. Kohler coll. **Madison Co.:** Standard Cr. Rd., Gravelly Range, 24 Jul. 1999, 1 female, S. Kohler coll. **Powell Co.:** Swamp Cr. Rd., 5 mi. E. Seeley Lake, 23 Jun. 1992, 6 males 1 female, 25 Jun. 1992, 4 males, 27 Jun. 1992, 1 male, 14 Jul. 1992, 1 male, 17 Jul. 1992, 1 male, S. Kohler coll.; 1 mi. W. Priest Pass, 5 Jul. 1990, 1 male 1 female, S. Kohler coll.; 5.5 mi. E. Seeley Lake, 10 Jul. 2000, 3 males, S. Kohler coll.; N. Fork Blackfoot River, 25 Jul. 2000, 1 male, S. Kohler coll.; 4 mi. S. Elliston, 6000', 6 Aug. 1995, 1 male, B. Vogel coll.; below Morrell Lookout, 7415', E. Seeley Lake, 27 Aug. 2001, 1 female, S. Kohler coll. **Silver Bow Co.:** Camp Cr. Rd., 4-8 mi. E. Melrose, 14 Jun. 2004, 2 males, S. Kohler coll.; Humbug Mountain, 10 Jul. 1985, 1 male, 2 females, S. Kohler coll.; Highland Lookout, E. Feely, 24 Jul. 1986, 1 male 1 female, S. Kohler coll. **Stillwater Co.:** Benbow Mine Rd., 5 mi. SW of Dean, 10 Jul. 1997, 3 males, S. Kohler coll.; Benbow Mine Rd., 6400', 21 Jul. 1994, 1 male, B. Vogel coll.; Benbow Mine Rd., 8500', 17 mi. SW Fishtail, 13 Aug. 1989, 3 males 2 females, B. Vogel coll. **Sweet Grass Co.:** Swamp Cr. Rd., 12 Jul. 1978, 1 male 1 female, 24 Jul. 1975, 1 female, S. Kohler coll.; Swamp Crk. Rd., 5400', July 2, 1966 2m, J. Scott coll. **Teton Co.:** Teton River, 30 mi. NW Choteau, 17 Jul. 2000, 12 males, 4 Sep. 2001, 1 male, S. Kohler coll. **Wheatland Co.:** W. Judith Gap, 17 Aug. 1987, 2 males 1 female, S. Kohler coll. **WYOMING: Big Horn Co.:** Hidden Basin Cgd., Bighorn Mts., June 26, 1966 1m J. Scott coll. **Sheridan Co.:** Bighorn Mts., 2 Jul. 1987, 3 males, S. Kohler coll.; 4 mi. SE Little Bald Mtn., at "timberline" 2720m=8924', Bighorn Mts., Aug. 1, 1995 1m J. Scott coll.; Burgess Junction, 2463m=8081', Bighorn Mts., July 27, 1957, 3m, Gene DeFoliart (Univ. Colo. museum).

I have seen some orangish individuals in a few specimens among those collected from the Wind River Mts. Wyo. by Paul Hammond and Steve Van Campen, but the orange is not nearly as extensive as it is in *sacajawea*, and the wing borders are narrower than *sacajawea*, and the vhw color is not the same either, thus those Wind River Mts. populations are considered to be *C. edwardsii astraea*. In Wyoming, *sacajawea* evidently occurs only in the Bighorn Mts.

Taxonomic relationship. The subspecies *C. christina sacajawea* is sympatric with *C. pseudocolumbiensis* at the western limits of its range in Montana, with the two flying together at several localities, and its range also overlaps that of *C. edwardsii* nr. *edwardsii* in parts of SW Montana. This is evidence that the three belong to separate species. In Judith Basin, Cascade and Fergus Counties *sacajawea* flies in close proximity to both *C. edwardsii astraea* and the new *C. alexandra* ssp. from the eastern plains of Alberta and Montana, more evidence that there are four species of the *alexandra* complex in Montana, *alexandra*, *edwardsii*, *christina* and *pseudocolumbiensis*.

***Colias edwardsii (alexandra?) altiplano* Michael S. Fisher and James A. Scott, NEW SUBSPECIES
(common name High Plains Sulfur), Plate VI**

Definition. This Great Plains two-generation ssp. is distinguishable from univoltine montane *C. alexandra* (plate I shows montane male from Pioneer Resort, 8800', Gunnison Co. Colo., July 1, 1975, R. E. Stanford) in many characters. The black wing borders of males are narrower on upf and uph on average, sometimes very narrow. Fw shape is usually more pointed. Wing fringes are pinkish on most males (although the pink may be noticeable only on the underside; the fringes are pinker on those males with orange uph spot) and slightly pinker on females, whereas mtn. *alexandra* tend to have creamier fringes on males and slightly pinkish fringes on females. The unf disc of the forewings is a brighter, warmer (slightly orange) yellow with less of a pale white area on the lower portion of the wing. The unh ground color is slightly lighter (grayer), especially in the second generation (unh color obviously varies seasonally, being darker greenish-gray in the spring generation, a little paler greenish-gray in the second gen.). The uph central spot is slightly more often orangish (the uph discal spot is sometimes whitish-yellow, often faintly orange as on the types, or is orange), whereas it is seldom orange in *alexandra*. The reddish unh marks seem a little more prevalent in *altiplano* (these marks include a reddish ring around the central spot, a reddish satellite spot beside it, and submarginal russet dots). In *altiplano*, the unh central spot is usually surrounded by a ring, which is always pink in color if the uph discal spot is orange. However these unh spots are not quite as prevalent and are somewhat less reddish than they are in the Great Basin ssp. *edwardsii*, and *altiplano* has the unf yellowish color more orangish in shade than *edwardsii*. On average, *altiplano* is smaller in wingspan than the univoltine mountain *alexandra*. *altiplano* is one of the very few ssp. of butterflies that only occur on the Great Plains.

Variation. All of these traits are somewhat variable, and specimens can be found in *altiplano* and *alexandra* that fit both these names and even *edwardsii*. The black borders are more often narrower than *alexandra* but may be just as wide. The forewings are sometimes even concave on the outer margin, and the hindwing sometimes has a distinct apical angle. Fw shape varies, as does unf color and fringe color and unh ground color. A reddish ring on the unh discal spot is more frequent in *altiplano*, and is usually present whether the discal spots above are orange or not. The uph discal spot is orange in about the same frequency in both the first and second generations, which Fisher estimates as 25-35%. **Comparison to NW Colorado ssp. near-edwardsii.** Butterflies from Diamond Peak in Moffat Co. differ somewhat from Great Basin *edwardsii* (plate II) in some traits, but we'll use that name here for comparison. The black fw border of males averages

narrower in *altiplano*, usually wider in *alexandra* and *edwardsii*. The outer fw margin is often straight in *altiplano*, seldom in the others. The hw often has a notable apex in *altiplano*, seldom in the others. The uph central spot is rarely orange in *alexandra*, often orange in *altiplano*, always orange *edwardsii* (adults with this spot pinkish tend to be pinker elsewhere on the wings also). The unh central spot is rarely ringed with pink in *alexandra*, usually ringed in *altiplano*, always in *edwardsii*. This central spot has a satellite spot in about 10% of *altiplano*, about the same number of *edwardsii*, but a ring is rare in *alexandra*. The unh/unf sometimes has russet submarginal dots (“*eurytheme* spots”) in all three taxa. Dorsal wing fringes are generally yellow in *alexandra*, a little pinkish (esp. females) in the usual *altiplano*, and more pinkish in *edwardsii*. Ventral wing fringes are slightly pinkish in some *alexandra* males and most females, in most *altiplano*, and all *edwardsii*. The unf yellow color has a warmer tint in *altiplano*, a yellower tint in the others. The unf has a white area in all *alexandra* and *edwardsii*, but the white is reduced or absent in *altiplano*. The unh ground color is paler grayer-green in *altiplano* (varies from spring to summer as noted above), grayish but sometimes yellowish-green in *alexandra*, and is like the usual *alexandra* in *edwardsii* (but is not quite like Great Basin *edwardsii*). **Name.** *Altiplano* is Spanish for “high plains”, because the range occupies the highest-altitude portion of the Great Plains. **Taxonomic relationship.** Interestingly, the bivoltine ssp. *altiplano* seems more similar to the bivoltine ssp. *edwardsii* (TL Virginia City, Nevada)=*emilia* W. Edwards (TL Crump L., Lake Co. Ore.) from the lowlands of Nevada-Utah-Idaho-Ore.-Wash.-SW Mont., than to the univoltine Colo. mtn. ssp. *alexandra*. Thus *altiplano* seems to be the Great Plains representative of *edwardsii*. Farther north in the Great Plains, in E Montana and Alberta (the new ssp. named below), Kondla & Kohler find that bivoltine adults are smaller and females are whitish and the reddish fringes and rings are reduced like *alexandra*, so *altiplano* does not extend that far north. The butterflies have two generations on the Great Plains from Alta. south to the Dakotas and Neb. and SE Wyo. and Colo., and *edwardsii* mostly has two gen. also, perhaps the reason for the similarity of *altiplano* to *edwardsii* as their similar flight patterns and habitat allowed them to trade more genes, and their similarity may also represent shared recent ancestry. Ssp. *altiplano* has two generations even where it occurs within just one km of the foothills (*altiplano* occurs on Green Mtn. and South Table Mtn. in Jefferson Co., both of them prairie-covered prominences [sedimentary in Green Mtn., and volcanic lava on the latter] which are right next to the true foothills), whereas ssp. *alexandra* in the mountains has one generation. Those *altiplano* populations right next to the foothills do not seem to differ from those 20-30 miles eastward on the plains SE of Denver and in C Wyo. and Neb.; they differ from mtn. *alexandra*, though both taxa are somewhat variable in nearly every trait so some individual specimens do not fit their ssp. Because Scott’s specimens show no indication (other than the overlap of individual variation) that these taxa intergrade along the foothills, the possibility exists that *altiplano* and *alexandra* could be separate species, and *altiplano* could be a ssp. of *edwardsii* rather than *alexandra*, if those two taxa are different species (as Kohler suggests above). And the difference in average wing shape in particular might suggest that they are different species. Some Great Basin species do extend eastward across S Wyoming into Nebraska and N Colorado, such as *Speyeria zerene* and *Euphydryas bernadetta*. Arguing against the theory, *altiplano* is more similar to *edwardsii*, but falls between *edwardsii* and *alexandra*, so one could argue that it has shared genes with both. And variability of the taxa makes such theories difficult to prove, without extensive rearing of large families from individual females. Further studies of their relationship are needed, but at the present time we tentatively list *altiplano* as *C. edwardsii* (*alexandra*?) *altiplano*, representing our view that it probably belongs to *C. edwardsii*, but we are not completely certain. **Range, habitat, and behavior.** Occurs on shortgrass prairie areas of the highest-altitude western Great Plains, from eastern Wyoming and western Nebraska southward through eastern Colorado, where it flies primarily north of Colorado Hwy. 93, including east and north of the Black Forest. It also occurs on shortgrass prairie habitats within 1 km of the actual Front Range hogback and foothills in Colo. (such as Green Mtn. and South Table Mtn. and Bear Creek in Jefferson Co., and probably south of there to at least the Sedalia area in Douglas Co.). It has two generations, the first from early May to late June (earliest east of Denver, latest near the foothills); the second, from late July through August. It is most commonly found where there is coniferous forest (Ponderosa Pine) or where remnant forest existed on prairie sites. The host plant at the type locality is *Thermopsis montanus* (Golden Pea or Golden Banner), but the host is probably *Astragalus* spp. or perhaps *Oxytropis* at drier prairie sites without trees. *Altiplano* is a swift flyer, is difficult to catch over open ground, is not seen at flowers very often (sometimes females) and does not seem attracted to wet sand or mud like mountain populations. **Types.** Holotype male and allotype female (both deposited in Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado) Piney Creek, 6000 ft., Arapahoe Co., Colorado, 23 June 1993 and 2 June 1974, both coll. M. S. Fisher. Numerous paratypes from the TL and other eastern Colorado localities collected between 1969 and 1994 are in the coll. of M. Fisher, and many paratypes from eastern Colorado, southern Wyoming and western Nebraska collected between 1969 and 1998 are in the coll. of J. Scott.

***Colias alexandra altamont*, NEW SUBSPECIES, by Norbert G. Kondla and Steve Kohler
(common name Northern Prairie Sulphur), Plate I**

Northern prairie populations of *Colias alexandra* have long been recognized as being different from nominate *alexandra* (Kondla 1981, 1993, 1995), and are here described as a new subspecies.

Definition. This northern prairie subspecies of east-central Montana and southeastern Alberta, which has two generations, differs from univoltine montane nominate *C. alexandra* from Colorado in the following aspects. Size of

altamont is smaller (spread Montana males average approximately 45mm in expanse tip-to-tip of forewings, and Alberta males average about 41mm with a range of from 36 to 45mm; nominate Colorado *alexandra* males average approximately 49mm). The male forewing shape in *altamont* is more pointed and narrow, while being broader and more rounded in *alexandra*. The black wing borders of the upper side of male *altamont* are narrower than are those of *alexandra*, and the yellow is a 'colder' shade than on *alexandra*. This also includes the yellow on the ventral forewing. The male dorsal forewing discal black spot is a little smaller on *altamont* (see Figs. of *altamont* holotype and Figs. of nominate Colorado *alexandra* for comparison). Both have a yellow-appearing dorsal hindwing discal spot (because the ventral white discal spot shows through, but in reality the spot is lacking). Females of *altamont* are mostly white on the dorsal surface (as in the allotype, Fig.), while *alexandra* females are yellow. Of 35 females in the collections of the authors examined, 29 were white and only 6 yellow (see Fig. of a paratype female). Even when *altamont* females are yellow, it is a different, colder yellow than nominate *alexandra*. Wing fringes of both male *altamont* and *alexandra* are yellow. These fringes in the females of both subspecies are somewhat pinkish, especially on the forewings, but female *alexandra* usually have more extensive pink on the wing fringes. The ventral hindwing color of *altamont* is a little more greenish, rather than the grayish of *alexandra*, and both have the discal spot pearly white with no ring. **Name.** The name *altamont* is a combination of the province of Alberta and the state of Montana. **Taxonomic relationship.** *C. alexandra altamont* is sympatric with *C. edwardsii astraea* (as redefined above) in Cascade, Fergus and Judith Basin Counties, Montana, and *C. christina sacajawea* is also found in close proximity at some locations in these counties. These findings support the separation of *alexandra* and *edwardsii* into two distinct species. Furthermore, based on the fact that *altamont* is double brooded, and on the totality of the other characters separating it from nominate *alexandra*, there may be sufficient differences that one could consider possible separation of the two at species level. The relationship of *altamont* to the very small *alexandra* discussed briefly by Ferris (1972) is unclear. He said, "In western Wyoming and northern Utah, a diminutive *alexandra* is found. It is not clear whether this is an altitudinal form or genetically related. The specimens are considerably smaller than normal *alexandra alexandra* and the dorsal black borders of the males are very narrow (as in *emilia*). The discal spot is lacking but appears to be yellow because of the white ventral spot showing through on the upper surface of the wings." Ferris elaborates no further on these specimens. Kohler has, in his collection, 3 specimens from Montana that fit Ferris's description. They are all from the Little Belt Mountains in Cascade County as follows: 1 male, Monarch, 11 Aug. 1934, 1 male 1 female, Kings Hill, 15 Aug. 1934, all C.C. Albright coll. The two males have a wing expanse of approximately 38mm (compared to 49mm for *alexandra* and 45mm for *altamont*). The female has a wing expanse of 41mm. A.B. Klots examined the pair from Kings Hill in 1977, and determined that were *C. alexandra alexandra* dwarfs. If they are indeed dwarfs, they more closely fit the definition given here of *altamont*, except in size, rather than *alexandra alexandra*. They are not from the same habitat as where *altamont* is normally found (prairie and foothills), but are from coniferous forest at between 6000-7000' in elevation in the mountains. Too few specimens are available to draw further conclusions at this time. **Range and habitat.** It occurs in the prairie region and foothills east of the mountains from southeastern Alberta and southern Saskatchewan south through central and east-central and eastern Montana in the Great Plains Dry Grassland ecological province, which includes everything east of the Rocky Mountains except for several island ranges and the small portion of arid land comprising the Intermountain Semi-desert Province. The Great Plains Dry Grassland is largely rolling semiarid terrain, much of which is rangeland, home to grasses and sagebrush and dissected by intermittent streams. North of the Missouri River is a largely treeless, hummocky terrain with seasonal and semi-permanent potholes and wetlands. To the northwest, several island ranges of significant elevation rise above the plains, including the Little Rocky Mountains, Bears Paw Mountains and Sweetgrass Hills, each supporting coniferous forests at higher elevations (Werner et al., 2004). The range of *altamont* extends south at least to Montana's Intermountain Semi-desert Province, the dry semi-desert region in Carbon County west of the Pryor Mountains and just north of the Wyoming border. In the rain shadow of the Beartooth Mountains, this region is one of the driest places in Montana and supports mostly a sagebrush steppe plant community distinct from adjacent ecological provinces. In Canada *altamont* is a prairie grassland butterfly that flies where there are patches of native grassland containing legumes among the predominantly cultivated landscape. There is one old record probably referring to *altamont* from southern Manitoba (Layberry et al. 1998), but they are apparently either extirpated there or survive in a few isolated pockets of what little prairie habitat is left. There are apparently no recent records for Manitoba. Kondla has examined approximately 70 specimens in his collection from Alberta and Montana and also examined many additional specimens in various other private and institutional collections. The distribution map for *C. alexandra* in Alberta in Layberry et al. (1998) contains numerous errors. Published maps that accurately show the Alberta distribution of ssp. *altamont* include Bird et al. (1995), Ferris (1993), and Kondla (1993, 1995). The range of *altamont* also extends into North Dakota, where it is apparently restricted to badlands counties south and west of the Missouri River (Royer 2003). Royer referred to *C. alexandra* (no subspecies were discussed) as a rare endemic that is only sporadically encountered in N. D. Recent records listed include Mineral Springs and Chalky Butte, Slope Co.; the northeast slope of Bullion Butte, Billings Co.; Sentinel Butte, Golden Valley Co.; and Killdeer Mountains, Dunn Co. Royer's figures of *C. alexandra* represent ssp. *altamont*. **Types.** Holotype male and allotype female—Arrow Creek breaks, Hwy. 80, 19 mi. N. of Stanford, Fergus Co., Montana, 19 August 2002, S. Kohler coll. Paratypes—**MONTANA: Broadwater Co.:** White Gulch, 24 mi. NNE Townsend, 12 Aug. 1990, 1 female, B. Vogel coll. **Carbon Co.:** Bear Cr., 18 Jul. 1994, 3 males, B.

Vogel coll.; 8 mi. SE of Bridger, 6 Aug. 1994, 2 males 2 females, B. Weber coll.; Silver Tip Cr., 7 mi. SE of Belfry, 22 Jul. 1994, 1 male, B. Vogel coll. **Chouteau Co.:** Little Battle Cr., Hwy. 80, 21 mi. N. of Stanford, 19 Aug. 2002, 1 male, S. Kohler coll. **Daniels Co.:** 5 mi. N. of Scooby, 1 Aug. 1980, 1 female, G. Anweiler coll. **Fergus Co.:** Arrow Cr. breaks, Hwy. 80, 19 mi. N. of Stanford, 19 Aug. 2002, 1 male 2 females (paratype on plate I), S. Kohler coll.; Crystal Lake Rd., nr. Big Snowy Mtns., 26 Aug. 1975, 1 male, S. Kohler coll. **Judith Basin Co.:** 7 mi. E. of Geyser, 21 May 1981, 1 female, S. Kohler coll.; 5 mi. SE of Geyser, 15 May 1987, 2 females, S. Kohler coll. **Liberty Co.:** 10 mi. N. of Chester, 20 Jun. 1990, 1 female, S. Kohler coll. **Petroleum Co.:** nr. Teigen, 17 Aug. 2005, 1 male, S. Kohler coll. **Valley Co.:** nr. Bjornberg Bridge, NW of Hinsdale, 20 May 1998, 1 female, S. Kohler coll. **Wheatland Co.:** 4 mi. S. of Two Dot, 17 Aug. 2005, 1 female, S. Kohler coll. Holotype male, allotype female and one female paratype will be deposited in Monte L. Bean Life Science Museum, Brigham Young Univ., Provo, Utah; remaining paratypes in the Kohler collection.

Oeneis alberta ojbwe J. Scott & Norbert G. Kondla, NEW SUBSPECIES

Definition: wings much more orange-tawny on ups than any other ssp. By comparison, *alberta* Elwes, *oslari* Skinner, and *capulinensis* Brown are all grayer, and are rather variable in color with some dark-gray individuals and some oranger individuals, and variable number of ocelli, and all look like synonyms of *alberta* to Scott (the Saguache Co. Colo. population is the most different, being more uniformly light-ochre-gray, yet it has no name, though it looks similar enough to *alberta* to not be nameable by Scott). Ariz. *daura* (Strecker) is a valid ssp. *Ojbwe* is not as reddish as *O. calais calais*. *Ojbwe* was fig. by Klassen et al. (1989, pl 25, figs. 11, 12, 14); notice how these are tawnier than grayish ssp. *alberta* from SW Man. (figs. 10 & 13). **Range:** SE Manitoba. **Holotype:** the male figured in Butt. Canada (plate 19, fig. 19) from Pine Ridge, Man., May 24, 1973, coll. Paul Klassen; this holotype is in CNC (segregated in a separate section of the coll. with the other butterflies illustrated in that book). **Paratypes** in J. Scott collection, all from Pine Ridge: June 3, 1956 C. S. Quelch 1m; May 28, 1973 from Joseph Zeligs 1m; May 11, 1977 C. S. Quelch 1m; June 3, 1974 C. S. Quelch 1m; May 18, 1978 C. S. Quelch 1f; May 31, 1973 from Joseph Zeligs 1f. 1m paratype Birds Hill Prov. Park near Winnipeg Man., May 26, 1968 coll. by John Masters, in M. Fisher coll. **Name** is the Ojibwe tribe of native americans, who lived in or near the area at one time. The word “chippewa” is a corruption of ojbwe, which has often been spelled ojbwa or ojbway. An Ojibwe village occurred at Portage du Prairie in Manitoba at one time. The village of Nibowisibiwininiwak occurred in “Sask.” N of Lake Winnipeg for a time (aren’t you glad we didn’t name it that?).

Relationship between *O. alberta* and *O. “chryxus”*, and within *O. “chryxus”*: We note here that there is some controversy about the relationship between *O. alberta* and *O. “chryxus”* (Doub. & Hew.) (we place the name *chryxus* in quotes here for reasons explained below). Thomas W. Kral (pers. comm.) suggested that *alberta* and *daura* are ssp. of *Oeneis calais* (Scudder), along with *strigulosa* McDunnough and *caryi* Dyar, which he thinks are smaller and have annual life cycles, while *O. “chryxus”* is a separate species that occurs only from near Atlin BC (where it flies near the *caryi* phenotype) in NW BC and in the Rocky Mts. westward to the Olympic Mts. and Sierra Nevada (including *ivallda* [Mead]) that is biennial and larger in size and flies a little later in the season. Kral notes that the first species becomes more orange as one travels north and east from the Canadian true prairie, and even *daura* is smaller and grayer in the White Mts. Ariz. but is larger and more ochre northward on the San Francisco Peaks in N Ariz. More research must be done on the geographic variation especially within *O. “chryxus”*, as there is a lot of difference between *calais/strigulosa* and “*chryxus*”, so one wonders whether they really intergrade by means of *caryi* (J. McDunnough’s 1938 checklist was the first to lump them, without much justification). And *calais* from Cowan Man. looks a lot like *ojbwe*. But *ojbwe* is a little grayer and just looks like *alberta* to us (though its oranger color does tend toward *calais*), whereas *calais* looks more like “*chryxus*”. At any rate *alberta* seems to be a distinct species, because it is distinct from E Alberta near-*caryi*, as Hooper (1973, pp. 187, 189) reports that both *alberta* and *O. “chryxus” caryi* fly at Batoche Sask. And Chris Schmidt (pers. comm.) states that *alberta* flies in Alta. on S-facing grassland slopes of the North Saskatchewan River near Lloydminster, and N of there are Jack Pine forests where *caryi* should fly (he has found it at Lac la Biche). *O. alberta* and “*chryxus*” ssp. seem to overlap in range in C Saskatchewan and S Manitoba as well in the dot maps of Butt. Canada (Layberry et al. 1998), though such an overlap in Man. is not shown on Klassen et al. (1989) maps and Kondla is certain that “*chryxus*” is absent in SE Man., so those Man. dots are errors, and those identifications must be rechecked. *O. alberta* and ““*chryxus*”” are sympatric without interbreeding in Middle Park etc. in Colorado (maybe those “*chryxus*” are actually not the real *chryxus* [see below], but *O. alberta* and the real *chryxus* are surely sympatric or near-sympatric somewhere around the S and E end of South Park in Colo.). The stigma of all *O. alberta* ssp. is extremely weak, the M₃ jog of the postmedian line on upf is long, the basal 2/3 of male upf is somewhat grayish, and the uns is heavily striated, which (along with overall appearance and early flight and characteristic bunchgrass prairie habitat) seem to unite the ssp. of *O. alberta* quite nicely. So *alberta* appears to be a separate species, regardless of problems in the other taxa.

But more research is needed on *O. “chryxus”* and relatives. The taxon *caryi* at Yellowknife and Atlin BC (Kondla specimens) and Yukon (Scott specimens) has a paler male stigma and less contrast between dark basal 2/3 of upf and outer tawny 1/3 than BC-Alta. *chryxus*, which has a more conspicuous stigma and a wider tawny outer third; the uph averages darker in male *caryi*; *chryxus* averages larger and many or most have a more pointed fw; the unh of *caryi* varies from like *strigulosa* to banded like “*chryxus*”. However, *caryi* (TL NE Alta. taiga) in Yukon is quite variable in unh banding (from

like “*chryxus*” to like *strigulosa*), and the uph color varies from light brown to tawny, etc.; such unh variation of *caryi* may indicate intergradation with “*chryxus*”, so “*caryi*” and “*chryxus*” need to be studied from central Canada to Alaska. Actually, true *caryi* from N Alta. and N Sask. seem to be a little different from Yukon “*caryi*”, by having the unh mostly a little more striated “strigulated”, whereas Yukon “*caryi*” have some strigulated adults but most have a strong “*chryxus*”-like unh median band with little or no unh strigulation (among 9 males 1 female, 2 are strigulated a lot, 3 are a little strigulated, and 3 males 1 female are not strigulated at all), so Yukon populations should evidently be called “near *caryi*”, not typical *caryi*. Kenelm Philip has series of an extreme *caryi*-like bug in Alaska. (Note: the “*nahanni*” fig. 16 in W. Howe’s book Butt. N. America is actually *caryi*.)

There is a lot of geographic variation in biennialism also. The low-altitude *chryxus* is biennial in Colo. where adults fly on even-numbered years (Scott) and is also biennial in Mont. (S. Kohler) (*chryxus* is the only biennial low-altitude butterfly known at those latitudes), yet high-altitude pops. fly every year there (because two different cohorts alternate years in a biennial life cycle, Scott presumes), which is interesting and might be relevant to understanding speciation.

It would seem, based on work done so far and reported below, that the taxon *caryi* extends southward through the Rocky Mts. at high altitude to the higher mts. of Colorado, because those Colo. adults have a light brown inner 2/3 of upf, with the androconial patch inconspicuous, and in these populations males perch in swales to await females and oviposit in open grassy areas and appear annual evidently (because of several biennial cohorts no doubt), whereas in foothill populations evidently related to *chryxus* the androconial patch is conspicuous, and in these populations males perch on hilltops to await females, and oviposit under the canopy of trees (esp. Ponderosa Pine, and sometimes Douglasfir) on dead twigs above a sward of short *Carex* plants growing in the partial shade under the tree, and appear biennially (2 years are needed for development in the shade under the tree). And we have some adults from high altitude in S Alberta and S BC, evidently related to the species containing *caryi*, which are often paler in color (orangish-tan) and have inconspicuous stigma, like *caryi*, whereas the adults from low altitude have a more conspicuous stigma and tawnier color, evidently ssp. *chryxus*. This new research is now presented more fully:

***Oeneis calais altacordillera* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: This butterfly, which is new to the entire Rocky Mtn. chain from New Mex. to N BC, is different from true *O. chryxus* in male stigma size, in amount of brown on basal 2/3 of male upf, in color of the rest of upf and uph, in the presence of dusky scattering of dark scales on ups, in the length of a jog in the fw postmedian line, in forewing shape, in hw fringe color, in male genitalia, in oviposition behavior, in mate-locating behavior, and in mitochondrial DNA (however, no single wing or genitalic character is completely reliable for identification). **Comparison to Yukon near-*caryi*.** Some wing characters such as the small upf stigma and more convex wing shape and smaller size are similar to near-*caryi*, however the unh of *altacordillera* nearly always has a distinctive median band, and the unh is almost never extra-strigulated, and the unh veins are seldom white, whereas Yukon near-*caryi* has a distinct median unh band less often, and usually has whitish unh veins (the unh of Yukon *caryi* varies hugely from banded like *chryxus* to less banded to merely striated almost like *strigulosa*, to banded and white-veined like *bore*, the male fig. as 128a “*chryxus*” by Scott 1986). The ups of males generally has an inconspicuous stigma and a browner basal 2/3 of upf like *caryi*, and sometimes looks like Yukon near-*caryi* (which is grayish-tinted on ups in 50% or more males), but is more variable, from yellowish-tawny to dull-orangish (more like *chryxus*) to reddish-brown, occasionally mostly uniform dark reddish-brown on ups, rarely dark brown all over ups, rarely grayish-tinted. The male fw is a little more pointed than near-*caryi*, which usually has the fw rather stubby. The unh has whitish veins in only about 5% of *altacordillera* (versus most specimens of near-*caryi*, and almost none of *O. chryxus*—note that most *altacordillera* and *chryxus* have the veins a bit whitish as they go through the median unh band, and the unh veins look a little whiter when viewed from the front rather than the rear, because the scales appear to be whiter on the front of the veins than on the rear, but few *altacordillera* have the veins visibly white beyond the unh median band). **Comparison to true *O. chryxus*.** It is much more different from true *O. chryxus*: The male stigma on upf is comparatively inconspicuous and appears small and light-brown and weak, and thus looks only half the size of that of *O. chryxus* (this stigma is in four parts, including a long streak along bottom of discal cell, a nearby streak at base of cell CuA₁, and two dashes in cell CuA₂ that are partly fused, and very rarely a tiny streak at base of cell M₃). (Place the butterfly in front of a light bulb, and you’ll see that the stigma is actually almost the size of *chryxus*, but each element averages weaker, so the streak of the stigma in the discal cell is rarely more than half as thick as that streak in most *O. chryxus*). Using that light bulb trick, one can see that about 10-15% of *altacordillera* males seem to completely lack androconia (no dark stigma is visible), and the width of the stigma in the discal cell ranges from 0 to about 1 mm or so (versus about 1-2 mm in *chryxus*). The basal 2/3 of male upf is usually a rather uniform light-brown, usually extending beyond the stigma up to the postmedian line, on average covering the wing much more in area than *O. chryxus*. The ups ground color is mostly duskier than *chryxus*, being most often rather dull orangish (holotype, plate IV), but is very often yellowish-tawny (ups averages a little yellower, like paratype var. 1 on pl. IV, same data as holotype). The male ups varies greatly from orangish to yellowish-ochre to reddish-brown, some specimens are somewhat darkish orangish-brown, and some are dusky reddish-brown (paratype var. 2 on plate IV, from Mosquito Pass in Park Co.), a few are dark slightly reddish-brown, and a few are dark-brown all over (solid dark brown with no markings at all!), and a few are a bit grayish in tint on basal 2/3 of upf, but

few are clear bright orangish-tawny like *chryxus*. The great variation in ups color is a notable characteristic (a good population characteristic) especially in the alpine zone, compared to the comparatively unvarying orangish coloration of *chryxus*, although in the Montane Zone most specimens tend to be orangish in tone, while in the alpine zone most are rather orangish too but many are the odd-looking and dark ones. The male fw varies in shape but the outer margin is nearly always convex, and only 5-10% of males have a straight stretch 1 cm long. Size tends to average a little smaller than low-altitude *O. chryxus*, but Montane Zone *chryxus* are smaller too. The distal jog in the fw postmedian brown line at vein M_3 (a brown wedge attached to the anterior side of vein M_3) is longer on average than *chryxus*, and on upf this jog also appears longer than *chryxus* because it is nearly always filled with brown. The white dashes in the hw fringe average smaller and less conspicuous (more whitish-tan than white). The unh is mottled as usual like *O. chryxus*, and always has a strong median band like *chryxus*, which varies a lot (a few have the band only 4 mm wide, and a few 10 mm), and the thickness of the white edging to the band varies also, but many average narrower edging. I have two males with rather dark brown unh because the mottling is so solid. The unh mostly lacks white veins (only about 5% have the veins whitish beyond the median band). Some specimens (maybe 10%) look extra-strigulated (more striated than usual) on unh, while about 25% of *O. chryxus* seem to be extra-strigulated; however in Rio Arriba & Sandoval Cos. New Mex., about 50% of *altacordillera* are extra-strigulated, which shows through a little to uph and makes these look a little different on uph too (thus these N.M. ones are slightly different, but don't seem different enough to name a new ssp.). Females are hard to identify, but females average a bit duskier on ups, the fw M_3 jog averages a little longer, and the eyespot in fw cell M_3 seems to average a bit smaller/fewer. It may intergrade a little to *valerata* in SW BC and to near-*caryi* in N BC as noted below. **Comparison to *O. c. valerata*.** The ups of *valerata* is orangish to reddish-orange, without the yellower variants that are common in *altacordillera*. The eyespots average smaller in *valerata*. The unf of *valerata* lacks (or it is weak) the marginal dark band that is present in *altacordillera*, and the unf postmedian line found in *altacordillera* is absent in about half the *valerata*. The unh has white veins beyond the median band in most *valerata*, only ~5% of *altacordillera*. The unh has extra fine striations (strigulations) in most *valerata*, in few *altacordillera*. **Male genitalia:** 7 males from the Front Range, Sawatch Range, and San Juan Range Colo. were compared to 7 males of *O. chryxus* from Jefferson Co. Colo. The tip of the valva was narrow in all *altacordillera* males and in 3 *chryxus* males, but was comparatively wide in 3 males of *chryxus* and slightly wide in 1 male, which seems to be a significant average difference (narrow in *altacordillera*, wide in 50% of *chryxus*). The ventral edge of the valva (in lateral view) has a slightly-concave stretch halfway between base and tip (just beyond the bend where the valva edge turns dorsad) in 6 of 7 *chryxus*, but in only 3 of 7 *altacordillera*, though this concavity is small. The gnathos seems to average a bit shorter in *altacordillera* (gnathos length on uns varies from 33-42% of the length of uns of uncus in *altacordillera*, 40-45% in *chryxus*, based on my crude visual estimates of the % of each specimen rather than actual measurements). The length of the uncus seems to be about the same. The dorsal process of valva varies quite a bit in length, and the longest and shortest were in *chryxus*. N. Kondla has looked at a few male genitalia from Canada also, and found several wide and a narrow valva tip among *chryxus*, and narrow, fairly narrow, and wide tips in *caryi*, wide in an evident *altacordillera* from N BC, and narrow in several *ivallda*. Thus, there seems to be an average difference between them, though it isn't enough to identify specimens with certainty. **MtDNA and evolution:** Nice & Shapiro (2001) presented data on allozymes of *ivallda* and *stanislaus*, and mtDNA of various *O. "chryxus"* populations. Based on my knowledge of the species and their distribution and the fact that many of their samples were collected by me, I think their samples from Mt. Moriah in Snake Range Nev. (haplotype D), and from E of Uncompahgre Peak Colo. (L, M, N) and Hopewell Lake (F) and La Jara Crk. (I, O) in New Mex. were all *altacordillera*, whereas their samples with haplotype B & J were *O. chryxus*, and their samples from Tok in E-C Alaska with haplotype E are evidently *O. calais* near-*caryi*; (they found that *ivallda* had haplotype A, P, C, G, H, and K, and *stanislaus* had haplotype A). Their study would have been better if it had included *O. c. strigulosa* and *O. alberta*. Their mtDNA results suggest that *altacordillera* is a more polymorphic ancestral-type population, while *O. chryxus* is a less variable offshoot, which agrees with what I see in the oviposition behavior and wing pattern, which suggests that *O. chryxus* is a specialized offshoot. However *O. chryxus* is orange with a big stigma like *O. nevadensis*, which suggests that they might have some phylogenetic link, but some *altacordillera* are just as orange. *O. alberta* and *O. (nevadensis?) macouni* mostly lost the stigma, so we can't rely much on stigma size to deduce the phylogeny. *O. alberta* clearly is a specialized offshoot of an *O. calais*-like ancestor. *O. nevadensis* also has the dorsal process on male valva that is present in *O. calais-chryxus-alberta* (and *O. bore*), so it belongs in this family tree also, evidently near the base. **Distribution: TL and holotype male (BMNH) from Colorado: Sangre de Cristo Mts.: Baldy Peak 12,500', Custer Co. Colo. July 29, 1970 J. Scott.** **Paratypes:** 7m5f same data; Baldy Peak north slope 10,200', Fremont Co. July 5, 1966, 4m2f coll. Glenn R. Scott; Baldy Peak S slope rockslide 12,500' Custer Co. July 13, 1965 J. Scott 1 female. The following specimens from Colo. and S. Wyo. and New Mex. are paratypes in my collection and the collections of the Univ. of Colorado museum (CU) and Colorado State Univ. Gillette Museum (CSU) and Michael S. Fisher, except the few photos mentioned are not paratypes: Galena Peak, 12,483', Fremont Co. Colo. July 14, 1966 G. Scott 2 males; Hermit Pass road, 9000', Custer Co. Colo. July 3, 1970 J. Scott 1m; Hermit Pass, 12,000', July 23, 1970 J. Scott 1 male; Dry Lakes Trail, ~10,000', Custer Co., July 16, 1968 G. Scott 2m1f; North Taylor Creek, (S of Spread Eagle Peak), 10,800', Custer Co. Colo. July 17, 1968 G. Scott 1m1f; North Taylor Creek at Rainbow Trail, 9400', Custer Co. Colo., July 9, 1970 J. Scott 2f; Music Pass road, 9200', (on S-

facing slope?), Custer Co. Colo., July 11, 1970 J. Scott 3m (a little oranger than usual with less upf brown, but stigmas very weak) 5f; South Crestone Creek 11,000', Saguache Co. Colo. July 31, 1967 J. Scott 2f; Wild Cherry Creek ~9000', Saguache Co. July 15, 1970 J. Scott 1m; Wild Cherry Crk. ~9400' May 29, 1972 J. Scott 1m; North Crestone Cgd., 9000', Saguache Co. Colo., July 15, 1970 J. Scott 1m; 2 mi. SW Villa Grove, low hills on E edge La Garita Hills, 8300', Saguache Co. Colo., June 19, 1966 J. Scott, 1f (probable *altacordillera*); Whiskey Pass, ~12000'? [pass is 12400'], Costilla Co., Aug. 2, 1978 B. Rotger 1m (CU). **Wet Mts.:** Greenhorn Mtn. 12,349', Wet Mts., Huerfano Co. Colo., July 13, 1970 J. Scott 10m4f; South Hardscrabble Park, 10200', 5 mi. W Bigelow Divide, Wet Mts., Custer Co. July 10 1968 G. Scott 2m; 2.5 mi. NE Rosita, 9250', Custer Co. Colo., Canadian Zone grassland meadow, July 1, 1970 J. Scott 1m1f; Locke Park (a meadow on Locke Mtn., 9280', Fremont Co. Colo., June 29 1968 G. Scott 1m2f, June 25, 1968 Richard B. Taylor 1m1 female, June 26, 1968 G. Scott 1m, June 3, 1972 G. Scott 1 female; Middle Creek, Ophir Creek road, 10,000', Custer Co. Colo., July 13, 1970 J. Scott 3f probable; Devils Hole, 8900', Wet Mts., Huerfano Co. June 20, 1968 G. Scott 1m. **San Juan Mts.:** North Pass, 10,000', Cochetopa Hills, Saguache Co. Colo., July 17, 1966 J. Scott 2f probable; Wolf Creek Pass, Mineral Co., Bernard R. Rotger, 11,900' July 2, 1963 3m1f, 11,200' July 11-13 1962 1m (CU); Spring Creek Pass, hwy 149, Cebolla Creek, 10,400', Hinsdale Co. July 27, 1999 Michael S. Fisher 1m; Valley ESE Uncompahgre Peak 10,500-11,000', Hinsdale Co. Aug. 2, 1979 J. Scott 2m; Uncompahgre Peak, 12,000', H. Co., July 1981, Michael S. Fisher 1m; 2.75 mi. E Uncomp. Peak 12,500' H. Co. July 19, 1980 J. Scott 4m; Wetterhorn Peak 13,000' H. Co. July 20, 1980 J. Scott 1m; Silver Creek 12,000' H. Co. J. Scott, July 18, 1988 3m3f, Aug. 2, 1983 2m1f; Redcloud Peak, 10,500', Hinsdale Co., July 29, 1997, Jim Ebner 1m (CSU); Weminuche Creek 10,200' H. Co. July 28, 1971 J. Scott 1m; Cinnamon Pass 12,500' H. Co. July 18, 1988 J. Scott 4m; Rio Grande Pyramid, E ridge, Hinsdale Co., Aug. 5, 1995, Charles P. Slater, 3600m=11,800' 1m, 3400m=11,150' 1m (CSU); Richmond Basin 11,500' Ouray Co. July 27, 1980 J. Scott 1m; 1 mi. E Silverton 9200' San Juan Co. July 2, 1965 J. Scott 1m; Silverton, 12,000', San Juan Co., July 19, 1902, 1m, Aug. 5, 1903, 1m (CSU); head California Gulch 12,800' SJ Co. July 23, 1980 J. Scott 1m; pass 1 mi. N Jura Knob 12,000', SJ Co. July 24, 1980 J. Scott 3m1f; Savage Basin 12,200' San Miguel Co. July 20, 1981 J. Scott 1m; Gold King Basin, 11,500', SM Co. July 20, 1981 J. Scott 1m1f; South Fork Mineral Creek, 10,500', San Juan Co. Colo., July 11, 1934 F34105 D. Davenport 2m, same data 10,000' July 4, 1934 F34101 D. Davenport & Whitmer 1m (CU); Animas River headwaters (SE of Animas Forks), 3300m=10,827', San Juan Co. Colo., July 13, 2001 K. L. Poudic & J. C. Oliver 2m (CU); Chicago Basin trail, 10,700-11,000', La Plata Co. Colo., July 15, 1934, F34108, D. Davenport 2m2f (CU); Chicago Basin, 12,000', La Plata Co. July 13, 1934, F34106, D. Davenport & Whitmer 1f (CU); N ridge Chicago Basin trail, 12,500', La Plata Co. July 16, 1934 F3410, 2m (CU); Ice Lake Basin (11 mi. W Silverton), 12,000', San Juan Co., July 5, 1934, F34002 D. Davenport & Whitmer 1f (CU); So. Fork Mineral Creek, 10,500', San Juan Co. Colo., July 11, 1934, F34105 D. Davenport 1m (CU); Pass N Crystal Lake, 10,600', Ouray Co., June 20, 1988, Paul M. Thompson 1f (CU); Burro Crk. Road, ~9900', Rio Grande Co., July 27, 1986, Robert Hammon 1m (CSU); Platoro, 10,100', Conejos River & Co., July 4, 1961 Bernard Rotger 3m1f (CU); Little Cimarron Crk., 8000', "Montrose" [Gunnison] Co. Colo., June 19, 1966, Scott L. Ellis 1m1f (CSU); Barlow Creek, 9,300', Dolores Co., July 1, 1972, Bill & June Head 2m (in M. Fisher coll.). **Sawatch Range:** Shrine Pass, 11,300', Eagle Co. Colo., July 13, 1954 F. M. Brown 3m (CU); Homestake Crk. (E), 10,400', Eagle Co., July 10, 1976, Ray E. Stanford 2m (CSU); sage hill just E town of Twin Lakes, 9200', Lake Co., June 7, 1970 J. Scott 1m; Independence Pass, Pitkin Co. Colo., 10,000' June 29, 1950 3m1f, 11,800' June 30, 1950 3m F. M. Brown (CU); Independence Pass hwy., July 27-29, 1933, L. E. Chadwick & D. Davenport, 10,400' 4m5f, 10,900' 1m, 11,500' 1m, 11,600' 2m1f (CU); Mt. Massive 12,500', Lake Co. Aug. 1, 1982 J. Scott 1m; Cottonwood Pass Rd., 11,500', Chaffee-Gunnison Co. Colo., July 9, 1953 F. M. Brown 1m (CU); Cottonwood Pass, Hudsonian Zone 11,000', "rock glacier" mound in *Vaccinium* bog, Chaffee Co. Colo., July 21, 1980 Charles P. Slater 1m (CU) & 4m1f (CSU) (spectacular variation on ups, 1m dark-brown, 1m redder-orangish, 1m tawny orangish, 1m orangish, all dusky); Cottonwood Pass, ~12000', Ch. Co., July 13, 1968 Ray E. Stanford 1f (CSU); Cottonwood Pass, Ch. Co., July 18, 1966 J. Donald Eff 1f (CU); 2 mi. W Mt. Harvard, 3598m=11,804', rockslide (on upper Pine Creek in Missouri Basin, on trail to Silver King Lake), Chaffee Co. Colo., July 16, 1982 Charles P. Slater 1m1f (CU); Baldwin Crk. 11,000', Chaffee Co. June 22, 1974 1m Glenn R. Scott; Monarch Pass 11,200' Gunnison Co. July 29, 1967 J. Scott 4m1f; Marshall Pass, 10,800-11,500', Saguache-Chaffee Cos. Colo., Aug. 10, 1935 F3516 L. E. Chadwick 1m (CU); Colorado Trail, Marshall Pass, 11,000', Saguache Co., M. Fisher July 22, 2001 2f (common); Mt. Ouray, 10,800-11,500', Marshall Pass, Saguache Co., July 18, 2003 M. Fisher 1m1f; Poncha Creek, 10,500', Saguache Co. Colo., July 28, 1935 F3511, L. E. Chadwick 2m (CU); Cumberland Pass, 12,200', Gunnison Co., July 7, 1968 M. Fisher 2m1f; Cumberland Pass area, 10,000', Gunnison Co., July 7, 1968 M. Fisher 2m; Elko Park near Schofield Pass, 11,000', Gunnison Co. Colo., Aug. 1, 1962 Scott L. Ellis 4m (CU); Brush Crk. [evidently Fossil Creek Wilderness, 11,100'], Gunnison Co., June 22, 1986, Robert Hammon 4m (CSU); Tincup, 10,200', Gunnison Co., June 28, 1982 2m, July 10, 1983 1m, July 10, 1987 1m (CSU); near Tincup, 10,000', Gunnison Co., July 19, 1964, Scott L. Ellis 2f (CSU); Aspen, 7900'+, Pitkin Co., June 12, 1968, Ray E. Stanford 1m (CSU). **Elk Mts.:** Cinnamon Peak, near Slate Cr., 11,200', Gunnison Co. Colo. Aug. 2 1962, Scott L. Ellis 1m (CU); Mt. Gunnison, 12700', Gunnison Co., July 23, 1967, Scott L. Ellis 1m (CSU); Cement Crk., 34NE, 10,000', Gunnison Co., July 31, 1984, M. Rolfs 1m (CSU); near Lake Irwin, 11,500', Gunnison Co. Colo., July 25, 1962, Scott L. Ellis 1f (CU); Jacks Cabin cutoff [NE of Almont], 8600', Gunnison Co., July 2, 1985 Robert Hammon 1f (CSU). **West Elk Mts.:** Curecanti Creek, 9000', Gunnison Co.

Colo., June 21, 1962, Scott L. Ellis 2m (CU); Ohio Pass Rd., Gunnison Co. Colo., July 25, 1962, Scott L. Ellis 1f (CU); Black Mesa, 10,000', Gunnison Co. Colo., July 15, 1962, Scott L. Ellis 2m (CU); Black Mesa, ~10,000', Gunnison Co., Aug. 7, 1933, "358", 1f (CSU). **Mosquito Range:** Base Peak 9, Breckenridge Ski Area, 10,000', Summit Co., July 2, 1993, M. Fisher 1m; East Buffalo Peak near timberline 11,800', Park Co., Aug. 12, 1973 J. Scott 3m1f; Buffalo Peaks, <=12,000', Park Co., Aug. 7, 1975, 1f (CSU); East Fork Arkansas River, NNE Leadville, 10,400', Lake Co., July 10, 1976 1f (CSU); Leavick Valley to Horseshoe Mtn., 11,600-12,200', Park Co., July 17, 1984 Rick Worth 3m (CU); 2 mi. N Alma 10,550', Park Co., J. Scott, June 21, 1964 1m, July 1, 1988 1m; vic. Alma, 10,500', Park Co., June 21, 1950 F. M. Brown 5m3f (CU); near Alma, 3360m=11024', Park Co., July 1, 1982, Charles P. Slater 1f (CSU); Hoosier Pass, 11,700', Park-Summit Co. Colo., July 20, 1953 F. M. Brown 1m (CU); Hoosier Pass, 11,600', Park-Summit Co. Colo., Aug. 5, 1949 F. M. Brown 3m1f (CU); Hoosier Pass, 11,700', Park-Summit Co. Colo., July 20, 1953 F. M. Brown 5m4f (CU); Mosquito Pass, 12,800', Park Co., July 31, 1982 J. Scott 3m(color var. 2 on plate IV)1f; Mt. Sherman 12,000', Park Co., July 17, 1980 J. Scott 2m; Mt. Bross 12,200', Park Co., July 17, 1990 J. Scott 2m2f; 1.2 mi. S Mt. Bross 13,500', Park Co., July 31, 1982 J. Scott 1f; Half Moon Cr., Park Co., July 10, 1965 1m1f (CU); Buckskin Joe Gulch, 11,200', Park Co., June 27, 1953 F. M. Brown 4m (CU). **Front Range:** Bare Hills, NW of Canon City, 8400', Fremont Co. Colo., June 27, 1970 G. Scott 1m; Seven Lakes, Teller Co. Colo. 11,000', July 6, 1932 2m, July 11, 1932 1m, July 18, 1932 1f (CU); Seven Lakes, 11,100', Teller Co. Colo., 4-2, July 6, 1932, F. M. Brown 1m (CU); Crystal Creek, Teller Co. Colo. 9300' June 24 1932 F. M. Brown 3m (CU); North Cheyenne Canyon, 8700', El Paso Co. Colo. June 30, 1984 J. Scott 3m; Rampart Range Rd. near Woodland Park, Teller Co. July 2, 1948 F. M. Brown, 9500' 6m, 9600' 1m (CU); Caroll [Carrol on map] Lakes (3.5 mi. ENE Woodland Park, 9000'), Rampart Range, El Paso Co. Colo. June 23, 1960 F. M. Brown 16m3f (CU); Rock Creek, 8200', El Paso Co. Colo., June 29, 1932, B1455, 1m (CU); W West Creek, 8500'?, Douglas Co. Colo., June 28, 1960 3m1f, June 24, 1960 3m1f (CU); Douglas Co., 8000', June 10, 1930, 1m (CSU); Hall Valley, 9,600', Park Co., June 20, 1950 F. M. Brown 3m1f (CU); Hall Valley 11,000-11,500', Aug. 3, 1935 F3513 F. M. Brown 1m (CU); Hall Valley, 11,500', July 7, 1935 F3501 F. M. Brown 3m1f (CU); Hall Valley, 12,000', July 7, 1935 F3501 F. M. Brown 2m (CU); Hall Valley, 12,250', July 12, 1935 F. M. Brown 1m (CU); Hall Valley, 9,300-10,500', Park Co., M. Fisher, June 23, 1968 1m, Aug. 5, 1967 1f (males rest on road); Hall Valley, 9000-10000', Park Co., June 23, 1968, M. Fisher 3m; Gibson Gulch, 11000' (1.2 mi. SE Gibson L.), Park Co., C. Durden (N. Kondla photo, rather uniform brownish ups a little redder-brown outwardly, stigma weak, jog fairly long, fringes almost uncheckered); Mt. Evans massif [evidently Mt. Logan], 11,600', N of Santa Maria, Park Co., Aug. 16, 1962, Charles P. Slater 1f (CSU); McClellan Mtn. 12,900', Clear Creek Co. July 10, 1992 J. Scott 1m; Guanella Cgd., 11,100', Clear Creek Co., July 30, 1967 Ray E. Stanford 2m (CSU); Torrey's Peak, ~12,500', Clear Creek Co. Colo., July 25, 1937, Bob Potts 1m (CU); Loveland Pass 12,400', Summit Co. July 22, 1988 J. Scott 1m; Loveland Pass, Clear Creek Co., M. Fisher, Aug. 4, 1967 1m; Henderson Mine Valley, 10,950-11,200', Clear Creek Co. July 23, 1999 Paul M. Thompson 4m (CU); Big Bend Picnic Ground, 10800', Clear Creek Co. July 16, 1978 J. Scott 1f probable; Berthoud Pass, 11,300', Clear Creek Co., July 4, 1974 Ray E. Stanford 1m (CSU); Berthoud Pass, Clear Creek-Grand Co., July 29, 1960 Bernard Rotger 1m (CU); Copper Mtn., 10,000'?, Summit Co., July 23, 1984, 1f (CSU); Blue River Cgd., 8600', Summit Co., July 8, 1980 Ray E. Stanford 1f (CSU); Snake River near Keystone, 9400', Summit Co. June 22, 1962 William A. Cobban Jr. 1f probable; Monarch Lake (above Lake Granby), 8350', Grand Co., July 18, 1928 1f (may be *chryxus*) (CSU); near Tabernash, 8400', Grand Co., July 21, 1972 1f probable (CSU); Hideaway Park, 8800', Grand Co., July 6, 1968, Ray E. Stanford 2m2f (CSU); Hideaway Park, 8800', Grand Co., July 6, 1972 1f probable (CSU); Ski Idylwild Lodge, Hideaway Park, 8800', Grand Co. July 16, 1978 J. Scott 1m1f; 0.6 mi. N Moffat Tunnel, 9000', open lodgepole pine woods, Grand Co. July 16, 1978 J. Scott 1m (stigma looks more like *chryxus*); Corona Pass, 11,200', Boulder Co., July 25, 1968, M. Fisher 1f probable; Jim Creek, 9,200', Grand Co. Colo., June 25, 1934 F3402 F. M. Brown 2m typical (CU); Mt. Audubon, ~12,000', Boulder Co. Colo., July 8, 1953 J. Donald Eff 1f (CU); Green Lakes at timberline, W Boulder Co. Colo., Aug. 13, 1941 Hugo G. Rodeck 1f (CU); NW above Brainard Lake, 10,500', Boulder Co. July 15, 1978 J. Scott 1f probable; Long's Peak, Larimer? Co. Colo., June 1m (CU); Pennock Pass, 9100', Larimer Co., June 22, 1974, R. Simpson 2f (altac.?) (CSU); Fall River Road, 11,500', RMNP, Larimer Co., July 3, 1990 Paul A. Opler 1m (CSU). **Wyoming:** Brooklyn Lodge, ~10,560', Medicine Bow Range, Albany Co. July 26, 1964 J. Scott 1m1f; Sand Lake Rd., hwy 130, 8500-8650', Snowy Range, Albany Co., July 20, 1980 Ray E. Stanford 1m3f (CSU); Teton NF, probably Teton Co., Howard E. & Mary Alice Evans, 1f probable (CSU); Mt. Washbourne [evidently an error for Mt. Washburn, as gazeteer has Washburn but not Washbourne], 8900', Yellowstone NP, July 16, 1934 F3437 HH & FM Brown, 2m (one definite *altacordillera*, one oranger)(CU); Lake Eleanor, 8500', Yellowstone NP, July 21, 1936 F36112 F.M.Brown & N.L. 2m (CU); Beartooth Lake [which is 8901'], Park Co., William N. Burdick, 1937, July 27 1m, July 29 1f (CU)(male very small with pointy fw but otherwise typical); Dead Indian Hill, ~<8673', Park Co., Aug. 2, 1982, N. Kondla 1m worn; Clear Creek E of Green River Lakes, Wind River Mts., Sublette Co. Wyo., July 16, 1953 J. Donald Eff 1m1f (may be *chryxus*, as stigma is fairly wide in discal cell, though upf is dark)(CU); Lower Green River Lake to Slide Creek Falls, 8000', Wind R. Mts., S. Co., July 15, 1998 Paul M. Thompson 1m definite *altacordillera* (CU); New Fork Trail, 8000-10,300', Wind R. Mts., S. Co., July 17, 2002, P. M. Thompson 1m1f (CU); Upper New Fork Lake, 7820-7900', S. Co., July 10, 2002 P. M. Thompson, 1f (CU)(*chryxus*?); Rainbow Lake, 10,190', Wind R. Mts., S. Co., July 11, 2002, P. M. Thompson 1m (CU); Powder River Pass W, 9600', Bighorn Mts. & NF, Johnson Co., July 30, 1953, F. M. Brown 2m1f

(CU), seem to be definite *altacordillera*; 4 mi. SE Little Bald Mtn., 2720m=8924', Bighorn Mts., Sheridan Co. Aug. 1, 1995 J. Scott 2m1f (the 2 males are like *altacordillera* with weak stigma on one male and fairly weak on the other male and extensive upf brown, M₃ jog long, although coloration is fairly orangish, and 1 male has straight fw margin, the uph has an odd strong dark marginal border); Bighorn Mts., July 25, 1937, W. N. Burdick 2f (postmedian line strong, might be *altacord.*)(CU). Nice & Shapiro (2001) found that Bighorn Mts. specimens of *O. "chryxus"* of unknown phenotype at lower altitude 7500' and 7280' have haplotype A that was otherwise found only in Calif. *ivallda*, which seems to suggest that they are probably *altacordillera* even at that low altitude, which may explain why all Bighorn Mts. "*chryxus*" specimens I have seen are peculiar-looking and all may be *altacordillera* (even the *O. chryxus* listed below); more specimens are needed as the specimens and mtDNA are both peculiar. **Montana:** Polaris, Beaverhead Co. Mont., July 14, 1942 1m2f, July 19, 1942 1m, July 10, 1943 1f, H. A. Howland (CU). Dry Head Vista, Pryor Mts., 8880', Carbon Co., 45°10'30''N 108°22'35''W, moist open hilltops, July 20, 1997, Chuck & Cindy Harp 4m, same 2 p.m. July 9, 1997, Chuck Harp 4m8f (CSU); East Pryor Mtn., FR#849, E of Dry Head Vista, 8010', Carbon Co., gravel roadside meadows, 45°10'35''N, 108°22'30''W, July 25, 1995, Chuck Harp 16m (CSU); Beartooth Hwy. #212, Carbon Co., 45°02'00''N 109°25'30''W, roadside turnout/seeps, 8700', July 26, 1994, Chuck & Cindy Harp, 1f (CSU); SW of Redlodge/hwy#212 at roadside turnout, 8500', Carbon Co., 45°01'50''N 109°25'45''W, July 24, 1995, Chuck & Cindy Harp 3m1f (CSU); Standark Crk. Rd. W of Wolverine Crk., 9000', Gravelly Range, Madison Co., 44°53'00''N 111°45'46''W, Chuck & Cindy Harp, Chris Harp, July 28, 1994 1m (CSU); Lone Mtn. Cirque, 9050' at timberline, W of Big Sky, Madison Co., July 27, 2003, Evi & Paul A. Opler 1m (CSU); Gallatin Range near timberline, Gallatin NF, Gallatin Co., Aug. 8, 2004 Paul A. & Evi Opler 1f (CSU); Porphyry Peak near top, NE slopes, Little Belt Mts., Meagher Co., 8100', under ski lifts, Aug. 9, 1994, Chuck Harp 1f (CSU); W Teton Sci. Area, NW of Choteau, Teton Co., June 19, 1994, CEH & CH (Chuck Harp) 1f (CSU); Rocky Mtn. Hi Ski Area, 6500', along slopes under lifts, Lewis & Clark Range, Teton Co., 47°55'45''N 112°47'30''W, July 30, 1996, Chuck & Chris Harp 2m4f (CSU). **New Mexico:** San Pedro Peaks Wilderness Area, ~9000-10000', Rio Arriba Co., June 19, 1978 Glenn R. Scott 1m; Tusas Mtn. (~6 mi. SE Hopewell Lake), 9800', Rio Arriba Co. June 20, 1978 G. R. Scott 1m; San Jose Creek (SE of Regina), 8200-8800', Sandoval Co. NM June 16, 1978 G. Scott 1m; Palo Duro Spring (SE of Coyote), ~8000-9000', Rio Arriba Co. June 19, 1978 J. Scott, 1f probable; La Jara Creek, 8300', Sandoval Co. NM June 17, 1978 J. Scott 3m2f; just NE Hopewell Lake, 9800', grassy swales or bunchgrass prairie hillside, San Juan Mts., Rio Arr. Co., June 20, 1978 J. Scott 2m1f; 5.3 mi. W Hopewell Lake Cgd. (valley bottom of Gavilan Crk.), mostly grassy swales, 9750', Rio Arr. Co., June 20, 1978 J. Scott 3m; Hopewell Lake & vic., 9800', in swales or gullies or hillside, Rio Arr. Co., June 21, 1978 J. Scott 2m (1 male looks somewhat like *chryxus* as it is more orangish with bigger stigma, and the other male looks a bit like *chryxus*) 2f; Encino Lookout, 9957', to 1-2 mi. S (on N end Grulla Plateau), Rio Arr. Co. June 19, 1978 J. Scott 13m, in bunchgrass swales; Cabresto Lake, 9000', Sangre de Cristo Mts., Taos Co. New Mex. June 11, 1936 F. M. Brown 2m1f (CU); Cabresto Peak, 12,000', S. de Cr. Mts., Taos Co. New Mex. June 12, 1936 F. M. Brown 4m (CU); Lake Fork, 10,000' (NW of Wheeler Peak), near Taos, S. de Cr. Mts., Taos Co. New Mex., June 10, 1936 F. M. Brown 1m (CU). **Utah:** Navajo Mtn., 10,000', San Juan Co. Utah, July 4-8, 1936 F. M. Brown 2m (could be *chryxus*)(CU); Little Valley, 14 mi. WSW Panguitch, Garfield Co. June 11, 1989, Kilian Roeber 1m (CSU). **Nevada:** Mt. Wheeler [presumably near Wheeler Peak Cgd. 9850' or above on the trail], Snake Range, White Pine Co., Nev., William N. Burdick, 1935, July 15 1m, July 17 4m, July 18 1m, July 19 4m3f, July 20 1f (CU); Wheeler Peak, 10,800', Snake Range, White Pine Co., July 12, 1972, Jim Mori 1m (CSU); Lehman [evidently Lehman Creek Forest Recreation Site or vicinity, 7635' or higher], Snake Range, W. P. Co., W. N. Burdick, 1935, July 15 1m, July 17 3f, July 19 1f (CU)(the 12m from these mts. seem to be typical *altacordillera*, the stigma is weak and all but 3 have upf all brown inside the postmedian line, which usually has a long jog, the fw margin is convex in most, most are fairly orangish without the frequent weird color variations in many Colo. adults but several are a bit yellower and one is albinic like *ivallda*). **Alberta-BC:** (see next section below). **Range Summary:** apparently occurs in the high mts. (Montane Zone to Alpine Zone) of most of the Rocky Mts. from New Mexico and Colorado and Wyoming north to Alberta and British Columbia, plus E Nevada and Utah (hence the name *alta*=for high altitude and *cordillera* for Rocky Mts. chain; *cordillera* is english & spanish, NOT a latinized word, thus *altacordillera* should NOT be emended to -us or -um or anything else). It is common in N New Mex. and Colorado (in all the high mts. evidently, but evidently not quite as common in the Front Range). It flies in the upper Wind River Mts. and Beartooth Plateau and Yellowstone and Bighorn Mts. in Wyoming, and surely occurs in the Absaroka Mts. as well. In Montana it occurs in all the higher mts. of the western part of the state, and surely occurs in Glacier NP, and probably occurs in the higher reaches of the Crazy Mts. and other ranges also). In Utah it surely occurs in the Uinta Mts. and the Wasatch Mts. It surely occurs in Idaho also. **Geographic Variation:** The populations in S and N BC may differ due to possible intergradation, as noted in the next section. In Rio Arriba & Sandoval Cos. New Mex., the uns seem to be striated (strigulated) a little more than usual in about half the specimens, and these striations even show through onto uph a bit, so these populations look a little different. The mtDNA is diverse in this area also, which perhaps indicates that they occupied this area stably during the 17 glacial advances and retreats. The butterflies in the Bighorn Mts. are strange-looking, both what I am calling *altacordillera* which have a dark uph margin, and those I am now labeling *chryxus* (but may not be); more study and more specimens are needed from this range (things would be a lot clearer if someone found ordinary-looking *chryxus* at low altitude in the Bighorns). **Habitat and Altitude:** It occurs in Montane Zone grassy slopes

and sloping meadows sometimes without trees but usually near them, subalpine (and maybe upper Montane sometimes) meadowy slopes with some trees, and alpine tundra, in Colorado from about 8,500' (a few as low as 8,200') to 13,500', and surely up to the tops of the mts. at 14,400'+. It flies at lower altitudes northward of course. **Flight period:** one yearly flight mostly mid June-early Aug. (extreme records June 1 & Aug. 22), mostly July at or above timberline, mostly L June-M July at 9000'. This ssp. flies annually, though no doubt individual butterflies are biennial or longer in life cycle (because Scott doesn't know of any alpine/arctic butterfly that is annual in life cycle), and further collecting may show that there are biennial surges in numbers at some sites (in comparison, nearly all records of true *O. chryxus* from Colorado and S Wyo. are from even years). It was reported (as "*chryxus*") common on odd-numbered years at Horseshoe Mtn. 12,500' in the Mosquito Range (in 1991, A. Warren, 1992 Lepid. News #2 p. 11) and on Guanella Pass 11200' in the Front Range (in 1967, R. Stanford, 1992 Lepid. News #2 p. 11). *O. c. altacordillera* flies on both years, but I have more records of *altacordillera* in even years than odd years, in part because of bias in collecting more often then (people made trips to alpine zone more often in even years in Colo. to collect another butterfly species that is more common then), but perhaps also because they may actually be more common in even years (this might happen perhaps because a swarm of annual-life cycle parasitoids from abundant lower-altitude *chryxus* attacks adjacent populations including *altacordillera* the next [odd] year thus punishing the odd-year populations?). S. Kohler states that high-altitude Montana "*chryxus*" are annual, which evidently refers to the annual appearance of several biennial cohorts of *altacordillera*; he finds that low-altitude Montana populations (of true *O. chryxus* of course) are biennial. **Sympatry with *O. chryxus*:** Thus far, they seem to be sympatric at 20 known localities (these sites are mostly in the Montane Zone in the U.S., and also in subalpine and alpine zone in Alberta-BC), including four sites in the Wet Mts. of Colo. (Locke Park 9280', South Hardscrabble Park 10200', NE Rosita 9250', and Devils Hole 8950'), three locales in the S end of the Front Range of Colo. (North Cheyenne Can. 8700', Rampart Range road 9500' near Woodland Park, and the nearby Carrol Lakes 9000' where F. Martin Brown found both common in 1960), and at one spot on the W side of the Front Range (Hideaway Park, 8800'). At Locke Park (an interesting geologic site that contains large river boulders from a Miocene-Pliocene river that once flowed across the Wet Mts. when the Rocky Mts. were flat and had not yet arisen), 5 *chryxus* males were found on June 3 along with a female perhaps of *altacordillera*, then 2 male and 2 female *altacordillera* were found June 26-29. The species composition changes quickly in short distances at some places (2.5 mi. NE Rosita in Wet Mts. I found mostly *altacordillera* on a grassland, but a short distance away where there were more trees at 3 mi. NE Rosita [at Junkins Park and the E of Game Ridge sites] only *chryxus* was found (common). Both are found at Aspen, 7900'+, Pitkin Co. Colo. (June 12, 1968). On the W side of the Wind River Mts. Wyo., a spectacular sympatry is at Lower Green River Lake to Slide Creek Falls, 8000', where a male *altacordillera* was an extreme at its end of the variation and the male *chryxus* was an extreme at the opposite direction, so they look totally unlike each other. Nearby on New Fork Trail 8000-10,300' another sympatry occurs. Both fly on Mt. Washburn in Yellowstone NP, and on Dead Indian Hill in Park Co. Wyo. They fly together at seven sites in Alta. (Nigel Pass, Highwood Pass, Spray Lake, Plateau Mtn., Prairie Bluff Mtn., Prospect Mtn., & Cardinal Divide). And a photo from Kondla seems to show both present on Eldorado Mtn. in the Coast Range of BC. **Mate-locating behavior and mating:** Mate-locating behavior was recorded at 16 localities by Scott. Males perch in depressions (little gulches, hillside swales or hollows, a road below a mine dump, once a fairly-flat SE-facing slope, etc.) all day to await females. The only possible exceptions were the following. At Encino Lookout in New Mex., Scott's field notes say that males perch on a little hilltop behind some trees in strong wind, and were blown into a swale bottom where they chased others too (maybe the males were merely resting on the hilltop behind the trees rather than awaiting females?, as males only perched in swales to await females at the four other New Mex. sites with recorded info, and it's harder to get normal behavior in windy conditions, and maybe my mind was predisposed to believe that they should be perching on hilltops because the true *O. chryxus* I had studied a lot near Denver do perch to await females only on hilltops). And at Loveland Pass Scott caught a male, which his notebook says was a male perching on a ridgetop at 11:00 MST (presumably awaiting females) (perhaps I misinterpreted its behavior and it was just resting there, as Scott can't remember catching any other *altacordillera* at that locality, though Mike Fisher has found it there and I have seen a photo of a male uns from W slope Loveland Pass (July 8, 2005, Randy Emmitt, on Internet), so either they are scarce or are mate-locating somewhere else down-valley). NE of Rosita three mating pairs of *Oeneis* were found, of which one pair (found at 12:11 MST) is mounted in my collection and is obvious *altacordillera* (weak stigma, much upf brown, long M₃ jog in male and female, duskier in male and female, etc.), a second pair (found at 11:49 MST) is mounted in my coll. and is obvious *O. chryxus* (mostly orange on upf of male and female, strong stigma, M₃ jog small on male and female, straighter fw margin of male, etc.), and the third pair (found at 12:12 MST, when the female carried the male once) is unidentified because it is missing (probably never collected, as my notes wrongly recorded the capture of only 3 males at that site). All three of these mating pairs were found on "area 5 top" (one portion of a mapped area used for Scott's study of population movements of *Parnassius phoebus*, reported in Entomologica Scandinavica 4:161-168, 1973), which was a slight rise in a small several-meter tall rounded ridge in the grassland that sloped gently to the north toward some gullies and trees. The *altacordillera* cop. pair was found after they joined, so the male might have been mate-locating in the nearby swale and then followed the female and the pair ended up on the rise where I found it. The 12:12 pair is missing so it could have been *O. chryxus* that mated on the rise and not the swale. The third pair (11:49) was *O. chryxus* and it did couple on the rise, as I saw them join (see *chryxus* below). No other *Oeneis*

were seen at this site in the next few weeks, so male perching behavior was seen only for the male *chryxus* that mated. Thus *altacordillera* may mate-locate mostly in swales at this site also, which was adjacent to this rise, as the female wouldn't have to fly far to get to the rise after being contacted by the male in the swale. At any rate, male *altacordillera* generally perch in swales rather than hilltops to await females for mating, and the evidence that they can perch on adjacent small hilltops sometimes is weak. D. Petr also observed a mating at Fourmile Crk., Park Co. (talk at 1993 Fort Collins meeting of lepidopterists), where males perch in a valley meadow to await females, in which the female flew over a perching male who pursued, there were two spirals upward, the female landed, the male turned to find her, she flew, the male pursued and landed on top of here and bent his abdomen under and joined. Daily et al. (1991) observed mate-location on a "subalpine" slope in Gunnison Co. Colo. (crossing meadow near Gothic), where males mostly perched on prominent visual parts of the road; evidently those males were *altacordillera* and they used the the road as swales for mate-location. Of interest here is a study of *O. calais strigulosa* male perching behavior in Ontario (R. Knapton 1985, Behav. Ecol. Sociobiol. 17:389-95), where males perch on flat bare ground areas to await females. **Biology:** Females oviposit in open meadows, not under shady trees. At high altitude, most of Colorado is covered with a gloomy infestation of Engelmann Spruce (covering whole counties such as Clear Creek and Summit, which will soon burn to the ground in catastrophic wildfires), and slightly lower in altitude lodgepole pines choke a lot of areas, such as the Sierra Madre Range in Wyo. where the hwy. forms a gloomy tunnel through the doghair-thick forest. The lower branches of the spruce droop almost to the ground, shading the ground so much that almost nothing can grow beneath except fungus, so *altacordillera* cannot oviposit beneath trees. Daniel Petr (pers. comm.) studied mate-location etc. at a Subalpine Zone population at Fourmile Creek, Park Co. Colo. in the early 1990s, where he and Scott found a shortage of suitable tree branches and sedges for oviposition beneath the spruce trees; we searched *Festuca idahoensis* for eggs in the meadow briefly but found none. At the subalpine slope in Gunnison Co. Colo. mentioned above, Daily et al. (1991) found that females evidently of *altacordillera* 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 captive for hours and kept from ovipositing to increase their probability of ovipositing upon release, which may have reduced their discrimination in choosing oviposition sites; nevertheless, no female oviposited beneath trees. In other subspecies of *O. calais*, ssp. *strigulosa* oviposited on *Oryzopsis pungens* & *Phalaris arundinacea* at Marathon Ont. (N. Escott, Toronto Ent. Assoc. Occ. Publ. #9-78), ssp. *valerata* is associated with *Festuca idahoensis* in the Olympic Mts. (Pyle 2002), a grass that grows in sunny spots, and *O. c. ivallda* is assoc. with *Carex spectabilis* in Calif. (Emmel & Emmel, J. Lepid. Soc. 28:345). In the lab, *O. c. strigulosa* was reared on *Danthonia spicata* in Ont. (R. Layberry et al., Trail & Landscape 16:49). **Early stages** of *altacordillera* may have been reared already. *O. calais* in general seems to have a mature larva that differs from *O. chryxus* by having the middorsal dark band a series of dashes (blackish near the joints, mostly tan in middle of segment), based on larvae/pupae photos made by Jim Troubridge of Ontario *O. c. strigulosa* (the middorsal band is dark at the segment joints, and pale for that 2/3 portion of the stripe between dashes), and based on photo of older larva of *O. c. valerata* in Pyle (2002, p. 356, from Hurricane Ridge in Olympic Mts. Wash., see also Atala 3:34) which clearly shows the middorsal band as a set of dark dashes. In contrast, the mature larva of *O. chryxus* (photos taken by J. Scott reared from Crawford Gulch, Jefferson Co. Colo., and photos taken by Scott of larvae reared from Utah by Clyde Gillette) has the middorsal heart-band a continuous dark-brown stripe (only a weak indication of dashes anteriorly in the very palest of Scott's larvae). Scott's *chryxus* larvae were somewhat variable from dark to pale, depending on the darkness of the stripes. Pyle's *valerata* photo appears to be an older larva but not mature, because his larva has orangish within stripe #3 (stripes numbered from top down according to the *O. chryxus* account in Scott 1986) and it has a whitish band within stripe 5 (enclosing the spiracles), and those traits appear on older larvae of *chryxus* but are then lost on the mature larva. (Emmel, Minno, & Drummond 1992 also have a photo evidently of true *chryxus*, from near Florissant Colo.; they write that it only flies in even-numbered years and the few specimens I identified from Florissant and vicinity were *O. chryxus*, so that photo is probably true *chryxus*, but I can't see the heart-band very well at top of larva on that photo, which shows no evidence of dashes there if the heart-band is actually visible on it a bit.). Anyway, William Henry Edwards' Butterflies of North America reported the early stages of *O. "chryxus"*, and illustrated adults and immatures on a color plate, and various clues seem to indicate that he was dealing at least in part with *altacordillera* when he reared the larva and pupa. Edwards received two shipments of eggs from Herman Nash at Rosita (received on Aug. 2, 1884 and June 27, 1886) in the Wet Mts. (I have found both *altacordillera* and *chryxus* near Rosita) and he reared a mature larva from those before killing it accidentally with scissors. He also received a shipment from W. S. Foster of Salida, Chaffee Co. Colo. on June 10, 1888 (an early date fitting *O. chryxus* better), from which he reared a pupa, which could have been either species as neither occurs right at Salida. Anyway, Edwards described the ups of "*chryxus*" adults as either red-brown or yellow-brown (and the latter fits only *altacordillera*, while the former could be that or real *chryxus*), he wrote "the stigma scarcely to be found in the darker examples" (which fits only *altacordillera*), he wrote that 3/5 of the primaries are a dark or a pale brown (which better fits *altacordillera*), then he wrote that the hw fringe is yellow & fuscous (which is closer to *altacordillera*). He also wrote that the high altitude Colorado butterflies are yellower (fitting *altacordillera*), and the dark-red ones (really orangish-tawny) at low elevation are rare (which fits foothills *chryxus*). The male ups on his plate is dark (on my poor b/w microfiche copy of the book) compared to the females, so looks more like *altacordillera*. So, from these clues it seems that

his rearing was likely to have included *altacordillera*, and he illustrates egg and larvae of all sizes and pupae on his plate, and the dorsal view of “segment seven” (A3 or A4 I think, depending on whether he counted the head as #1 or not) of the mature larva does show the middorsal band being darker around the segment joints and paler in middle of the segment, in other words dashed like *O. calais strigulosa* and *O. c. valerata*, and unlike the solid stripe of true *O. chryxus* from Colo. and Utah. He describes this band as “on middorsum a narrow stripe, somewhat macular” which perhaps describes those dashes, or perhaps refers to tinier dots. (Converting Edwards’ description using Scott’s [1986] band numbers, band #1 is the heart band described as pale with dark spots, #2 is a yellow-buff or brownish-buff line, #3 a reddish-buff wide band cut by a reddish line, #4 a broad band replaced by yellow, then a yellow line, #5 a wide brown-buff band containing spiracles, a dark line, then a yellow basal ridge, a darker line, and #6 a brown-buff uns.) So maybe that fig. does represent the larva of *altacordillera*, which of course needs confirmation with future rearing of properly identified material. Edwards gives a description of the egg and larvae of different ages and the pupa (which resembles real *chryxus*), but his descriptions are somewhat jumbled and some of the colors are probably a little off (yellow lines rather than yellowish-white, etc.), so in view of the possibility that both species could be represented we shouldn’t make much use much of his work here, other than to say that his dashed-heart-band larva is probably *altacordillera*. (Edwards described *O. alberta* mature larvae as having the heart-band black, but his fig. shows that it is darker at segment joints and paler in middle 2/3 of segment, so evidently it is more similar to *O. calais* than to *O. chryxus* in this trait.) Larvae of *O. c. valerata* hibernated at the 1st and 4th stage in successive “winters” according to Pyle. Edwards’ larvae of “*chryxus*” (mostly *altacordillera*?) hibernated as 3rd, 4th, & 5th stages in artificial unnatural conditions.

Discussion. Lepidopterists will complain that some specimens (esp. females) cannot be identified, so they will question the validity of the two species of *O. “chryxus”*. But this is an identification problem, which does not affect their species status. W. Edwards noticed altitudinal differences in “*chryxus*”, and J. McDunnough noticed this taxon, when he discussed *caryi* in his original description of *strigulosa*, way back in 1934: “A somewhat similar form [to *caryi*], I believe, occurs at high altitudes in Colorado.” But noone since has mentioned altitudinal differences. Could *altacordillera* be just a high-altitude form of *chryxus*? After all, every trait is variable and the variation overlaps in every trait, and I can’t identify every specimen (I can’t identify many females either). That altitudinal form hypothesis seems exceedingly unlikely. They seem to be distinct species, because they differ greatly in oviposition behavior, they mostly differ in mate-locating behavior, they mostly differ in 2-year life cycles at least in some regions, most males can be identified using multiple characters of ups coloration and wing shape, the male genitalia differs, the mtDNA differs, they appear to be sympatric at 20 known localities, and they remain distinct all the way from New Mexico to British Columbia. And all the purported “high-altitude forms” of butterflies that have been investigated have proven to be genetically different, so actually there are NO high-altitude forms among butterflies (there are only seasonal forms, and those spring forms may predominate in the cold short growing season at high altitude).

Scott first discovered this ssp. biologically years ago, by noting how the high-altitude populations differed in oviposition and mate-location behavior from the low-altitude biennial ones. But he had mounted few of each, and had not noted the connection with arctic *caryi*, because he hadn’t looked much, and Scott’s series of *caryi* had incredibly variable unh (ranging from *chryxus*-like to near *strigulosa* to like *bore*), which paralyzed his judgement. But when Kondla sent photos contrasting the ups of near-*caryi* and *chryxus* in BC, and Scott considered Tom Kral and Kondla’s opinion of separate species status for them, Scott realized how the ups of *caryi* is rather characteristic and is not so variable and is different from *chryxus* (despite the confusing unh), then after comparing them with other “*chryxus*” he realized that these same two species occur in Colorado, with not so much difference! And suddenly, it made sense that the unh of Yukon “*caryi*” is variable, because there the population is evidently starting to change to ssp. *altacordillera* to the south, which has the unh with a strong median band, yet the ups traits have mostly remained similar to Yukon *caryi*. Kohler had also noticed the biological difference in biennialism between high-altitude and low-altitude “*chryxus*” in Montana. But it has taken a long time to realize what is now quite obvious, that we have TWO species of “*chryxus*” in the Rocky Mtn. cordillera, all the way from BC to New Mexico. (Maybe the stenospecies concept helped the thinking process here, because Scott was working with such species, and stenospecies do messy things like introgression and convergence and polymorphism and geographic variation and individual variation greater than between-taxa difference, etc., and all of those difficulties except perhaps introgression are involved in “*chryxus*”. There’s a lesson here also: studies can be conducted using thousands of adult specimens, but if the wrong traits are studied or they aren’t studied well, the study will be useless, or worse than useless if it retards a good study. Some kind of key clue is needed to focus the search for truth, then with a key clue the mess will fall into place. For instance the *Speyeria atlantis/hesperis* mess defied analysis for a hundred years despite the study of many thousand specimens, and lepidopterists were fixated upon the variation in silvering, and finally when it was realized that the key clue was the unh color, rapid progress was made. The key clue in these *Oeneis* is the more stable ups wing traits of Yukon *caryi* vs. “*chryxus*”, rather than the chaotic mess on the unh.)

A lot more work is needed on this species and *O. chryxus*, which will take years. We need to map biennialism in both species. We should examine the stigma scales with SEM etc. to see why the stigmas look different. We should stare at hundreds more specimens to try to find more identification characters. More thorough study of genitalic morphology, palpi, antennae, body pattern & legs might prove worthwhile (W. Burdick identified some genitalic differences between

chryxus and *valerata* in the O.D. of the latter). We need to study how *caryi* changes from near the TL (NE Alta.) to Yukon & Alaska, and should investigate how Yukon “near *caryi*” changes southward through BC to *altacordillera*, and how it may change into *valerata* in SW BC. More specimens from BC & Alberta to Montana and Idaho and Wyoming and Utah should be studied. Maybe *O. calais* occurs on Vancouver I. (as the O.D. of *valerata* claimed), and the darker Mt. Hull phenotype in the Okanogan Highlands of Wash. mentioned by Pyle (2002) might be *O. calais*. Thousands of old “*chryxus chryxus*” specimens must be reidentified, an enormous task that will take years. Biologically, it makes sense that a higher-altitude population that lives where trees such as Engelmann Spruce shade the ground heavily thus killing flora, should be *O. calais altacordillera*. And at lower-altitude (in Montane Zone also?) where the trees are open enough to permit a population of sedges to grow thickly beneath, *O. chryxus* should occur. Both species occur in the Montane Zone (both occur in the open mature Lodgepole Pine forest in Grand Co. where *O. jutta* occurs and eats the lush sward of *Carex geyeri*). But forest conditions change geographically, so there may be surprises in each region. Perhaps more work on DNA will be helpful (Nice & Shapiro [2001] give some data, but mtDNA has proved to be extremely variable whenever sample size is large such as in *Phyciodes* and *Plebejus* (*Lycaeides*), so mtDNA is of limited value). In the checklist below Scott gives his opinion as to which species the other names formerly belonging to “*chryxus*” should be assigned. Kondla would retain more taxa as separate species because our information is incomplete (and of course, when the reasons for placing them into the former species proved wrong, some people will wonder whether the reasons for placing them into the newer species are much better). *Ivallda* males perch all day on hilltops to await females, which is different from the usual *altacordillera* behavior, but it appears that mate-locating behavior vary somewhat in this species, depending on topographic conditions of the usual habitat (and the related *stanislaus* may have different mate-locating behavior?).

***Oeneis calais altacordillera* in Alberta-British Columbia, by Norbert G. Kondla & J. Scott**

Altacordillera occurs in the Rocky Mts. of Alberta and SE BC without apparent difference from the butterflies farther south, and in BC ranges northward and toward the coast, where the *Oeneis* will need more study by Kondla & Guppy. Since there are three taxa of *O. calais* in opposite corners of BC (*altacordillera*, *caryi*, and Wash. *valerata*), a study of how they vary within BC may help elucidate what happened to the butterflies of BC during the 17 Pleistocene ice advances/retreats. Records so far: **Alberta:** Nigel Pass, subalpine to alpine zone, Banff-Jasper Hwy., Aug. 2, 1966, J. Scott 1m (definite ordinary *altacordillera*, totally unlike *chryxus*, with the inconspicuous stigma and yellower-tawny coloration and extensive brown on upf and long brown M₃ jog & other traits of it); Plateau Mtn., N. Kondla, July 26, 1978 1m, July 26 1980 1m (or *chryxus*); Plateau Mtn., July 18, 1966, J. Scott, 1f probable; S of Plateau Mtn., 6600', July 31, 1969, John S. Nordin, 1f probable; Johnson Can., 4750', Banff NP, Alta. July 8, 1934 F3427 F. M. Brown 1m1f (CU)(definite *altacordillera*); Stoney Squaw-Norquay Saddle, Banff, Alta., 5600', July 7, 1934 F3426, HH & FM Brown (CU) 1m (might be *chryxus*); Highwood Pass 2150m=8464' upper subalpine forest, Peter Lougheed Prov. Park, July 25, 1977, N. Kondla, 1m (a little smaller, convex fw margin, fairly small stigma, slightly yellower orangish-tawny ups color, inconspicuous fringe checkering, evidently *altacordillera*); Highwood Pass, mile 72, Coleman-Kananaskis Hwy., 7200-7400', July 15, 1966 J. Scott & Christopher Curtis, 4m (Yale Peabody Museum); Highwood Pass, 2150m=7050', July 22 1977 1m probable, N. Kondla; Spray Lake near Canmore, July 11, 1966, J. Scott & C. Curtis, 2m (Yale Peabody Mus.); Prospect Mtn., July 12-13, 1989, N. Kondla, 5m; Prairie Bluff Mtn. (2254m=7395', N of Pincher Crk. in SW Alta.), July 24, 1982, N. Kondla, 1m; Cardinal Divide (an alpine ridge S of Cadomin), July 19, 2003, leg. B. Beck, 1m (small stigma and the other *altac.* traits, except less upf brown) in N. Kondla coll. **British Columbia:** above treeline on Mt. Thompson (N end of Monashee Mtns.) BC, July 28, 1996 1m N. Kondla, looks certain to be *altacordillera* to Scott & Kondla, as it has inconspicuous stigma, light brown all over upf up to the postmedian line, convex fw, and size is small. 2m from Mt. Spieker in NE BC N. Kondla are evidently *altacordillera* as well. A male from BC from Pink Mtn., mile 147 Alcan Hwy., July 9, 1978 (Jim Troubridge?) 1m (CSU) has orangish ups, straight fw margin, stigma rather inconspicuous, upf mostly 2/3 brown, checkering tan, is probably *altacordillera* (the straight margin better fits *chryxus*), but we'd like to see more from there. **Near-altacordillera:** Gott Peak, 7100-8300', Lytton area, Lilloet Ranges, BC, July 15, 1996, Paul M. Thompson, 4m (CU)--the ups of these 4m, plus the ups of an additional 5m from Gott Peak in N. Kondla coll., is variable but resembles *altacordillera*, varying from orangish to tawnier to redder-brown, and many are even a little grayish on basal 2/3 of upf, and fw outer margin is a little convex like *altacordillera*, the stigma is always very inconspicuous and the upf is brown on basal 2/3, and M₃ jog is fairly long, many males resemble many *valerata* in reddish-tawny color of ups, the unh is dark with wide median band on 3m from CU but not on Kondla's, and the unh veins are not noticeable or are weakly whitish. These Gott Peak specimens seem to be near-*altacordillera*, and have little influence from *valerata* because most males have a conspicuous unf marginal band and a strong postmedian unf line like *altacordillera*, whereas those unf markings are absent or weak in most *valerata*. The frequent grayer basal 2/3 of upf is like most near-*caryi*. A male from Eldorado Mtn. in Coast Mts. of BC coll. N. Kondla seems to be *altacordillera* also (sympatric with *chryxus*). ***Caryi* X *altacordillera*:** *O. c. altacordillera* presumably intergrades to near-*caryi* in the mts. of central-northern BC. A male from N end of the Rocky Mtns. in N BC with weak stigma (Nonda Creek, just E of Muncho Lake Prov. Park, N. Kondla) looks somewhat like *altacordillera* because it is somewhat orangish on uph and outer 1/3 of upf, and the fw is rather pointed in

shape (near-*caryi* has rather stubby fw), but the basal 2/3 of upf is rather grayish like most near-*caryi*, and the unh has white veins like many near-*caryi*, so perhaps this location represents a transitional population (more specimens are needed).

***Oeneis chryxus* redefinition in Alberta-British Columbia, by N. Kondla, J. Scott, & C. Guppy, Plate IV**

TL and type: Because there are now two species of “*chryxus*” in Alberta, we have to decide which one was described by the name *chryxus*. The *chryxus* TL was designated as Rock Lake, 22.5 mi. NW Pocahontas, Alta. (which is just N of Jasper National Park ~32 air km WNW Hinton) by J. Shepard (1984, *Questiones Entomologicae* 20:35-44). This TL is evidently approximate, because Rock Lake is lodgepole pine forest with meadows and a grassy slope, but the alpine butterfly *Boloria astarte* was labeled from there too, so some specimens with that label were collected merely somewhere near Rock Lake, not right at the lake. Shepard designated a female lectotype because no type specimen existed, but unfortunately females are not very good for identification, so that purported lectotype isn’t much help in determining the identity of *chryxus*. However, the O.D. gave a color painting of a male (plate IV shows half of Kondla’s photo of the painting taken from a CNC copy of O.D.). And actually, Kondla and Guppy’s study of ICZN Code indicates that the painting is of a specimen that was the valid holotype by monotypy, even though the holotype specimen is now apparently lost (Articles 73.1.4, 73.1.2), and thus the lectotype is invalid anyway (and it has more problems, see below). As a practical matter, that painting has to be used to define the name *chryxus* because it is a male and is all we have to go on (there was no verbal description). That painting of the holotype shows a conspicuous dark male stigma surrounded by very little brown, like what we call *O. chryxus*, and that portion of the stigma within the discal cell is also very wide (twice as thick as most *altacordillera*), the fw appears to be rather pointed like many *chryxus*, the postmedian upf line and jog are absent, and the hw fringe has long dashes of clear white, all like what we are calling *chryxus*; however the ups ground color is yellowish-tawny like many *caryi/altacordillera*; but considering all the characters, we attach the name *chryxus* to the low-altitude species, not to *caryi/altacordillera*. Regarding its paler (orangish-yellow) color, perhaps the color of the painting was yellowed during painting or printing, or faded with time because that book is 157 years old, but most likely it represents an actual yellower specimen, because a male from Prospect Mtn. trail to the north (b/w fig. here) is yellowish-tawny-orange, almost as yellowish as the O.D. painting (its other characters say it is *O. chryxus* though, as there is not much brown beyond the stigma, the stigma is rather conspicuous and is wide ~1.5 mm+ in right discal cell, the M₃ jog is weak, the fw is rather pointed but outer margin is a little convex; it is like the Rock Lake male on pl. IV but yellower-orange)(*O. chryxus* is usually comparatively unvarying orangish, but Scott has an albinic male from Jefferson Co. Colo. that is creamy like *ivallda*). Plate IV shows a male Kondla coll. at Rock Lake which is typical of our current concept of *chryxus* (bright orangish, the stigma conspicuous and nearly 2 mm wide in discal cell, upf brown mostly medial to stigma, fw outer margin straight for 1 cm, but apex not pointy). The only specimens in Univ. Alta. museum from the vicinity of Rock Creek TL are 3 somewhat faded males from Fitzhugh (now Jasper) Alta., June 15, 1911 (photo taken by Chris Schmidt), which look like ordinary *chryxus*. The purported “lectotype” (shown in b/w here, from color photo sent to Kondla by J. Belicek) has many problems. It is a female in BMNH with six labels: B.M. TYPE No. Rh7845 *Chionobas chryxus* D.W.&H. female; *chryxus* Doubl. Hew. This spec agrees bad w. figure of type; ?Type; LECTO-TYPE; Lectotype of *Chionobas chryxus* Doubleday, designated by Jon H. Shepard, 1983; Rocky Mts., 45-136 (this label descr. by Shepard). The “lectotype” is a female and is totally unlike the real type (painting) which is male, so cannot be the type as it is labeled, as the labels with “...bad...” and “?Type” also indicate. All the labels on the “lectotype” were obviously placed on the specimen after the original description, so there does not seem to be any good evidence that the “lectotype” was even a syntype (Shepard stated that the O.D. says *chryxus* was from Rocky Mts., but actually the O.D. gives zero information except the painting and the name, it gives NO locality). Shepard appears to assume the “lectotype” is a syntype because 2 females were donated to BM in 1845, but we do not know that Doubleday used these females at all, he described *chryxus* from one male used in a painting. The “lectotype” is clearly a false type (“pseudotype”), a specimen on which somebody later placed the erroneous “type” label. Furthermore, the female apparently is a different species from the real type (painting). The female seems to be *O. calais altacordillera*, because it has ups tawny rather than orangish, the ups is duskier, upf is mostly brown up to the postmedian



Pale male from Prospect Mtn. trail, Alta.

False *chryxus* lectotype female upperside

and underside.

line (even though a little orangish shows through the brown in 4 cells), and the fw is convex, all traits like *altacordillera*. The fw M₃ jog is moderately long, and the hw fringe is whitish-tan, which could fit either species. The unh veins are whitish beyond median band, and fw has 3 ocelli and the one in cell M₃ is about 1.5 mm wide, which might be a bit closer to *chryxus*. Most females are difficult to identify, but the false “lectotype” is evidently *altacordillera*, thus is the wrong species from the real type. **Definition:** Kondla notes that the figs. in the Alberta book (Bird et al. 1995) on p. 301 accurately picture *chryxus* (the photos of *caryi* on p. 302 are more similar to *O. calais altacordillera*, which has the male ups usually not quite as dark as *caryi* and the *altacordillera* unh is more banded like p. 301 rather than the more striated unh shown for *caryi*). The male stigma on upf of true *chryxus* appears large and darker-brown and conspicuous, and looks much larger in size than that of *O. calais*. The basal 2/3 of male upf has less brown area, so that the postmedian-submarginal tawny band tends to be wider on average, and sometimes there is not much brown at all around the stigma (as on on p. 301). The distal jog of the fw postmedian line along vein M₃ varies but averages shorter than *altacordillera*, and very often looks shorter also because the jog is filled with orangish rather than brown. The hw fringe is checkered with fairly conspicuous white and brown. The ups wing color is usually rather bright orangish-tawny, not dusky, and is much less variable than *altacordillera*. The outer margin of male fw varies from straight to convex: the margin is straight for 1 cm or so in many or most males (as on p. 301), whereas it is seldom straight in *altacordillera*. Wing size averages a little bigger than *altacordillera* at least at low altitude. Kondla notes that the hw of Alta. *chryxus* is often more round/bulbous than *altacordillera*, though hw shape varies a lot; the hw of *chryxus* is usually more round/bulbous than narrow in Alta., whereas most *altacordillera* have the hw smaller (narrower/more elongate), and *chryxus* southward (S Mont.-Colo.) usually have the narrower hw also. Unh median band varies a lot, but averages fairly thick white edging. The unh seems to be extra-strigulated slightly more often than *altacordillera*. Farther south, in the U.S., *chryxus* is similar, but is often biennial, the hw is seldom bulbous, and the fw outer margin seems to average a bit more convex, so those might be a slightly different ssp. (that isn’t quite different enough to name). The Alta. male fig. by Bird et al. (1995) has the fw elongated “pointed”, so Scott wondered if that trait was characteristic of Alta. *chryxus*. A series from Teton Pass Wyo. (enumerated below) did have nearly all males with pointy fw. But *chryxus* from nearby Teton Mts. did not have the fw often pointy, and the pointy fw was found to be unusual in the specimens Scott has seen from Montana and Alberta and the rest of the range, so evidently this pointy fw is uncommon, although it may be a little more frequent in the Central and Northern Rocky Mts. than in the Southern Rocky Mts. of S Wyo.-New Mex. Overall, Alberta *chryxus* may differ a little from *chryxus* in the U.S., by having the fw outer margin averaging a bit straighter perhaps, by having the hw often a bit larger, by lacking biennial populations (two cohorts must fly at each Alberta locale), and by ranging into the alpine zone (only into the Montane Zone farther south), but these differences do not seem to be great enough to call them separate subspecies at the present time. **Range:** Nice & Shapiro (2001) list 2 “*chryxus*” from Tok Alaska, but based on its location in E-C Alaska and its E haplotype, those are surely *O. calais* near-*caryi*. **British Columbia:** True *O. chryxus* (not *caryi*) extends northward as far as Racing River (N. Kondla) and Summit Lake (C. Guppy) in NE BC in the E part of the Rocky Mts., and T. Kral states that true *chryxus* occurs in the Coast Mts. at Atlin in NW BC (where it flies near the *caryi* phenotype). It extends south through BC and Alta. Kondla and Guppy have found *chryxus* from many locales in BC. A male is from Ashnola Road in Cascade Mts. 2m N. Kondla. Mile 390 Alaska Hwy., June 18, 1969, J. Donald Eff & Jim Eff (CU). Kondla has found *chryxus* in the Coastal Mts. on Eldorado Mtn. and at high altitude on Poison Mtn., although the latter have the unh veins mostly weak to stronger whitish. BC Coast Mts. populations are not true *O. chryxus*, may be a new ssp., and are being studied by Kondla & Guppy, who note that preliminary data show the CO1 gene of real Alberta *chryxus* differs from that of “*chryxus*” from interior BC and Coast Mts. BC. **Alberta:** Road to Adams Lookout near Wilmore, pine forest, July 8, 1980 Felix Sperling 1m (uns fig. by Scott 1986 as 128b), in Scott coll.; Wilkinson Crk., 6300’, Kananaskis Hwy., July 12, 1970, John S. Nordin, 1m in Scott coll.; Livingstone Falls Cgd., Crowsnest Forest, July 2, 1962, J. Scott, 1m; Ptarmigan Lake, July 31, 1966, J. Scott, 1m; Spray Lake, Canmore, Alta., John Legge, June 23, 1961 1m1f (CU); Spray Lake near Canmore, July 11, 1966, James A. Scott & Christopher Curtis, 1m1f (Yale Peabody Museum); Canmore June 22, 1961 1f (CU); Cadomin July 7, 1980 3m (CU); Cadomin, Alta., July 7, 1980, 1m (Jim Troubridge?) (CSU); Sask. Crk., Banff NP, July 9, 1962 1m (CU); Nigel Pass, Banff-Jasper hwy., Aug. 2, 1966, J. Scott & C. Curtis, 1m1f (Yale Peabody Museum); Allison Creek Cgd., 6800’, July 17, 1966 J. Scott & C. Curtis 1f (Yale Peabody Museum); King Creek fan 1700m=6700’, valley bottom pine forest, Peter Lougheed Prov. Park, June 25, 1977, N. Kondla 1m; Plateau Mtn., N. Kondla, July 26, 1980 2m, July 31 1983 5m; Plateau Mtn., July 18, 1966, J. Scott, 1f probable; Prairie Bluff Mtn., July 24, 1982, N. Kondla, 4m; Prospect Mtn., July 12-13, 1989, N. Kondla, 7m; Cardinal Divide, July 19, 2003, leg. B. Beck, 2 m in Kondla coll. **Altitude:** In Alberta, Kondla finds that it occupies the foothills, up to 1700m=6700’, which is fairly high, reaching the Alpine Zone. *O. chryxus* seems to have a greater altitudinal range in Alta., as it has been found in the alpine zone on Plateau Mtn., Prospect Mtn., Prairie Bluff Mtn., & Cardinal Divide (and in the subalpine or alpine zone at Nigel Pass and Spray Lake, and in the subalpine zone on Highwood Pass), whereas farther south in the U.S. *chryxus* seldom extends above the Montane Zone. **Flight period:** Bird et al. (1995) report that it is annual in Alberta, mostly in July (May 23-Aug. 16). Surely there are two biennial cohorts so that populations merely appear annual, but evidently nowhere are there obviously biennial populations that fly only on alternate years, as occurs southward from Montana to Colorado. **Mate-locating behavior:** This has not been studied in Canada. Bird et al. (1995) state that males appear to be resident

along gullies, paths and edges of meadows, suggesting that males perch in gullies to await females like *O. calais altacordillera*, but this needs to be confirmed, as that behavior may have been observed in localities missing hilltops.

***Oeneis chryxus* redefinition in western U.S. and especially Colorado, by J. Scott**

Definition: The male stigma on upf appears large and darker-brown and conspicuous, and looks much larger in size than *altacordillera*. That portion of the stigma in the bottom of the discal cell is usually thicker than *O. calais altacordillera* (1-2 mm). The basal 2/3 of male upf usually has less brown area, so that the postmedian-submarginal tawny band tends to be wider on average, and sometimes there is not much brown at all around the stigma. The hw fringe is checkered with brown and fairly conspicuous whitish. The ups wing color is not dusky, and is much less variable than *altacordillera* in ground color, and is usually rather bright orange-ochre (it varies a little in males and is often yellowish-tawny in females, but is usually somewhat orangish). The distal jog of the fw postmedian line varies but seems to average shorter than *altacordillera*, and also often looks shorter because the jog is very often filled with orangish rather than brown. The male fw shape varies from like *altacordillera* to more pointed, and the main difference seems to be that the outer margin of male fw is straight for 1 cm or so in nearly 40% of Colorado males, whereas it is seldom straight in *altacordillera*. Size seems to average a little bigger than *altacordillera*, however Montane Zone *chryxus* are smaller like *altacordillera*. Unh median band varies a lot, but averages fairly thick white edging. The hw is seldom large (bulbous) as it often is in Canada. At present, it seems that Colo. adults may differ a little from Alta. *chryxus* because fewer males have a straight fw margin, the hw is seldom large, and adults are biennial and fly only on even years (with rare lonely adult exceptions), and mate-locating site apparently or possibly differs (mostly hilltops in Colo.). This Colo. bug needs to be compared more closely with *O. chryxus* from the Alberta TL of *chryxus* to determine if it is a distinct ssp. Kondla states that the fw margin is fairly straight in most Canada *chryxus* (but the males I have seen mostly have the outer margin of fw a little convex), while less than about 40% are straight in Colo. at low altitude, and even fewer at higher altitude. The hw of Alta. *chryxus* averages larger than southward also as noted above. (Note: the upper left “*chryxus*” photo in the book Butt. Rocky Mtn. States [Univ. Okla Press, 1991] is a misidentified *O. uhleri*.) **Altitude:** In Colorado it evidently occurs in lower mountains (7,000-10,000’, and even up to 10,500’ at several places), in the Transition and Montane Zones, and at higher altitudes adults are smaller like *O. calais altacordillera*. *O. chryxus* from N of Victor 10,500’ in Teller Co., from Luders Creek 9000’ in Saguache Co., from Rollins Pass 10,500’ in Gilpin Co., and from Caribou bog 10,000’ in Boulder Co., are a little darker than usual and a little small, but seem to be *chryxus* as they have a conspicuous stigma and orangish-tawny coloration, etc. **Specimens examined by Scott:** **WASHINGTON:** Brewster, Okanogan Co. J. C. Hopfinger, July 13, 1941 4m, July 25 1934 1m, July 25, 1939 1f (CU). Moses Meadows, 4500’, E of the Okanogan Valley, 1m (Kondla photo, ordinary *chryxus*)(another male from here is brown over most of upf except for 5 small red-brown areas on outer part containing 3 ocelli, and about ½ of uph is orange-brown, the M₃ jog is very long, the fringe checks are tan; the brown color suggests it is *altacordillera*, however the stigma is large and black and fw margin is straight and the altitude is low, so I will currently regard this specimen as a freak *chryxus*). **MONTANA:** E side Hungry Horse Res., 3560’, Flathead Co., July 15, 1984, Richard L. Hardesty 1m (CSU); Dillon, 5406’, Beaverhead Co., July 12, 1939, 1m1f (CSU); W Halfmoon Park, Crazy Mts., Sweetgrass Co., July 4, 1966, J. Scott 4m3f; Hellroaring Plateau, 9000’, Carbon Co., Aug. 3, 1982 N. Kondla, 1m. **IDAHO:** Deer Park, 4200’, N Fork Boise River, Boise Co. Ida. July 1944 J. H. Manning, 27m5f (CU); Mt. Baldy, Ketchum, Blaine Co., J. Donald Eff, July 16, 1941 1m, July 16 1944 2m (CU); Trail Crk. Summit, Ketchum, Blaine Co., July 15, 1944, J. Donald Eff, 2m (CU); Galena Summit, Ketchum, Blaine Co., July 27, 1944, J. Donald Eff, 3f (CU); Dollarhide Summit rd., Blaine Co., July 6, 1946, J. Donald Eff, 2m (CU); Alturas Lake, 7900’, near Sawtooth, Blaine Co., July 10, 1996, T. B. Evermann, 1m (CSU); Alturas Lake, Blaine Co., July 8, 1945 J. Donald Eff 1m (a freaky specimen, the upf like *ivallda*, but uph orangish like *chryxus* so evidently not mislabeled from Calif.)(CU); rd to Dollarhide Mtn., Camas Co. 1m L. P. Grey in Scott coll.; Pine Creek Pass [between Swan Valley & Victor], ~6800’, Big Hole Mts., Bonneville/Teton Co. line, W. N. Burdick, 1937, July 13 2f, July 14 2f, July 15 1m1f (CU). **UTAH:** Mt. Raymond, 9400’, Salt Lake Co. (N. Kondla collection & photo); Indian Can., 8200’, 26 mi. SW Duchesne, Duchesne Co., June 12, 1986, Ray E. Stanford 1m (CSU); Kent Lake [FS route 137, off hwy 153, E of Beaver], Tushar Mts., Beaver Co. June 17, 1937 W. N. Burdick 1m (CU); Old Woman Plateau, 7900’?, Sevier Co., June 3, 1984, Clifford A. Miles 1m (CSU). **NEVADA:** Lone Pine Swale, 7800-8600’, Egan Range, White Pine Co., June 12, 2002, Paul M. Thompson 1m2f (CU)(bright orange! in color, surely a new ssp. if adults in nature are this bright, though a series of *O. alberta* in same drawer were unnaturally blackish, so maybe a volatile chemical such as chlorocresol altered them?; in other traits they are typical *chryxus*). **WYOMING:** Mt. Washburn, Yellowstone NP, Wyo. P.S. Remington July 23, 1941 1m1f (CU); Madison Junction 6800’, Yellowstone NP Wyo., June 29, 1934 F3411 1m, F. M. Brown (CU); Dead Indian Hill, <=8673’, Park Co., Aug. 2, 1982, N. G. Kondla 1m; Muddy Creek, hwy. 212, Park Co., July 31, 1982, N. Kondla, 1m; Teton Pass, 8429’, Teton Range & Co., W. N. Burdick, 1937, July 15 1m1f, July 16 1m1f (CU)(10 of these 12m have very pointed fw, all have strong stigma and most have little upf brown); Teton Mts., Teton Co., W. N. Burdick, 1937, July 17 5m2f, July 18 6m3f (CU)(the fw is not as pointed on these, and several males may be *altacordillera*); Teton Wyo. June 18, 1931 1m (CU); Lower Green River Lake to Slide Creek Falls, Wind River Mts., Sublette Co., 8000’, July 15, 1998 P. M. Thompson 1m1f definite *chryxus* (CU); New Fork Trail, 8000-10,300’, Wind R. Mts., Sublette Co., July 17, 2002, 1m P. M. Thompson (CU); Togwotee Pass

East, 7900', Wind River Mts., Fremont Co. Wyo. June 27, 1934 F3404 F. M. & H. H. Brown 1m (CU); Dickinson Park 9350', Wind R. Mts. Fremont Co. J. Scott 1m2f probable; Dickinson Park, 9260-9280', Wind River Mts., Fremont Co., Aug. 2, 1999, P. M. Thompson 1m2f (CU) prob. *chryxus*; same but 9280' July 31, 1999 4f; Antelope Butte Ski Area 2550m=8366', Big Horn Co., Aug. 3, 1995 J. Scott 1m3f (male has a fairly conspicuous stigma and straight fw and orangish coloration and not much upf brown and looks like *O. chryxus*, but maybe these are *altacordillera*, because some lower-altitude ones of unknown phenotype from North Fork Crazy Woman Can. 7500' Johnson Co. Aug. 4 1995 J. Scott 2m and Steamboat Point 7280' Sheridan Co. Aug. 3, 1995 J. Scott 1m had haplotype A like *ivallda* [Nice & Shapiro 2001] which may suggest they were *altacordillera*, and the odd-numbered year might suggest that also); Red Grade Rd. near Rapid Creek, 7400-7500', Big Horn NF, July 7, 1953 F. M. Brown, 5m4f (CU); Penrose Park, 7800', Bighorn Mts., S Johnson Co., July 7, 1951 F. M. Brown 1m1f (CU); (Bighorn Mts. specimens are often somewhat odd and more specimens are needed; what I think is probable and definite *altacordillera* is listed above); Summit, 8680-8876', Sherman Range [Hills] of Laramie Mts., Albany Co., June 14, 1974, Richard L. Hardesty 1m (CSU); Pole Mtn. (a hilltop with radio towers, 8876', next to Summit, SE of Laramie), Laramie Mts., Albany Co. Wyo., L. P. Grey 1m (Kondla collection & photo, probably *chryxus*, as stigma is conspicuous and fairly wide in discal cell, the M₃ jog is just medium long, and fringe checkering is strong, but upf is brown on basal 2/3 more typical of *altacordillera* and the ups is a little tawnier orangish than most *chryxus*, the location fits *chryxus* which mate-locates on hilltops, & Nice & Shapiro [2001 p. 119] say the Sherman Hills "*chryxus*" pop. flies in even years); Laramie Co. June 24, 2000 Loretta Mannix, 1m (CSU). **COLORADO: Colorado Plateau:** Mud Springs, Pinon Mesa, 7500', Mesa Co., June 8, 1963 C. J. McCoy 1f (CU). **West-Central Colo.:** near Basalt, 6800-7000', Eagle Co., June 10, 1976, Ray E. Stanford, 1f (CSU); Colo., "Baldy", 8500', White River NF, [Pitkin or Gunnison Cos., there are two Mt. Baldy's], June 24, 1938, 1m probable (*altacordillera*?) (CSU). **San Juan Mts.:** La Plata, 9100', La Plata River & Co., Colorado June 20, 1952, J. Donald Eff, 1m (CU); 5.4 mi. W jct. 114 & Luders Creek rd., ~9000', Cochetopa Hills, Saguache Co. Colo. May 28, 1972 J. Scott 4m (look a bit like *altacordillera*). **Wet Mts.:** South Hardscrabble Park, 10200', 5 mi. W Bigelow Divide, Custer Co. July 10 1968 Glenn Scott 2m; big hilltop W of divide between North Creek & South Hardscrabble Creek, 8000', Custer Co. May 25, 1972 J. Scott 1m; Locke Park (a meadow on Locke Mtn., 9280', Fremont Co. Colo., June 3, 1972 G. Scott 5m; Junkins Park (3 mi. ENE Rosita), 10000', Custer Co. Colo. May 26, 1972 J. Scott, 12m3f (1 yellow-tawny female may be *altacordillera*), grassland, males common on steep sloping ridge-hillside (below some woods on Arkansas Mtn.), where they rested & often flew & chased at 9:00 MST; wash 1 mi. E Game Ridge (3 mi. NE Rosita) 9400', Custer Co. May 26, 1972, 1m2f; 2.5 mi. NE Rosita, 9250', Custer Co. Colo., Canadian Zone grassland meadow, July 1, 1970 J. Scott 1m1f; S side Burris Meadow, 9500', Ophir Creek, Custer Co. June 3, 1972 G. Scott 1m; Devils Hole, 8900', Huerfano Co. June 20, 1968 G. Scott 1male. **Sangre de Cristo Mts.:** Pass Creek, 2 mi. N hwy. 60, Huerfano Co. Colo. July 4, 1970 J. Scott 1f probable. **Sawatch Range:** SW of Bald Mtn. (S of Middle Cottonwood Crk., W of Buena Vista), ~9000', Chaffee Co. June 11, 1974 G. Scott 1m; Bald Mtn. S of Middle Cottonwood Crk. 8800', June 11, 1974 G. Scott 1f; 5 mi. W Buena Vista, 8500', Chaffee Co. June 8, 1970 J. Scott 1m; Indian Flats, jct. 7.1 mi. W Buena Vista, 9000', Chaffee Co. June 8, 1970 J. Scott 1m; Red Deer Creek, 9600', 1 mi. N Cottonwood Hot Springs, Chaffee Co. June 12, 1974 G. Scott 1f; Fryingpan River, 7-8000', near Ruedi Res., Eagle Co., June 10, 1976, Ray E. Stanford 3m (CSU); near Thomasville, 8000-8400', Pitkin Co., June 10, 1976, Ray E. Stanford, 1m (CSU). **Elk Mts.:** Aspen, 7900', Pitkin Co., June 12, 1968 Ray E. Stanford 1m1f (CSU); Snowmass Crk., 7000', Pitkin Co., June 9, 1976, Ray E. Stanford 1f (CSU). **Mosquito Range:** vic. Alma, 10,500', Park Co. Colo., June 21, 1950 F. M. Brown 1m (CU); County Road 3, W of Breckenridge, Summit Co., M. Fisher, July 3, 1992 1m (probable). **Park Range:** Rabbit Ears Pass, 9572', Routt/"Grand" [must mean Jackson] Co., July 27, 1968, Ray E. Stanford, 2f (CSU). **Front Range:** Pikes Peak hwy., 9500', El Paso Co. Colo. F. M. Brown, July 15, 1932 1m, 9500' July 18 1932 1m probable *chryxus* & 1f (CU); Caroll [Carrol on map] Lakes (3.5 mi. ENE Woodland Park, 9000'), Rampart Range, El Paso Co. Colo. June 23, 1960 F. M. Brown 14m3f (CU); Rampart Range Rd. near Woodland Park, 9,500', Teller Co. Colo. F. M. Brown, June 23, 1950 4m, July 2, 1948 14m1f (2m are *altacordillera*?) (CU); Rampart Range Rd., 9,600', July 12, 1950 F. M. Brown 2m1f (CU); Rock Creek, 8,200', El Paso Co. Colo., June 16, 1954 F. M. Brown 1m (CU); Cascade, 8500', El Paso Co. Colo., June 28, 1932 F. M. Brown 1f (CU); Cheyenne Mtn., 9,200', El Paso Co. Colo. June 6, 1964 Samuel Johnson 2m (CU); North Cheyenne Can., 8700', El Paso Co. Colo. June 30, 1984 J. Scott 4m; Stove Mtn., 8000', E-facing slope, El Paso Co. June 23, 1990 J. Scott 1m2f; Farish Memorial Recreation Area, 9150-9200', US Air Force Academy, El Paso Co., Peter M. Cutter, June 2, 16, 24, 1994 3m1f (CSU); Range View Road, 2 mi. N Victor, 10500', Teller Co., June 7, 1972 G. Scott 2m; Crystal Peak, 9300', Teller Co. Colo., July 1, 1932 F. M. Brown 3m (CU); Crystal Peak, 9000', Teller Co. Colo., June 11, 1960 J. Scott 1f probable; NE end High Park, S of Florissant ~10 mi., ~8800', Teller Co. Colo. June 7, 1972 G. Scott 1m1f; Florissant, Teller Co. Colo. 1m (CU); Devil's Head Road, Douglas Co., May 12, 1931, 1m (CSU); Douglas Co. Colo. 8000' June 10, 1930 1f (CSU); Spruce Cgd., 8500', Park Co. Colo., May 29, 1960 J. Scott, 1m1f; Bailey, 7750', Park Co., Charles P. Slater, 1962, June 14 1m, June 17 dry meadow 1m, July 1 1f (CSU); Kenosha Pass, 10,000', Park Co., Ray E. Stanford, June 11, 1974 2m, June 27, 1968 1f, June 27, 1963 1f probable (CSU); Jefferson Co. Colo. several dozen sites ~7000-8000', hundreds of specimens, J. Scott; Jefferson Co. Colo. (Red Rocks 1m, Coal Creek Can. 1m, Lookout Mtn. 1m1f, Ralston Creek 1m, Mt. Zion 1m, details not recorded) (CSU); head Gunbarrel Crk., Jefferson Co. Colo., 8500', June 4, 1952 J. Donald Eff 2m (CU); Evergreen, Jeff. Co. Bernard Rotger June 9, 1960 2m1f, June 15, 1960 1f (CU); Bailey,

Park Co., June 17, 1962 Charles P. Slater 4m1f (CU); York Gulch, 9300', Clear Creek Co. June 27, 1964 J. Scott 1f; hilltop SE Empire, 9400', Clear Creek Co. Colo., June 30, 1972 J. Scott 1m1f; 1 mi. up North Fork Clear Creek, 7500', Gilpin Co. Colo., July 2, 1978 J. Scott 1f; King's Flat, 9400', Gilpin Co. June 27, 1964 J. Scott 1f; just NW Central City, 8800+', Gilpin Co. June 23, 1973 J. Scott 1 m (a rare adult in odd-numbered year); Missouri Falls, 8200', Gilpin Co. Colo., Charles P. Slater, June 20, 1976 1m, July 11, 1976 1f (CSU); 1 mi. SE Yankee Doodle Lake, 10,500', Gilpin Co. Aug. 5, 1978 J. Scott 2m (looks a bit like *altacordillera*); Tolland, 8950', Gilpin Co. Colo., June 29, 1972 1m (CSU); Tolland, 8900', Gilpin Co. July 5, 1976, Ray E. Stanford 1f (CSU); Caribou bog, 10000', Boulder Co. Colo. July 3, 1988 J. Scott 1m3f; Caribou Ranch, Delonde Crk., 8600', Boulder Co., July 21, 1998, 980768PMP P. M. Pineda & T. M. Nosaka 4f (CSU); 4th of July Can. [10,160' at 4th of July Cgd.], N Fork Middle Boulder Creek valley, Boulder Co. Colo., July 22, 1962 S. M. Sutton 3m2f (CU); Flagstaff Mtn., Boulder Co. 3m1f (CSU); Mountain Res. Station [evidently Univ. Colo. Camp 9500' on map, which is SE of Niwot Ridge], Boulder Co. July 10, 1982 Oren Pollak 1m (CU); 4 mi. E Gold Hill, Boulder Co., June 20, 1964 Url Lanham 1m (CU); Maxwell Rd., Boulder Co. Colo., July 2, 1942 1m (CU); RR grade NW Sugarloaf Aandahl, Boulder Co. Colo. J. Donald Eff 2f (CU); Phantom Valley Trading Post, Rocky Mtn. NP, June 30, 1950, Vaughan Aandahl 1f (CU); Estes Park 1f (CU); Ski Idylwild Lodge, Hideaway Park, 8800', Grand Co. Colo., July 5, 1984 J. Scott 1m; Deer Ridge Trail route, 8875', RMNP, Larimer Co., June 3, 1998 1m (CSU); 5 mi. N Tunnel Cgd, 8500', Laramie River Rd., Larimer Co., June 28, 1986, Paul A. Opler 2m1f (CSU); Larimer Co., B. Simpson, June 26, 1974 1m, May 19, 1974 1f (CSU); Poudre Can., Larimer Co., June 29, 1972 3m (CSU); Horsetooth Mtn. Park, 6800', Larimer Co., June 28, 1985, Paul A. Opler 1 or 2m (CSU). **North Park:** Road 6W, 4.5 mi. N jct. of road 7, 8,400', hilltop, Jackson Co., June 1, 2000, M. Fisher, 1m1f. **Geographic variation:** The specimens from Egan Range in E Nevada are bright-orange, much brighter than other *chryxus*, which is an unnamed ssp. (unless that color was somehow artificially chemically induced). Coastal BC *chryxus* may have the unh veins a little whiter at some places. The fw outer margin of southern *chryxus* (from C Mont. southward) may average a little more convex than *chryxus* from Alberta (where the fw may average a bit straighter), and the hw is a bit more elongate like *altacordillera* (whereas in Alberta half or more of *chryxus* seem to have the hw more round/bulbous). The unh may have a little extra striation (strigulation) on unh on a slightly greater percentage of southern adults (a minority of both are extra-strigulated, and neither is strigulated like *strigulosus*), but this is a weak difference. Overall, these differences might be enough to identify close to half the Canada vs. U.S. adults, but we are not naming this southern bug as a separate ssp. now. **Sympatry with *O. calais altacordillera*:** Apparently sympatric at 20 known sites thus far from Colo. to Alta., as noted above. **Flight period:** One yearly generation mostly in June, always biennial in Colorado (and often or always in Montana) and flying in even-numbered years, with very few adults found in odd-numbered years. It is biennial also in even-numbered years in the Snowy Range of S Wyo. (C. Ferris 1991 Lepid. News #2 p. 20) and in the Sherman Hills of the Laramie Range in Albany Co. in S Wyo. (Nice & Shapiro 2001). But in Teton Co. of NW Wyo., *O. "chryxus"* (presumably the real *O. chryxus*) was abundant in 1981 but nearly absent in 1980 so flies mostly in odd-numbered years (K. Bagdonas, 1982 Lepid. News #2 p. 19), although some of these might have been *altacordillera*. **Mate-locating behavior and mating:** In the foothills, males always perch on rocks etc. on hilltops (generally among open woods) all day to await females for mating. D. Clayton & D. Petr (1992, J. Lepid. Soc. 46:110-118) studied mate-locating behavior on hilltops S of Florissant Colo. They are usually not common, and so males mate-locate on top of hilltops or ridgetops, but NE of Crawford Gulch when adults were common I also observed a few males perching on rocky outcrops on a sloping ridge 50 m S of the prominent hilltop. In the montane zone where hilltops are often absent, at Junkins Park I noticed males perching on steep sloping ridge-hillside to await females and chasing others there, and at Stove Mtn. a mating pair was found at 12:18 MST on an E-facing slope, so adults can adapt to slopes where hilltops are not readily available. A completed courtship and mating was observed NE of Rosita July 1, 1970, at 11:49 MST: my notes say that the female flew, the male chased after, and they appeared to grapple in midair, and when they landed or shortly thereafter they were mated, then the female flew carrying the male several times. Another completed courtship & mating was seen on a ridge NE Crawford Gulch (Jefferson Co. Colo., June 14, 1992), in which the female at 12:00 flew 3-6m over a ridgetop 4 times until she flew over a male who was perching on ridgetop to await females, he pursued, they hovered, she landed, but then he chased after another male, then at 12:04 she flew over a rocky spot and a perching male chased her, she hovered toward a grass clump and landed with wings closed while he fluttered just behind her and landed beside her and fluttered his wings beside her left hw (transferring pheromone from his stigma of course) and bent his abdomen to the right and joined and then turned to face opposite. I have found about 7 other mating pairs, at 10:38, 12:50, 12:54, 14:00, 14:20, 14:30, 15:10, and Ray Stanford found two at 14:00, 14:00 (all MST), all on hilltops, except two were found on a road cut on a hillside (the cut being sort of a mini-hilltop). **Oviposition, hostplant, biennialism:** Scott (1992) provided lots of data showing that females oviposit by flying a bit slower than usual and finding abundant turflike *Carex rossii* and related sedges under the semi-shaded canopy of trees (esp. Ponderosa Pine), then they land and oviposit on the underside of branches (fallen dead branches or dead or live ones still attached to the tree) above the *Carex*, then the hatching larva evidently falls off the branch onto the *Carex*. In lab, larvae eat the grass *Poa pratensis* well. *O. chryxus* is very strange because it is the ONLY butterfly known in the Colo. foothills with a 2-year life cycle (nearly all adults appear only on even-numbered years), evidently because the environment under the trees is somewhat shady and cool. All other known biennial butterflies occur in the subalpine/alpine zone or the arctic, where temperatures are too cold to produce a generation in only

one year (an arctiid moth on Ellesmere I. takes 7 years). In this oviposition behavior and biennialism it is very distinct from *altacordillera*, so it's not surprising that we now find that they belong to separate species. Clyde Gillette's Utah *chryxus* hibernated as mature larvae in lab (pers. comm.), which they would do in the second winter in nature, and in nature young larvae presumably hibernate during the first winter.

Reassembly of *Oeneis chryxus* group, by J. Scott

It's almost a miracle that there are so few synonyms, aberrations, & controversies cluttering the checklist of this group!

O. chryxus (Doubleday [Kondla notes that the book was authored by Doubleday & Hewitson, but the name *chryxus* was authored only by Doubleday]) 1849 TL Rock Lake vicinity, 22.5 mi. NW Pocahontas (thus ~32 air km WNW Hinton, and N of Jasper) Alta.

O. calais ivallda (Mead) 1878, **NEW COMBINATION**. Alpine zone of Sierra Nevada; creamy in color because of camouflage on paler background rocks according to W. Hovanitz.. Intergrades with *stanislaus* on Carson Spur etc. Placed in *O. calais* because of less-conspicuous smaller stigma and large extent of brown on basal 2/3 of male upf and fairly long jog on postmedian upf line and often paler color and alpine zone habitat, and several drawings of male valva have narrow valva tip like most *altacordillera*. However, males perch all day on hilltops to await females, unlike most *altacordillera*. A. Porter & A. Shapiro (J. Res. Lepid. 28:263-76) and Nice & Shapiro (2001) did electrophoresis of *ivallda* & *stanislaus*, & found *ivallda* on pale granite in S Sierra but on dark andesite like *stanislaus* in N Sierra, so the background camouflage theory is not entirely correct. The allozyme data showed that *stanislaus* is just a differently-colored part of the *ivallda* group. They suggested that it originated from Rocky Mtn. populations such as the "*chryxus*" (*altacordillera*) from Snake Range Nev. Mostly flies odd-numbered years.

O. calais stanislaus Hovanitz 1937, **NEW COMBINATION**. A local ssp. of *ivallda*, found in subalpine zone. Yellowish-orangish-tawny, with fairly inconspicuous stigma (averaging larger than *ivallda*) and large extent of upf brown. Mate-locating behavior unknown. Interrupts the range of *ivallda* in Sierra Nevada, where background rocks change color, but its color may be partly due to inheritance from *O. calais altacordillera*. Mostly flies in odd-numbered years.

O. calais valerata Burdick 1958, **NEW COMBINATION**. Found in Olympic Mts. (Hurricane Ridge, Eagle Pt., Gray Wolf Ridge, etc.). Distinguished by having vestigial unf postmedian and marginal bands. The ups varies greatly in color, but is usually rather reddish-brown. I place it into *O. calais* because of always-inconspicuous stigma and always large extent of brown on male upf and alpine habitat, plus the unh is often strigulated like *calais* (16 of 23 males and 6 of 10 females are somewhat to very strigulated), unh has white veins in all females and nearly all males as in *calais*, and larval heart-band has dashes of dark & tan like *strigulosa*.

O. calais altacordillera J. Scott 2006, **NEW SSP.** (present paper), TL Baldy Peak, Fremont/Custer Cos. Colo.

O. calais caryi Dyar 1904, **NEW COMBINATION**. TL Smith Landing, Athabasca, NE Alta. Yukon "*caryi*" differs in the direction of *altacordillera* somewhat.

O. calais calais (Scudder) 1865, **NEW COMBINATION(?)**. Unh veins white, a fairly strong median unh band, unh a little strigulated. Ups reddish brown, basal 2/3 of male upf brown. Stigma inconspicuous. Flies every year in most of Man., but only on odd-numbered years at some places.

O. calais strigulosa McD 1934, **NEW COMBINATION**. Strongly striated ("strigulated") on unh and even on unf, with weak unh median band, unh veins white, male upf has some brown but much less than *calais*. Ups reddish-brown. Stigma inconspicuous. Kondla suggests this is so distinctive that it warrants species status, but some *strigulosa* look like *calais* on unh with a fairly strong median band as strong as some *calais*, placing it as a ssp. to Scott and prior authors. Flies every year.

O. alberta ojibwe Scott & Kondla 2006, **NEW SSP.** (present paper). Somewhat similar to *calais*, but seems to belong to *O. alberta*; relationship needs further investigation, but its extremely weak stigma and grayish look and other traits fit *O. alberta*. Oranger than ssp. *alberta*.

O. alberta alberta Elwes 1893=*oslari* Skinner 1911=*capulinensis* Brown 1970. Grayish, variable. (Some individuals of this & *daura* are quite strigulated also.) The extremely weak stigma and strigulated unh and long M₃ jog on upf and dashed heart-band on older larva suggest that *O. alberta* is related to *O. calais*, not to *O. chryxus*.

O. alberta daura (Strecker) 1894. Larger, often tawnier. Some people question this placement, but it just looks like it belongs to *O. alberta* to Scott and most prior authors, and its extremely weak stigma and other traits fit *O. alberta*. But with the separation of *O. chryxus* and *O. calais*, the relationship of *O. alberta* to *O. calais* could still use investigation (but *alberta* appears distinct, and is evidently sympatric with *calais* at a few places).

Cercyonis sthenele/meadii, stencho species, by J. Scott

This taxon is definitely a stencho species. In S Utah and N Ariz. and NW New Mexico, they seem to intergrade rather fully as if they are just one species, according to four people. But in Wyoming, they are slightly allopatric and evidently do not overlap at all, in rather mysterious fashion. Northward in Montana, these taxa are definitely two distinct species! They are one species or two, depending on where you look. Details follow.

C. sthenele (Bdv.) and *meadii* (W. Edwards) seem to clearly represent just one species in N Arizona, S Utah, and NW New Mexico. In Wayne Co. Utah, there is a population intermediate between *sthenele* X *meadii* according to Pat Savage (pers. comm.), who found some adults like *meadii* in Zion Park at the E end of Washington Co., and found *sthenele* in the Pine Valley Mts. farther west in the county. Cliff Ferris (1981, p. 274 in Butt. Rocky Mtn. States, C. Ferris & F. Brown eds., Univ. Okla. Press) wrote that "There are populations in the Chuska Mountains, Arizona, that seem intermediate between *meadii* and the next species [*sthenele*]." The Chuska Mts. extend into New Mexico, where intermediates probably also occur. Thomas Kral (pers. comm.) found a locality in Iron Co. of S Utah where *sthenele* and *meadii* intergrade and there is a complete mixture of specimens of every kind. Lastly, they intergrade (introgress at least) extensively on the North Rim of the Grand Canyon in Coconino Co. Arizona. I have seen lots of adults collected at Cape Royal on the E side of the North Rim, where adults are mostly like *sthenele*, thus males have little red, but many females are slightly reddish on unf and upf (less than 10% of males but about 30% of females seem to have a tinge of reddish on the fw). The taxon *damei* Barnes & Benj. (TL Grand Can. Ariz.) was once considered to belong to *Cercyonis pegala*, but it actually represents this Grand Can. population of *C. sthenele* that is a little introgressed with reddish genes from *meadii*. Much farther west on the North Rim, just outside the park, I collected long series of intermediate *sthenele* X *meadii* at Timp Point and N Timp Point (Aug. 15, 1980) and Crazy Jug Point (Aug. 17-18, 1980), as follows (these are nice localities, and at Big Saddle in particular you can legally collect at a nice hilltop at the edge of the Grand Canyon, and get many nice species without government harassment, and *Speyeria hesperis schellbachii* Garth flies on aspeny N-facing slopes, and great cow-waterholes attract numerous adult butterfly mudsuckers):

Cercyonis sthenele/meadii intergrading in N Ariz.-S Utah, graded by amount of red on fw:

Locality	<i>sthenele</i>	near <i>sthenele</i>	intermed.	near <i>meadii</i>	<i>meadii</i>
Timp Point	1m	3m1f		4m	1m
N. Timp Point	2f	1m	1m		2m2f
Crazy Jug Point	1m2f	6m4f	4m5f	2m3f	19m31f
Big Saddle					1m
Big Sowats Can.					1f
Warm Spgs. Can					1f
Buck Ridge Point					3m1f
5 mi. N Glendale in Kane Co. Utah			1f		

And there is evidence that introgression from *meadii* has added genes to *C. sthenele* from Calif. to Nev. to Utah to W Colo. M. Fisher found a reddish female among ordinary *sthenele* "*masoni*" Cross in Unaweep Can., Mesa Co. Colo. R. Stanford found a male in Morgan Co. in N Utah with a slight red flush around the largest eyespot (1995 Lepid. News #2, Season Summary p. 12). Ken Davenport considers that ssp. *masoni* differs from ssp. *paulus* (W. Edwards) by often having a reddish flush on unf in fresh specimens. Therefore, *sthenele* and *meadii* seem to intergrade greatly in N Ariz.-S Utah and vicinity, and genes from that intergradation have spread widely.

In Wyoming, in contrast, *sthenele* and *meadii* seem to be barely allopatric, and do not contact each other, (though further collecting might change this conclusion perhaps). The *meadii* is common around Douglas west to Glenrock in Converse Co., and then westward barely a few hundred feet into the E end of Natrona Co. about 10 mi. E of Casper, where Ray Stanford and I found them mostly on *Chrysothamnus nauseosus* flowers. I found neither in and around Casper, but about 15 mi WNW of Casper (at some low hills S of hwy 20/26, 12 mi SE Natrona, in Natrona Co., Aug. 25, 1993) I found a population of ordinary *sthenele* (the usual "*masoni*" Cross phenotype in Colo. that looks a lot like *paulus* [W. Edw.]), and at the N end of the county I found more *sthenele* (6 mi. WNW Midwest, Natrona Co., Aug. 18, 1993). I call this phenomenon—the unexplained absence of either at Casper—"Casper the Ghost". As a guess, maybe the slight allopatry in Wyo. is because in Wyoming these bugs possess physiological reproductive isolation but not courtship/mating reproductive isolation, such that any individual that happened to wander into the other bug's population could mate there, but the eggs or larvae or pupae would die due to genetic incompatibility or whatever. This system of "genetic annihilation" would not be provable without a lot of time and expense, but it seems possible, and could prevent them from overlapping in range.

The situation seems clear in Montana, where Steve Kohler finds that *C. sthenele* and *C. meadii* are obviously separate species, with no hybridization and with differences in flight and habitat and flower visitation. In C Montana, Kohler (2003 Lepid. News vol 45 Supplement S1 p. 21, and pers. comm.) found *C. sthenele* fully sympatric with *C. meadii* at Little Battle Creek (21 mi. NW Stanford, Chouteau Co., Aug. 19, 2002), where the *sthenele* were fresh and common, the *meadii* few and worn, with no intermediates. In that area Kohler believes they are separate species, because *sthenele* emerges later (mid Aug.), *meadii* L July-E Aug., while *sthenele* occurs more in the upper portions of the draws in the badlands and is wary and seldom visits flowers, and *meadii* is usually in the lower end of draws and is not so wary and likes flowers. That seems reasonable to me (Scott), because I have found *sthenele* adults often wary and hard to catch and have found it not too often on flowers, and *sthenele* males are most reliably found patrolling gulch bottoms to find females, while Wyo.-Colo.

meadii seem to fly more slowly (though they can be hard to catch too esp. when scared) and often visit flowers esp. *Chrysothamnus nauseosus* and other yellow composites, and males seem less restricted to gulch bottoms.

How should the checklists deal with this situation? A Utah or Ariz. book would list them as one species, but a North American checklist should call them two bookkeeping “species”—parts of a stenchospecies.

***Asterocampa celtis*, ssp. assignment in Colorado, by J. Scott**

The ssp. of *A. celtis* (Bdv. & LeC.) occupying Colorado has never been settled. Ssp. *celtis* has the two fw eyespots completely white in the upper eyespot (in cell M₃) and solid black in the lower (in cell CuA₁), and has a darker ups than other ssp. Ssp. *antonia* (W. Edw.) in Mexico and Texas and Oklahoma and SE Colorado (Baca & Fremont Cos.) has the upper eyespot a black ring around white center, the lower eyespot black with white central spot. Tarrant Co. Texas seems to have intermediate *celtis*X*antonia*. Ssp. *montis* (W. Edw.) in Arizona and also near Denver (Jefferson Co.) Colo., has the upper eyespot a black ring around white center, the lower eyespot solid black. The disjunct “*montis*” in Jefferson Co. could be a relict, or an independent development of that eyespot pattern due to *celtis* X *antonia* interbreeding. Jeff. Co. pop. is darker than true *montis* from Ariz. which is tawny (and W Tex. *antonia* are tawnier than C Tex. also), so is not true *montis*.

***Euphydryas bernadetta* species status, by Steve J. Kohler & Norbert G. Kondla**

Euphydryas bernadetta was described as a full species by Leussler (1920). It was subsequently lumped with *E. anicia* by Gunder (1929) on the basis of genitalic study and “from superficial appearance”. However, the taxon *bernadetta* does not look at all like *E. anicia anicia*. Kohler has discovered populations of *bernadetta* in valley edges and foothills of western Montana, which fly in May, surrounded by *anicia* populations which fly in June, further up in the mountains. These western Montana *bernadetta* populations are widely separated from eastern Montana *bernadetta*. Kohler has also found worn *bernadetta* flying with fresh *anicia* in several western Montana localities where ranges of the two species overlap, including locations in Glacier, Lake, Sanders and Beaverhead Counties. Bauer (1975) noted, with respect to *bernadetta* and allied taxa, that “there is a fairly good possibility that this group is a separate, but closely related species instead of a subspecies of *anicia*”. Schmidt et al. (2003) briefly reviewed the situation in the Cypress Hills of Alberta, where *E. bernadetta* and *E. anicia* ssp fly in strict sympatry. They noted that “Available information certainly supports recognition of *Euphydryas bernadetta* as a species distinct from *anicia*”. Layberry et al. (1998) noted that the Cypress Hills population is “slightly atypical for subspecies *anicia*”. Subsequently Kondla has examined the Cypress Hills specimens in the Canadian National Collection and determined that they are a non-intergrading artificial assembly of *E. bernadetta* and *E. anicia* ssp. Thanks to recent field work in the Cypress Hills of Alberta by B. Beck, J. Beck and B. Parsons, Kondla has been able to examine more than 100 specimens each of *bernadetta* and *anicia*, many in strict sympatry, and has seen no evidence of visual intergradation. *E. bernadetta* also has a unique biology, with early larvae feeding on the herb *Besseyia wyomingensis* and later switching to the shrub *Symphoricarpos* (in Neb., S. Spomer J. Lepid. Soc. 29:55-57, J. Kansas Ent. Soc. 58:566; and Richard Hardesty wrote J. Scott that he found *bernadetta* on *B. wyomingensis* W of Laramie Wyo.). Finally, CO1 gene data from sympatric specimens of the Cypress Hills shows sequence difference. So, the *E. bernadetta* range overlaps that of *E. anicia*, they are sympatric in some places, they are very different visually, they have different but overlapping flight periods, and at least some populations differ with respect to larval host plant use. Thus we conclude that they are separate species.

***Euphydryas bernadetta wenatchee* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: Ups rather dark, almost like *colon*, but male valva prong is like that of *E. anicia* and *E. bernadetta veazieae*. Ups darker (with smaller amount of creamy spotting) than *veazieae*, with which it has been lumped by Washington lepidopterists. It seems to be worth naming because a bug this dark will surely cause confusion with *colon* by lepidopterists. Biologically, *wenatchee* is related to *veazieae* according to Jonathan P. Pelham (pers. comm.), who has been studying its habitat and hostplants, and who tells me that he considers it a variety of ssp. *veazieae* rather than a distinct ssp. Actually *veazieae* is rather similar to ssp. *bernadetta*, so could be lumped by some people, though *veazieae* tends to have more extensive whitish on ups (while *wenatchee* looks darker than both). *E. b. wenatchee* is sympatric and partly synchronic with the redder *E. chalcidona paradoxa*, which has a fairly short valva prong. **Range:** Wenatchee Mts. and vicinity, in central Wash. **TL and holotype** male (BMNH) 8 mi. N of Kittitas, ¼ mile above Colockum Pass road, ~1000' altitude, Kittitas Co. Wash., a rocky ridge under powerlines in sage-steppe above Ponderosa Pine belt, April 17, 2004, coll. Robert E. Hardwick. Paratypes: 15 male 1 female same data, in J. Scott coll.

***Euphydryas anicia eurytion* (Mead) clarification, by J. Scott, Michael S. Fisher, & Stephen M. Spomer, Plate V**

E. a. carolae T. Emmel & L. Harris was recently named (Syst. W. N. A. Butt., chapter 32, pp. 433-436) from western South Park in Colorado, without mentioning the name *eurytion*. Unfortunately most Colorado butterflyers think that *carolae* is a synonym of *eurytion*, as it looks the same and comes from South Park, the same place as the TL of *eurytion* listed as probable by Miller/Brown in their 1981 checklist (“probably in South Park, Park Co. Colorado”). So a brief review is warranted. Miller/Brown (in note 521) repeat the brief original description, and state that W. J. Holland

illustrated Mead's types of *eurytion* (1931, in The Butterfly Book, pl. LVII, fig. 15 male, 16 female). The *eurytion* syntypes still exist, and we have seen photos of ups and uns of the male and female syntypes in Carnegie Museum sent by Norbert Kondla from Steve Spomer (plate V). The male syntype has these labels: % Butterfly Book Pl. 57 fig. 15; Collection T. L. Mead; Melitaea 1 7? 4; eurytion %. The female syntype has these labels: & M. eurytion Mead Type. Ex Coll. Mead =nubigena fide Strkr.; Melitaea Eurytion Edw.; Collection T. L. Mead; Butterfly Book Pl. 57 fig. 16. The female has lost its right antenna, but otherwise the male and female syntypes look the same as they were in Holland's figs. 15-16, and they are typical Colo. *eurytion*. We could select the male now as lectotype, though the figs. themselves are quite clear so we don't see any need for a lectotype, as the male and female syntypes are perfectly fine and unambiguous. But the TL is a bit ambiguous, so because Mead's base of operations was Fairplay in South Park (very near the TL of *carolae*), and he made numerous trips on foot near there and by stage (sometimes stopping at Kenosha House, which was ½ mi. N of Kenosha Pass, where the butterfly probably doesn't occur) to what is now Tintown on present day U.S. hwy. 285, according to Brown & Brown (1996), we hereby restrict TL to South Park, probably near Fairplay, Park Co. Colo. Mead's syntypes are the phenotype of butterflies that now occur in South Park and in the Wet Mts. (Scott found the *eurytion* phenotype quite constant NE of Rosita) and around Steamboat Springs and the W edge of North Park in Colorado, as noted below, so *eurytion* is the correct name for South Park butterflies, not *carolae* which is a synonym, as its TL is only about 2 air miles SSW of Fairplay. Scott thinks *eurytion* is a good ssp., although it is somewhat intermediate between *brucei* and *capella*, as its phenotype (large size with yellow spots among the orange) is moderately uniform (*brucei* is very variable, one can find almost every color form in this small bug, whereas *capella* is reddish-orange with few if any yellow spots) and occupies only special middle-altitude areas with extensive grassland parks (it is not present in the Front Range E slope, which has only *capella* in the foothills and lower Montane, then *brucei* in the Alpine Zone). (The book Colorado Butterflies by Brown et al. 1957 confused the picture because on the *eurytion* page it illustrated only *brucei* and *capella* which it considered to be "forms" of *E. eurytion*, and combined the locality records and skimmed on *eurytion* records.) *Eurytion* is said to intergrade to *brucei* in valleys SW of Fairplay, and *brucei* is a separate small dark variable subspecies, no doubt genetically distinct from *eurytion*, that seems to be the Colo. representative of Alberta ssp. *anicia*, so *eurytion* would seem to be a ssp. of *E. anicia*, while *bernadetta* is a separate species. At the TL of *carolae*, based on many specimens in the Fisher & Spomer collections, most adults look like the *eurytion* types (some quite like those types), although a few males and about half the females have more of a widespread creamy or slightly yellowish look due to the enlarged yellow spots (in Spomer's series--Fisher's paler specimens are often more whitish esp. on uph, not yellowish). But 11 miles to the NE at Como many males and a majority of the females in a series of 8m6f coll. by J. Donald Eff (in Univ. Colo. museum) are quite light-yellowish on ups as the yellow spots are enlarged and the central portion of the wings are yellowed a bit too, and those yellower females especially are quite striking. That would be the population worth naming if the whole population was that yellow, but knowing Eff personally as Scott & Fisher did, we think he saved and mounted the yellower ones and didn't mount many of the ordinary ones (collectors' series are often biased in favor of oddities, for instance Scott's series of *E. a. capella* until recently consisted of a few ordinary ones and half a dozen freaky aberrations), but *carolae* isn't much different (the O.D. didn't mention paler individuals, though the b/w photos look a bit paler) so we have to consider *carolae* a syn. of *eurytion*. We are not restricting the *eurytion* TL more precisely until we find a site where yellowish ones are few (Spomer found a yellowish female at Rabbit Ears Pass, so that form must be widespread). *Eurytion* is also found 5 mi. S Fairplay & Red Hill Pass, plus Cover Mtn. in Park Co. near the SE end of South Park. (Note: the *Castilleja* host at TL of *carolae* is *C. integra*, not *C. chromosa* which only occurs in W Colo.)

***Euphydryas anicia wecoeut* Michael S. Fisher, Stephen M. Spomer, & J. Scott, NEW SUBSPECIES, Plate V**
Common Name Canyonland Checkerspot

Definition: Mostly tawny yellowish-orange on ups, with yellowish rows of spots on median areas of ups plus some yellowish on submargin of upf as well. True *alena* from S Utah is actually another ssp. with orange outer part of wings containing almost no yellowish on outer two rows of upf and uph, and the basal 1/3 of uph is quite blackish (fig. 7 of Austin & Murphy 1998, and specimens examined from Brian Head & Alpine Pond Trail in Cedar Breaks). The *alena* holotype (we show photos of it from USNM on plate V) is reddish on ups with lots of yellow spots, and the submarginal-marginal areas of upf lack yellow (except slightly yellow on the submarginal uph row), and looks like the middle of the five males fig. by Austin & Murphy (except that fig. has two yellowish postmedian upf dashes just beyond the discal cell, absent in the holotype), thus the *alena* holotype appears to represent the S Utah butterfly and not *wecoeut*. The *alena* TL is currently only "So. Utah" (*alena* holotype on plate V has two labels, one "Barnes/So. Utah/July 6, 1900, the other *Euphydryas alena*/Holotype male Br. Benj.), so we hereby restrict the *alena* TL to summit Brian Head, Iron Co. Utah, the locality of Austin & Murphy's fig. 7 photos, which is fairly high elevation thus could have produced the type caught in July. *E. a. wecoeut* is somewhat similar to *wheeleri* of Nevada also (TL restricted to mouth of Meadow Can., Toquima Range, Nye Co. Nev. and lectotype male designated in AMNH by G. Austin 1998, Syst. W N.A. Butt., chap. 50 p. 635), which also has more yellowish on outer part of ups like *wecoeut*, but *wheeleri* is mostly redder and darker (fig. 2 of Austin & Murphy 1998). *Wecoeut* was illustrated as "*alena*" in W. Howe's Butt. N. A. and in Brown et al. (1957), and in Butt. Rocky Mtn. States. A series from just outside Mesa Verde NP is like *wecoeut* but a bit darker on ups. **Range:** lower to middle

altitudes: W Colo. incl. Moffat Co. (11 mi. W Sunbeam, 5 mi. S Maybell, Lay Peak, 10 mi. W Craig), SW of Meeker in Rio Blanco Co., Leroux Creek & 3 mi. S Austin in Delta Co., Uncompahgre Plateau & Black Can. Rd. & near Oak Mesa 7500' in Montrose Co., 4 mi. S Red Mesa in La Plata Co., Cliff Palace (a bit darker) in Mesa Verde in Montezuma Co., plus the records from Mesa, Montezuma, Archuleta, & La Plata Cos. in Colorado Butterflies book; E Utah (San Rafael Swells, & Coral Pink Sand Dunes, E of Kanab, all S. Spomer, and perhaps spring at Cedar Breaks). Also, 1m1f in Univ. Colo. museum (=CU) from lowland SW Wyo. (Balsamroot Geology Camp 7200' T14N R113W Uinta Co.) also look most like *wecoet*. Possible in NW New Mex just S of Mesa Verde. The range seems to stop at the S Utah state line, and *hermosa* takes over in Ariz. (near-*hermosa* also occurs on Navajo Mtn. barely into Utah). **TL and holotype** male & allotype female Coal Mine Point, Black Ridge, 7500', Mesa Co. Colo., May 29, 1970 M. Fisher (holotype & allotype Gillette Museum, Colo. State Univ., Fort Collins, Colo.). Many **Paratypes** from Delta & Montezuma Cos. Colo. coll. between 1969 and 1987 in M. Fisher coll. Paratypes in S. Spomer coll.: Colo., Black Ridge, Mesa Co., 3 m 27 May 1989, leg. F. & J. Preston; Black Ridge, 3 m 18 May 1986, leg. SMS; Black Ridge, 1m4f 28 May 1988, leg. SMS; Black Ridge, 4f 31 May 1989, leg. SMS; Utah: Emery Co., San Raphael Swells, 2 mi. S San Raphael River, on Buckhorn Wash Road, 2m4f 24 May 1999, leg. SMS; Kane Co., ca. 13 mi. NW of Kanab on Hwy. 89, ex-larva on *Castilleja* or *Penstemon* 26 May 1999, emgd. 13-17 June 1999, 2m9f (one female is *hermosa* phenotype); Kane Co., 7 mi. W of Kanab, 6 June 1992, 1m1f leg. J. Harry; Washington Co., 0.7 mi. E of Oak Grove CG, Leed's Canyon, 6200', ex-larva, 1f emerged 5 June 1996, leg. Todd L. Stout. Paratypes in J. Scott coll.: 4 mi. S Red Mesa, La Plata Co. Colo. May 9, 1983 (host probably *Castilleja chromosa*), J. Scott; 11 air mi. W Sunbeam, Moffat Co. Colo., May 27, 1978 1 male 1 female J. Scott. **Name:** *wecoet* is from WEstern-COLORADO-Eastern UTah, the major portion of the range (we pronounce it wee-co-ee-yoot, as it is not a latin word). **Hostplants:** Scott found a larva on *Castilleja chromosa* in La Plata Co. (3 mi. SW Pulpit Rock, 5800', Montezuma Co.), which is also a host in E Utah (D. Murphy & P. Ehrlich, *Utahensis* 3:53-54). Scott Ellis observed ovip. on *Penstemon retrorsus* E of Olathe in Montrose Co. (Lepid. News 1973 #2). And Richard Klopshinske reared a larva found on *Penstemon* 3 mi. S Austin in Delta Co. (1984 Lepid. News #2 p. 22)

***Euphydryas chalcedona*, stenchospecies. Reclassification & discussion of the bookkeeping species *E. chalcedona*, *E. anicia*, & *E. bernadetta*, by J. Scott**

This group has been in chaos for a hundred years, as the taxa bounced from one species to another like yoyos. Jean Gunder used the male valva prong to combine lots of "species" into just a few, and then in the late 1900s it seemed like all of them could be combined into one species *chalcedona*, following Scott (1978b), who found that the valva prong seemed to intergrade between them, and P. Brussard et al. (Can. J. Zool. 67:330-335) whose electrophoresis study agreed. But lately it has become apparent that this group is another stenchospecies, as there seems to be reproductive isolation in many places between certain pairs of taxa, although the same taxa seem to intergrade in other places. G. Austin (pers. comm.) once treated *chalcedona* and *ancia* as one species in Nevada, but recently in Austin et al. (J. Lep. Soc. 57:176-92) he changed his mind and split the Nevada bugs into two species *E. chalcedona* and *E. anicia*, mostly because of a change of species concept to the "phylogenetic species" (which is basically a bookkeeping species, a portion of a stenchospecies that must be broken off and treated as a separate species after the areas of interbreeding between them are ignored, which allows each taxon to be treated as a separate species where they do not interbreed); that paper demonstrated that *E. chalcedona wallacensis* and *E. anicia veazieae* are sympatric without interbreeding (though their flight periods only partially overlap) in NW Nev. (suggesting two species), while in NE Nev. *E. chalc. "nevadensis"* interbreeds freely with *E. anicia wheeleri* in the small altitudinal and temporal overlap between them (suggesting one species)(ssp. *nevadensis* looks quite like *wallacensis* in photos in Austin et al. 2003, and thus is probably a syn.).

It's true that three "bookkeeping species" are needed, because there are lots of places where two taxa are almost or actually sympatric and synchronic without interbreeding, as follows: *E. chalc. paradoxa* (with wings often redder than *wallacensis* and variable short-to-fairly-long prongs) is sympatric in Wenatchee Mts. & nearby Wash. with blackish *E. bernadetta wenatchee* (wings blackish like *colon* but with sl. larger white spots but not as whitish as *E. b. veazieae*) which has prongs fairly long like *ancia* but flies a month earlier. *E. c. wallacensis* and *E. b. veazieae* are sympatric & partly synchronic in many places in S Wash.-Ore. & NW Nev. The forest-preferring *wallacensis* & sagebrush-preferring *E. bernadetta macyi* (*macyi* is like *veazieae* but somewhat redder, and one wonders if they are separable as distinct ssp. over their whole ranges from Nev. to Ore. & Wash.) fly nearby in Harney & Malheur Cos. SE Ore. *E. anicia bakeri* (which resembles *macyi* but is not quite as reddish [S. Spomer's resemble *wenatchee-bernadetta*] but belongs to *ancia* because of its biology according to Jonathan Pelham pers. comm.) & *E. b. veazieae* fly together at some sites in NE Ore. (these taxa occur in sagebrush habitats), although Warren (2005) notes that *bakeri* at Connor Crk. RD. near Snake River have apparent intermediates and occasional dark adults resembling *veazieae* that is apparent intergradation. *E. c. wallacensis* & *E. anicia ssp.* (redder than. *howlandi*) fly together at Matterhorn above Ice Lake in the Wallowa Mts. (E. Dornfeld). *E. c. macglashanii* & *E. a. wheeleri* are found near Walker on E side of Sierra Nevada, then *macglashanii* & *wheeleri* coexist with little intermediacy (*wheeleri* flying mostly earlier) along 70 miles of E side of Sierra (incl. just E Sonora Pass & Green Can. & near Mono Lake [thus the intermediate valva on redder intermediate "georgei"] to Tom's Place/Rock Gorge [where *E. c. olancha* replaces *mcglashani* but overlaps the end of the *wheeleri* flight]) (all along the Sierra the colonies are discrete

& scarce & flights differ somewhat, but some overlap occurs). *E. c. wallacensis* & *E. anicia* (redder than *howlandi*) are sympatric (but mostly allochronic) in Boundary Co. (E of hwy 95 NW Moyie Spgs. in Kaniksu NF, the *ancia* red here) & Valley Co. Ida. (Bear Valley region, vic. Deer Crk. crossing of the Boise NF rd. that connects Warm Lake with hwy. 12, the *ancia* red or black here) with a few intermediates (C. Ferris, J. Res. Lep. 26:109-115), and evident *E. b. bernadetta* occurs nearby in Valley Co. (near Warm L. and Stolle Mdw.). *E. c. klotsi* & *E. a. hermosa* exist near each other with a little altitudinal-temporal overlap in NW Ariz.-SW Utah (S. Spomer found *hermosa* 19 mi. W St. George, *klotsi* E slope of Beaver Dam Mts. off hwy. 19)(*klotsi* from C Ariz. resembles *hermosa* but is darker on ups, the yellow spots more prevalent than red ones). (*Hermosa* occurs all over Ariz. with a small version on Navajo Mtn. in SE Utah, and occurs in spring in lower Chuska Mts., where *chuskae* occurs higher up later. And at Cedar Breaks in S Utah, true *alena* flies in summer, while another ssp. evidently *wecoet* flies in May at lower altitude.) *E. c. nevadensis* & *E. a. maria-windi* are sympatric & synchronic in a few places (Steve Spomer found *nevadensis* & *maria* from Dove Creek Pass, 27 mi. SW Snowville, 5800', Box Elder Co. Utah, May 24, 1992). As noted above, worn *E. b. bernadetta* is sympatric with *E. a. anicia* in Cypress Hills Alberta and N Montana, and *bernadetta* flies with *ancia* and *E. c. wallacensis* at several locales in NW Mont.

The single-species theory has supporting data too: interbreeding evidently occurs between *E. c. macglashanii* & *E. c. sierra* in alpine zone at Carson-Ebbets-Sonora Pass area in Sierra Nevada, where wing pattern is similar but valva is nearer *chalcedona* on Carson Pass (however there is a report of *wheeleri* at & just S of Sonora Pass earlier than the alpine bug) & valva is near-*ancia* on Ebbets-Sonora Pass ("*E. a. variicolor*"). Some interbreeding evidently occurs between *E. c. macglashanii* & *E. a. wheeleri* at Rush Creek in E Lassen Co. (Scott 1978b), and in Sweetwater Mts. W Nev., and Scott's (1978b) *macglashanii-wheeleri* series from N Hallelujah Jct. in Lassen Co. (J Res. Lep. 17:150) showed a lot of variation with some red adults and some long prongs. *E. c. macglashanii* is a mostly-whitish mess with some redder ones, and looks like *E. b. veazieae-macyi* in wing pattern, except the valva prong places them in different species (their similar wing pattern surely proves gene flow doesn't it?). And *E. b. macyi* resembles *E. a. bakeri*, which suggests gene flow too. *E. c. paradoxa* evidently introgressed with *E. a. hopfingeri* on E slopes of Coast Range in BC & NW Wash. so its wings are blackish but redder than *wallacensis* and its valva prong is longer than *colon* (however sympatric *E. bernadetta wenatchee* "*veazieae*" in Wenatchee Mts. are less reddish thus do not interbreed with *paradoxa* there now). The longer prongs of *E. c. wallacensis* even in NW Mont. suggests past introgression from *E. anicia*. *E. c. nevadensis* interbreeds randomly with earlier *E. a. wheeleri* in mts. in NE Nev. (though different habitats and slightly different flight times make overlaps and therefore intermediates few). The book Butt. Rocky Mtn. States says that *E. c. nevadensis* varies on uns from like *wallacensis* to *bernadetta* in facies. *E. c. kingstonensis* & *E. c. klotsi* have a longer prong than *chalcedona* (but so does San Diego Co. *hennei* even though no *E. anicia* occur near it now, but maybe were nearby in Pleistocene) as if introgression has occurred (explaining why *E. c. kingstonensis* & *E. a. hermosa* have identical wing phenotype--*kingstonensis* in wing pattern is nearly identical to *hermosa* and is distinguished only by a slightly greater frequency of yellower specimens, yet they have different valva prong so are valid ssp. that have been placed into *E. chalcedona* and *E. anicia*).

There have been a few reports that *E. chalcedona* is sympatric with *E. colon*, in Warner Mts. (S. Mattoon), and doubtfully a site Michael Smith & Kenneth C. Hansen found, namely Ash Creek Siskiyou Co. (just off hwy. 96, 4 mi. W I-5, ~10 mi. N Yreka, M Apr.-E June) where 1 male of a larger "*chalcedona*" were found among many *colon*; actually the many specimens Steve Spomer and I have seen from Ash Creek coll. by Steve Van Campen are mostly fairly small dark *chalcedona*-like but some flying at the same place and time have enlarged cream spots like the paler *macglashanii* (and there are intermediates that are dark but just have the uph cream median band wider); the variants look a lot like *macglashanii* from Carson Range Nev. fig. by Austin & Murphy (1998). (S. Spomer notes that *macglashanii* is fairly widespread in N Cal.-S Ore., occurring in the Warner Mts., and *macglashanii/colon* intergrade at Bly Mtn. in Klamath Co., while *colon* and not *chalcedona* flies in Josephine & Jackson Cos.) And most reports say that *chalcedona* & *colon* intergrade: Dornfeld's Butt. Ore. says *chalcedona* intergrades into *colon* in S parts of Jackson, Josephine, & Curry Cos. Ore. A. Shapiro found that in Trinity Alps Calif. (Trinity Center N to Coffee Crk. Road, the road goes west curving south, to Public Forest Camp) adults look like a mixture of *chalcedona-colon-sierra* (females oranger than males). And D. Bauer (in Howe's Butt. N.A.) seemed to say that the larval differences are intermediate where they come near.

Considering all of this information, practical necessity forces us to accept the existence of *E. chalcedona*, *E. anicia*, and *E. bernadetta* (includes *veazieae* and *macyi* and *wenatchee*) as "bookkeeping species" at least, while the whole mess is more than a single "biological species", and could be called a "superspecies", or as I increasingly sarcastically prefer, "stenchospecies".

Actually, many of these problems of sympatry without much interbreeding can be solved by just removing *E. bernadetta* from *E. chalcedona-colon-ancia*, as was done in the names above already, except for the reports of *E. c. wallacensis* sympatric with *E. a.* (redder than *howlandi*) in Ida.-NE Ore.-Mont., and reports of *E. c. mcglashanii/olancha* sympatric with *E. a. wheeleri* in E Calif. (but they intergrade there in Lassen/Lyon Cos.), etc.

Since *E. bernadetta* is now considered a separate species, I have looked a bit into whether they intergrade in S Wyo.-Colo. This mostly involves the study of ssp. *eurytion*, which is mottled orange with yellow spots, and ssp. *bernadetta*, which is mostly white-spotted on a black background, with two rows of white spots near upf margin. I rounded up records from my collection, the collections of Univ. of Colo. and Colo. State Univ., and the Season Summaries of Lepid. Soc. Ssp.

eurytion is found on Rabbit Ears Pass (where 1m resembles *capella*, and 1f is blacker), 1-5 mi. W Steamboat Springs, and 4 mi. NW of Toponas in Routt Co. Nearby on W side of North Park W of Grizzly Crk. Cgd. in Jackson Co. I found a pair of *eurytion*. *Eurytion* is common 5 mi. E Eagle in Eagle Co., in No Name Creek in Glenwood Can. Garfield Co., and 1m is known from Hideaway Park in Grand Co. *Eurytion* flies in South Park as noted above, and at 10,500' up the Horseshoe Mtn. road M. Fisher found *eurytion* in a meadow (a mile or so west at timberline flies the darker smaller ssp. *brucei*). *Eurytion* is widespread around the Wet Mtn. Valley in Custer Co. (at Buttermilk Crk. 8800' in Sangre de Cristo Mts., at Pocahontas Hill, 4 mi. 2 Jct. 96 & 165, and 2.5 mi. NE Rosita, all on W side Wet Mts.). Maybe the records of "*alena*" from Gunnison Co. in the Colorado Butterflies book are really *eurytion* (that book mixed up *brucei*, *eurytion*, & *capella*, and didn't even figure *eurytion*). A male *eurytion* is from Phantom Can. "NF", Poudre River, in Larimer Co. In the Laramie Mts., *eurytion* was found by Paul Opler & Gene R. Defoliart in Palmer Can. 14.5 mi. W of Wheatland Platte Co. Wyo., 10 mi. W Tie Siding & Woods Landing in Albany Co. Wyo., and on top of a ridge along Laramie River Road in Larimer Co. Colo. In the Laramie Mts. between Cheyenne and Laramie (Happy Jack Road to Pole Mtn=The Summit/Veedauwoo Picnic Area), *eurytion* has been found at Pole Mtn. by Defoliart, and it and *bernadetta* were both found at nearby Veedauwoo on July 10 by Spomer, and *eurytion* was found 21 mi. W. Cheyenne (1m1f, with 3m2f *bernadetta*), 23 mi. W (1f, & 1 *bern.*), 24 mi. W (1f, plus 2m *bern.*), 25 mi. W [Camp Jack]-25.3 mi. W (1m, plus 3m1f *bern.*) by Opler & Ray E. Stanford (Stanford reported an "interesting mixture of phenotypes from *capella* to *bernadetta*", 1992 Lepid. News #2 p. 7). Opler found *bernadetta* and *eurytion* flying closely together there (fresh in L June) as if they were one species. S. Spomer saw some intermediate-looking individuals at Veedauwoo Picnic/Cgd. SE of Laramie in Albany Co. (but suspects they might have been extremes of *eurytion*, as they fly in early July, much too late for typical Neb. *bernadetta* which flies in May, though they fly later in Wyo.-Colo.). Richard Hardesty caught lots of *bernadetta* W of Laramie (in Kohler coll.). A. Warren/R. Stanford/M. Fisher caught both taxa and apparent *eurytion*×*bernadetta* intermediates in NW Larimer Co. At US287 rest stop NW Virginia Dale in Larimer Co., 2m1f are like *bernadetta* but a bit redder. A male at Glacier View Meadows Larimer Co. 2300m is like *bernadetta* (blackish with some red). In the Laramie Mts. Defoliart found *bernadetta* at Sybille Can. Albany Co., and Richard L. Hardesty found a *bernadetta* at The Rock in Converse Co. West of there 7 mi. W Encampment in Carbon Co., 1m *bernadetta* and 1m near *eurytion* were found. Farther south in Colo., the population is odd at Glenwood Springs in Garfield Co., where Boris Kondratieff found 3m1f mostly *bernadetta* but with a little more orange & yellow, and 2 mi. S of Glenwood Spgs. R. Stanford and I found 3f apparent *eurytion* (one much yellower all over, one much blacker) & 1f *bernadetta*. *Eurytion* phenotypes also occur in Wind River Mts. Wyo. (Middle Fork Popo Agie R. SW of Lander 1m1f, and Togwotee Pass 6m3f, in CU museum). But bugs from W side of Wind River Mts. and the Gravelly Range of SW Montana (S. Spomer coll.) evidently from high altitude, look most like ssp. *anicia* but are rather variable and many are whiter with bigger whitish spots, and almost as many are redder. The Cypress Hills Alta. "*anicia*" look a little like *eurytion* too, and the population above 11,000' in the Wasatch Mts. Utah reportedly resembles *eurytion* too. At Diamond Peak, Moffat Co., most are *bernadetta*, but some are slightly orangish, and one female looks like *eurytion*. However, Warren (2005) notes that every *E. b. veazieae* population has a few reddish variants, so perhaps we should not be shocked at a few red ones that appear in Colo. *E. bernadetta* populations. Another Moffat Co. pop. vic. Greystone is like *bernadetta*. M. Fisher found *bernadetta* at Game Creek in Eagle Co. along with some very colorful reddish ("*eurytion*" or "*wecoeut*"-like) ones that are evidently variants of *bernadetta* as he notes intermediates between them at most places on the W slope. *Bernadetta* is widespread on sagey hills in Grand Co. (at Hot Sulfur Spgs., 3 mi. SW Hot Sulfur Spgs., & Beaver Creek [where Don Eff found long series always had some red *eurytion*-like ones], near Blacktail Crk., 1 mi. NE Radium, 5 mi. NE Radium Hot Springs, near Parshall, Williams Fork Res., & Green Mtn. Res.). Scott Ellis found a curious population on the Black Mesa Road, 9500', in Gunnison Co. (not "Grand Co." as erred in Scott et al. 1968), in which a black form (no doubt *bernadetta*) and a red one (maybe *eurytion*, or the odd orangish *bernadetta*) fly together and show little phenotypic blending. Ellis (pers. comm.) found a similar situation with black and red forms along Hwy. 82 in Roaring Fork Can. W of Woody Creek, Pitkin Co. (papered specimens in CSU coll.). In Summit Co. *bernadetta* flies at Ute Park Rd. and 2 mi. N Dillon. R. Stanford caught an ordinary female *bernadetta* on Kenosha Pass in Park Co. *Bernadetta* flies around Aspen in Pitkin Co., and a female *eurytion* is known from the Aspen airport too. At Creede in Rio Grande Co., S. Spomer found near-*eurytion* rather than *carmentis*, while SW of Creede M. Fisher found mostly *bernadetta* with some redder ones. Northward, I have a female *bernadetta* from Canyon Creek in the Wind River Mts. Wyo., and a series of small *bernadetta* on the flat upper part of the Bighorn Mts. Wyo., as well as pure *bernadetta* from Neb. In SW Colo. *carmentis* is at Pagosa Springs & Dyke in Archuleta Co., Weminuche Crk. in Hinsdale Co., & 19 mi. N. Dolores (S. Spomer), though many northward (hwy 141 Beaver Mtn. 8400' in Dolores Co., and hwy 141 15 mi. S hwy 145 8200' in San Miguel Co.) look like *eurytion* near *carmentis*. Ssp. *wecoeut* (the new ssp. named above) is reported from lowland W Colo. (Moffat, Rio Blanco, Delta, Mesa, Montrose, Montezuma, La Plata, Archuleta Cos.) as noted above.

In summary regarding the relationship between *eurytion* and *bernadetta*, perhaps they do intergrade some in N Colo.-S Wyo. W of Cheyenne and Fort Collins as some people conclude, but it seems to me that they are separate species in Colo.-Wyo. too (I saw no intermediates among the specimens caught between Cheyenne and Laramie). (Spomer notes that AMNH has two ordinary *bernadetta* and two *eurytion* from "Black Hills", where they may be separate species too if *eurytion* actually occurs in Black Hills and was not mislabeled as seems likely). Evidently *E. b. bernadetta* and *E. a.*

eurytion fly sympatrically, and there seem to be some orange *bernadetta* variants that look like *eurytion*, and these bugs seem to be variable (esp. in *bernadetta*) and that variation overlaps somewhat thus giving a false impression of intergradation. Richard Hardesty lived in S Wyo., and found no evidence that *eurytion* and *bernadetta* intergrade (pers. comm. to N. Kondla), and his specimens caught W of Laramie are good *bernadetta* according to Steve Spomer. In Colo. most sites have just one or the other, and *bernadetta* is widespread in NW Colo. mostly in sagebrush areas, whereas *eurytion* is basically limited to middle-altitude grassland park areas along the mountainous backbone of Colo. & Wyo. For *eurytion* and *bernadetta* to be the same species, seems to require some dominant-recessive type gene producing *bernadetta* and *eurytion* with few intermediates, which is a kind of variation that seems to be unknown in the rest of the genus, where variation is continuous and lots of intermediates occur between the extremes. (If *bernadetta* and *eurytion* are the same species, then it seems that we would have to add *capella* as it seems to intergrade phenotypically to *eurytion*, then *chuskae* would have to be added as it resembles *capella*, then *brucei* probably would have to be added too as it is exceedingly variable and some look like *eurytion* etc., but isn't *brucei* pretty much the same as *ancia*=*howlandi*? This line of reasoning is getting into trouble.) Rearing would help here, and new characters are needed. *Eurytion* larvae mostly eat *Castilleja* in South Park & Wet Mts., though Frank Stermitz found a larva on *Besseyia plantaginea* at Cover Mtn. in Park Co. and found that *eurytion* eats both *Castilleja integra* & *B. plantaginea* at Red Hill Pass in South Park, and at Rabbit Ears Pass John Emmel (pers. comm. to Scott) found eggs on *Penstemon whippleanus*, while *bernadetta* eats *Besseyia wyomingensis* in the Laramie Mts. S Wyo. (Richard Hardesty pers. comm. to Scott) and Neb. (Steve Spomer), though Scott Ellis found an ovip. on *Penstemon strictus* at Aspen (1973 Lepid. News #2) for "*ancia* ssp. (?)" which probably refers to *bernadetta*. (*Besseyia alpina* is a very common host for the alpine Colo. *E. a. brucei*, which also eats *Castilleja occidentalis*.) Anyway, someone should collect older larvae from these plants W of Cheyenne (Spomer notes that mature larvae are easy to find in spring) and keep the larvae separate on each host and photograph them and rear them to see what hatches. I note also that topotype Pine Ridge Neb. *bernadetta* have the unh postmedian red spot-band usually with smaller red spots and surrounded by thicker black line, so the Rocky Mts. *bernadetta* differ a little from those, then *veazieae* have a blacker rim again. Over the whole range, *E. bernadetta* seems to be a separate species everywhere, probably even in that one area of Wyo.-Colo., so is definitely a valid bookkeeping species within the larger stenochospecies of *E. chalcidona/colon/ancia/bernadetta*.

Condensed checklist of *E. chalcidona* ssp.: *paradoxa* (like *wallacensis* but a little redder in center of ups, prong a bit longer), *wallacensis* (like *colon* but sl. redder ups margins, prong even longer)(syn. or weak ssp. *nevadensis*), *colon*, *dwinellei*, *chalcidona*, *hennei*=*"quino"*, *chalcidona* variety (W Sierra foothills, but upf subapical area a bit redder on most? males, larva differs), *sierra*=*trinitina* (weak ssp. *irelandi*, a bit pinker), *corralensis*, *kingstonensis*, *klotzi* (a little blacker on ups than *kingst.*), *macglashanii*, *olancha*, ssp. near-*"variicolor"*. *E. anicia* ssp.: *"variicolor"* (prong rather long, looks like *wheeleri-sierra-macglashanii*), *hermosa*, *wheeleri* (subordinate ssp. *alena*, *wecoeut*), *morandi*, *hopfingeri* (note the redder uns), *ancia*=*howlandi*, *helvia*, *brucei*, *eurytion*, *capella* (=cloudcrofti)(subordinate ssp. *chuskae*, same as *capella* on ups but uns more like *carmentis*), *carmentis*, *magdalena*, *windi*, *maria* (syn. *effi*), *bakeri*. *E. bernadetta* ssp.: *macyi*, *veazieae* (subordinate ssp. *wenatchee*), near-*bernadetta* (Rockies), *bernadetta*.

Condensed checklist of *E. editha* ssp.: *baroni* (much redder uns), *editha*=*bayensis*=*luestherae*=*karinae* (rounded fw)(subordinate ssp. *insularis*, blacker ups)(subordinate ssp. *quino*=*wrighti*=*augusta*, oranger ups)(subordinate ssp. *taylori*, smaller & a bit blacker than *editha*), (=ehrlichii is intermed. *editha*X*nubigena* thus invalid), *rubicunda* (large & red, elongated fw apex)(syn. or weak ssp. *aurilacus*), *nubigena* (small & red alpine)=*bingi*=*tahoensis*=*remingtoni*=*augustina* (reddish, high San Bernardino Mts.)(subordinate ssp. *lawrencei*), *colonia* (black & red & cream bands, fw shape of *rubicunda*), *beani* (small & red), *edithana* (fairly small, mottled with black red cream)=*monoensis*=*fridayi*=*mattooni*=*owyheensis* (subordinate ssp. *lehmani*=*koreti*=*gunnisonensis* [a bit redder, intermed. to *nubigena*])(subordinate ssp. *hutchinsi*=*alebarki*)(subordinate ssp. *montanus*, same as *hutchinsi* but darker alpine).

***Poladryas minuta simador* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: Resembles ssp. *minuta* in the reddish tone of ups (rather than yellowish-orange as in *arachne*) and the fairly wide unh red bands and narrower white bands; differs by having a very thick black line along unh (and uph) margin, and the unh fringe is heavily checkered with black. It is essentially a "super" extreme version of *minuta*. (Because there is a step-gradient of characters from *simador* to C Tex. *minuta* to NE New Mex. near-*minuta*, and at most only two names can be used for such a gradient, NE New Mex. pops. should just be called "near *minuta*".) **TL and holotype** female Iturbide, Nuevo Leon, Mex., Sept. 18 (the collector Ortavio Rodriguez of Monterey Mex. will deposit it in BMNH, pending regulatory clarification.) *P. minuta* was not listed in Carlos C. Hoffmann's Catalogo Sistemático y Zoogeográfico de los Lepidópteros Mexicanos. **Biology** unknown, presumably *Penstemon*. **Range and name:** Sierra MADre ORiental in northeastern Mex.

***Poladryas minuta/arachne* classification, by J. Scott**

This group needs discussion, because a recent checklist split the two into two distinct species, restoring the ancient treatment. Scott (1974) did the only research bearing on this subject. He found an extant colony of ssp. *minuta* in central Texas, where most populations have gone extinct, and reared larvae to adults, took them to a little hill near Denver where

males of ssp. *arachne* perch on hilltops to await females, and released several females in front of males to see if mating would occur. One female escaped, but mating happened quickly in nature with several others, and the copulating pairs were captured and a female laid eggs in the lab and numerous F1 hybrids were reared to adults, then one of those females was taken to the same little hilltop and released in front of a male, and again normal mating was obtained and the copulating pair captured, and the female laid eggs in lab and some backcross adults were reared. Courtship and mating in nature seemed perfectly normal, leading Scott—who believed in the reproductive isolation species concept—to believe that there were no barriers to courtship or development separating *minuta* and *arachne*, thus they should be called one species. That’s simple enough. The F1 generation actually seemed to have a lot of hybrid vigor, and were easy to rear, in contrast to *arachne* which is a little contrary as a lab insect. I took photos and pickled larvae and pupae, and Scott (1992) reported that F1 larvae were a little intermediate, being slightly-whitish-orange (closer to *minuta* in color, which is mostly orange including the subdorsal scoli)(though F1 adults look mostly like *minuta*), and the F1 pupae (more similar in the two ssp.) were intermediate, whereas the backcross larvae and pupae (and adults) were quite similar to *arachne*, whose larvae are mostly white with orange subdorsal scoli. Much later, some colonies of *Poladryas* were found on little limestone mini-mesas on the Great Plains of NE New Mexico by my father Glenn R. Scott while he was studying the local geology. I investigated these populations, and found them widespread on limestone hills and mesas throughout NE New Mex., only they are not like the central Texas TL *minuta*, because the black line on the unh margin (which is a key identification trait that is supposed to be black in *minuta* and white in *arachne*) was weak, varying from strong to absent, which leads one to believe that these pops. are somewhat intermediate between C Tex. *minuta* and *arachne*, especially because the F1 adults of the C Tex. X Colo. cross resemble those *minuta* and don’t show much influence of *arachne*. However the larvae from NE New Mex. are all orange like Texas ones (however the F1 larvae already mentioned were orangish too though light-orange not deep orange). Then I examined *Poladryas minuta simador* from the Sierra Madre Oriental, which differs in the opposite way, as the black unh line is solid black and quite thick, and the whole margin is darker, which seems to be at the far end of a step-gradient from the Sierra Madre Oriental to central Texas to NE New Mex., as the black margin changes from a thick black line to a narrow black line to a weak black line that is sometimes absent, then this margin in *arachne* is white. The width of the red unh bands also forms a step-gradient, as the red bands are wide in Mex., Tex., and New Mex., whereas they are a little narrower in *arachne*, then at the other end of the gradient is ssp. *monache* from Calif., which has the red bands very narrow, so the white bands are the widest of all. Thus, both of the adult identification characters (black margin and red vs. white band width) show step-clines, and the antennae are intermediate in color in *arachne* between *minuta* and *monache* also. These step-gradients seem to indicate that there has been gene flow across the range from the Sierra Madre Oriental through Texas to New Mex. *minuta* to *arachne* to *monache*, and the F1 and backcrosses that I reared seem to show that such gene flow can still occur. But on a trip over the top of the high Raton Mesa I found a little conelike hill 8445’ high that had 3 ordinary male *arachne* perching on it, and this little hill was only 17.2 miles from a prairie knoll where the near-*minuta* was found, though the *arachne* flies 2145 feet higher in altitude than the prairie *minuta*. Other people have found *Poladryas* at lower altitude in the general area N of Capulin, which they called “hybrids” between *minuta* and *arachne* in the Season Summary, and K. Roever found near-*minuta* on the plains just N of Raton Mesa in Colorado (in Las Animas Co. 2 mi SE Branson 6500’, and also in Baca Co. at Carrizo Crk. 22 mi. SSW Pritchett), evidently validating William H. Edwards’ ancient but confused writing that *minuta* occurred in SE Colo. I have not seen those so-called intermediates, but I presume they are like the near-*minuta*, which have a weak marginal black line. But despite all this information, a recent obscure checklist decided that because ordinary *arachne* and near-*minuta* fly just 17.2 miles apart and only 2145’ higher, that the two have to be separate species. There’s really nothing else I can say. If someone’s species concept requires any case in which two bugs range near but don’t meet in time or space or altitude (see *Callophrys* below) to be called separate species, by definition, then these are different species. I suspect, based on my rearing, that the two don’t meet very often there, because they have different habitats (mts. vs. plains), and if they did meet and mate the hybrids wouldn’t be adapted very well to either so the hybrids wouldn’t result in much permanent gene flow anyway, so I still consider that there is a possibility that there are still no real barriers to courtship and mating and juvenile development, and thus they all could well be just a single species. It boils down to what you think is a species; if one pokes and pokes until one finds any little gap in the step-gradient that gives him an excuse to split it into several species, then these are separate species. Their geographic variation suggests that they have been trading genes along the lengthy route. The role of lab hybridization studies seems to be controversial as well. Charles Oliver claimed that he saw some barriers to lab hybridization between *Phyciodes tharos* and *P. cocyta*, but Scott saw none in the same data, and Scott released female *cocyta* in front of male *tharos* in nature and got a number of matings and F1 adult offspring; yet the mtDNA seem to show that *tharos* is a good species and has not imported mtDNA from *cocyta* despite being sympatric with it in many places (but Wahlberg’s recent mtDNA analysis suggests to me that *tharos* did transfer mtDNA into *P. [cocyta] incognitus*). So in *Phyciodes*, two species can remain separate in nature despite being able to hybridize. In general, selection because of habitat and host and flight time differences between sympatric/parapatric taxa evidently make hybrids and backcrosses less viable in general, so “species” can exist without reproductive isolation evidently. This is probably what happens in *Euphilotes*: lots of hostplant races “species” exist, even when reproductive isolation probably does not. Should we now ignore all evidence of lab hybridization, and revert to the postage stamp species concept?

***Chlosyne leanira/fulvia* classification, by J. Scott**

This case is similar to the last, in that there is a step-cline in numerous characters, in which some people (Smith & Brock 1988) have looked for any kind of gap, and have used that gap to split the cline into two species. As discussed by Scott (1986, 1992), the polytypic variation forms step-clines (step-gradients if you prefer that terminology) in numerous traits: Larval ground color is orange in Cal. *leanira* & Nev. *alma*, yellow-orange in W Colo. *alma* & S Utah *pariaensis*, orange-yellow in S and C Colo. *fulvia*, and yellow in Ariz. *fulvia* (and S Ariz. *C. cyneas*), indicating the midpoint of the cline is C Colo. The black larval bands are very wide in Baja Cal., quite wide in S Calif., narrower elsewhere, indicating a midpoint of variation N of Los Angeles. The black subdorsal band of larvae contains many white dots in Calif. *wrighti* and *leanira* but not in other spp., indicating a midpoint of variation about the W edge of the Mojave Desert in Calif. The older larval head is black in *wrighti* and *leanira* and *alma*, reddish-brown in C Colo. *fulvia*, orange in S Utah & Ariz. *fulvia*, indicating a cline midpoint in C Colo. The ups color is black in coastal Ore.-C Calif., a bit redder in Sierra Nevada foothills, even redder in S Calif., blackish to red on the W edge of the Mojave Desert ("*cerrita*"), reddish in Nev.-W Colo. *alma*, intermediate *alma*×*fulvia* in *pariaensis*, and blackish in males and reddish in females in *fulvia* in C Colo.-New Mex.-Ariz., a little blacker in SE Ariz. *coronado* (then blacker again in S Ariz. *C. cyneas*), so this trait has three midpoints (at W edge Mojave Desert, *pariaensis*, & S Ariz.) . The unh has black marks and orange-tipped palpi in *wrighti*, *leanira*, and *alma*, and lacks them in *fulvia* (and *C. cyneas*) which have black-and-white palpi. The lesson of all these characters is that they all show a kind of step-cline (stairstep kind of intergradation) that seems to indicate gene flow from one end to the other, and all of the traits show a different point where the traits change halfway, indicating that there is no chosen point in the transect that is better than any other for surmising that interrupted gene flow proves that that's where one species ends and a second begins. Yet, Smith & Brock ignored all these traits except a few adult traits when they chose S Utah to divide the step-cline into two separate species! The ssp. *pariaensis* in S Utah actually is intermediate between their species, as its hostplant and single generation are like *alma*, ups wing color is intermediate, and postbasal marks and palpi are like *fulvia*. There is no sympatry of two taxa here; what we have is a single polytypic species with a lot of step-clines of different characters, and the midpoint of each occurs at a different place along the route. Their splitting is incorrect. With our present knowledge of the data, there is no species concept (other than the postage stamp concept) that would divide this polytypic bug into two species in an objective way.

***Chlosyne nycteis drusius* X *nycteis* blend zone, by J. Scott**

Colorado populations of *nycteis* have all been considered to be ssp. *drusius* (W. Edwards). However, collected specimens actually show that NW Colorado, west of the continental divide, the bugs seem to be rather intermediate between ssp. *nycteis* (Doub. & Hew.) and ssp. *drusius* in the extent of ochre color on the ups. Thus ssp. *drusius* is limited to the Front Range in Colo., south to the Wet Mts. and Sangre de Cristo Mts., and southward into New Mex. & Ariz.

***Chlosyne sterope (acastus) arkanyon* Michael S. Fisher and J. Scott, new subspecies, Plate VI**

Definition. Distinguished by its darker blacker dorsal and ventral appearance due to a reduction in the size and extent of the paler dorsal spots, giving it a dark grizzled appearance above and expanded black color below. The black spot centered in the wing length in the bottom wing cell (CuA₂) is larger ventrally and forms a significant bar rather than just a spot on most individuals of both sexes. The submarginal orange spots above are often more concave from their base, producing a more distinct chevron shape. The overall effect gives them a more pointed appearance. On typical *acastus* (plate VI), these usually form elongated half-moons having a mostly flat base. (Jonathan Pelham's research [pers. comm., and discussed in Warren 2005] has proved that *acastus* and *sterope* are the same species, and the name *sterope* is older.) **Variation and Discussion.** Like most populations of checkerspots, there is some variation. In comparison to ssp. *acastus* populations in western Colorado and specimens south in the San Luis Valley, the variation is similar. The size and shape of the spots varies, resulting in a slightly darker or lighter appearance. The new subspecies is consistently darker in appearance than ssp. *acastus*, which has larger spots and less black discal wing color, resulting in its overall lighter coloration. The darkest *acastus* are like the lightest *arkanyon*. The cell bar in the center base of the ventral forewing is a dominant character of this subspecies. **Distribution.** Restricted to east of the Continental Divide in the central Arkansas River basin of Colorado, mostly where it heads downstream from the higher valley south of Buena Vista in Chaffee Co. (the northernmost record is 4-5 mi. S of Buena Vista), to Wellsville in Fremont Co., an altitudinal range of 7000 to 7800 ft. It appears to be restricted to this small area of the Arkansas Valley, and is found only in association with the geologic Dry Union Formation, except for the southeasternmost two miles of its range. This Dry Union Formation is an ancient lake deposit that was formed when a lava flow from the NE dammed up the Arkansas River, forming a lake that gradually silted up, depositing an easily-eroded silty type of rock, that seems to provide good habitat for *arkanyon*. The bug was first discovered by J. Scott and Glenn R. Scott (Scott & Scott 1978), while the latter was researching the geology of the area. Adults often occur in gulch bottoms, and fly about May 27-June 25. The nearest locality for ssp. *acastus* is about 50 miles south at Rito Alto Creek, Saguache Co., Colorado. This is in the foothills on the northeast side of the San Luis Valley, southeast of the town of Moffat; *acastus* also occurs just southward at Crestone Cgd. in Saguache Co. These sites are north of the original site

where *acastus* was first recognized as a resident of Colorado (Mosca Pass Trail, Great Sand Dunes Nat'l [then] Monument, by Hugo Rodeck, June 24, 1955; Maurice Howard also found it there). *Acastus* was not included in Colo. by Brown et al.'s Colorado Butterflies (1957), but was later recorded from Colo. by Scott et al. (1968). The **hostplant** is suspected to be *Chrysothamnus nauseosus*, which is common in the pinyon-juniper woodland of the area, or possibly *Machaeranthera canescens*, *M. bigelovii*, or *Aster* spp. (Ssp. *acastus* is known to eat *Aster glaucodes* in W Colo.) **Types**. Holotype male and allotype female Poncha Creek, along Hwy. 285, south of Poncha Springs, 7800 ft., Chaffee Co. Colorado, both deposited in the Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado. Additional paratypes are in the collections of the authors: paratypes from TL in the collection of M. Fisher, collected between 1971 and 2005, and other paratypes in the collection of J. Scott, collected in 1969 and 1970 from other locales in Chaffee and western Fremont Cos. **Name** is from ARKansas cANYON, the range of the butterfly.

***Chlosyne sterope acastus*, DISTINCT SUBSPECIES?, by J. Scott, Plate VI**

I have two males from Bighorn Mts. Wyo. which have an odd-looking uns, with the paler bands much wider (pl. VI, from Bighorn Co.). It is not named because I have seen only these two specimens, and these might just be a randomly biased sample of oddities, but I point it out here so that collectors will look for more and discover whether this distinctive difference is typical.

***Phyciodes*, photos of types, by J. Scott, Plates IV-V**

The color plates contain photos of three types that I designate in another paper (Scott 2006, in Papilio [New Series] #13) (published on the same date as the current #12), specifically photos of the neotype of *P. cocyta selenis* on plate V, the holotype of *P. batesii saskatchewan* Scott on plate V, and the holotype of *P. pulchella sacramento* Scott on plate IV. These three types are figured in color here instead of in Papilio (New Series) #13 because that paper has no color plates.

***Polygonia satyrus transcanada* J. Scott and Norbert G. Kondla, NEW SUBSPECIES, Plate IV**

Many U.S. authors have noted that *P. satyrus* is extremely variable, from dark to pale or even yellowish. Quite true. But despite this variation, there is great geographic variation, and the populations across northern North America are clearly a distinctive valid ssp. **Definition:** This ssp. is much darker brown—even russet brown—on uns and ups than other ssp. The russet inner border of the submarginal uph spots is wider. The eastern Quebec types are so different that the wing pattern is unlike any of the variations that Scott has seen in Colo., Mont. (Crazy Mts.), and Calif., and they are darker than *neomarsyas* dos Passos. The Quebec adults have a russet tinge to the dark brown that is lacking in these other *P. satyrus*. **TL and holotype male** (BMNH) Temiscouata Co. Quebec, coll. Paul Hensel, ex larva, July 29, 1981, paratypes same data July 13, 1981 1 male, July 21, 1981 1 female, July 28, 1981 2 females, July 20, 1981 1 female, July 24, 1981 1 female; paratype same site Aug. 10, 1980, 1 female wild caught coll. Henry Hensel. **Geographic variation and range:** The variation within this species appears to be a gradient or a step-gradient. E Canada specimens are very dark and russet in tone. Kondla finds that BC specimens average quite dark also, though they are somewhat variable there and the lightest ones appear to be as light as some of the average ones southward in the U.S. Kondla notes that Kenelm Philip's Alaska specimens are also quite dark. In SW Alta., adults are lighter, like Montana *satyrus*. Manitoba adults (Bird et al. 1995) are fairly dark also and thus seem near this dark ssp. Sask. butterflies (photos in Hooper 1973 and Layberry et al. 1998) are lighter than the boreal ssp. as well, more similar to the paler U.S. *satyrus*. Thus it appears that this dark ssp. occurs throughout the boreal forest areas from E Canada westward across Canada to Alaska and south well into BC, while the Canadian prairie populations are lighter. dos Passos (1969, Trans. Amer. Ent. Soc. 95:153-159) proposed the name *neomarsyas* (TL Salmon Meadows, N of Brewster, Wash.) for specimens from California to Washington, Idaho and Montana, and all over Canada, thus the entire range in North America other than Colorado (the TL of *satyrus* at Empire, Clear Creek Co.), so he thought Canada specimens were *neomarsyas*. But the figures of *neomarsyas* in the O.D. are much lighter than the Que. types of *transcanada*, as the uns is lighter in both the male holotype and female allotype (the blackish area along wing bases of both *neomarsyas* types appears to be some kind of fungal smut rather than natural coloration), and the male ups is not especially dark either. The submarginal brown band on uph on the female is fairly wide like the narrowest-banded *transcanada*, but the submarginal pale spots are larger on the female than female *transcanada*. Examination of Scott's specimens shows that the *neomarsyas* phenotype is similar to the bugs flying in Montana and Idaho and California, thus those could be called ssp. *neomarsyas*. But the Colorado and Arizona true ssp. *satyrus* are paler, averaging a lighter brown uns and a paler uph, as the submarginal uph pale band is wider in both sexes mostly overrunning the dark band that edges it inwardly, so the uph is rather yellowish on most females. Warren (2005) noted that Pacific Northwest adults average smaller and darker than typical (Colorado) *satyrus*, and wrote "in series, all populations from Oregon are separable from those of *P. s. satyrus* from Colorado, and the name *Polygonia satyrus neomarsyas* is tentatively applied to populations in Oregon". Washington lepidopterists are not impressed by the name *neomarsyas* and consider it to be rather variable and not much different from *satyrus*. Pyle (2002) wrote that there are no valid ssp. because individual variation is so great, but mentioned that the species trends darker near the coast, and paler in the interior (where the *neomarsyas* TL is); but he may not have studied geographic variation carefully. The Benton Co. Ore. male and female uns

figs. by E. Dornfeld (Butt. Ore., 1980) look quite like Colo. specimens, and are greatly different from the Quebec ssp. Thus *neomarsyas* seems to be somewhat intermediate between *satyrus* and *transcanada* but is closer to *satyrus*, so *transcanada* would seem to be a useful name to call attention to these dark northern populations. **Name:** is from the range across Canada, evidently from Nfld. to Alaska.

***Polygonia oreas satellow* J. Scott, NEW SUBSPECIES, Plates IV-V**

Definition: Resembles *P. oreas nigrozephyrus* Scott, but the uph is paler, such that the uph pale submarginal spots are larger, so the uph rather resembles *P. satyrus satyrus* somewhat, and in females the uph postmedian brownish marks are generally entirely missing on the posterior half of the wing (traces are present in most *satyrus*), so the yellower uph is quite reminiscent of *satyrus*. The uns is comparatively-uniform blackish-gray like *nigrozephyrus* & all *P. oreas* (except the blacker *silenus*) and *P. progne*. Scott (1984) named *nigrozephyrus* as a ssp. of *P. progne*, from the eastern slope of the continental divide in Colorado (Gilpin Co.). On the E slope the true ssp. *nigrozephyrus* ups resembles *zephyrus*, because the uph submarginal pale spots are fairly small like those of *zephyrus* (thus the name *nigrozephyrus*, referring to the *zephyrus*-like ups and the blackish-gray *progne/oreas*-like uns). Scott (1988) reared it from both the east and west slopes and compared it to *P. progne*, and on p. 42 he noted the difference between E and W slopes in the ups appearance of adults. *Satellow* seems worth naming because it is distinctively different from E slope *nigrozephyrus*, and the paler uph could cause people to misidentify it as a weird form of *P. satyrus*. **Name** is from the SATyrus-like YELLOWish uph submargin esp. of females. **TL and holotype** male (BMNH) 8 mi. NE Cedaredge, 7500', Delta Co. Colo., rearing lot W, emerged June 24, 1984 (plate IV), paratype female same site, rearing lot A, emerged June 26, 1984 (plate V); about 300 paratypes same site from 4 rearing lots A,B,C,W. Wild-caught paratypes: from TL caught by J. Scott 4m3f May 13-14 & 21-22, 1984, 3m Aug. 28, 1983, caught by Richard L. Klopshinske 1m Sept. 1, 1983; Game Creek, Eagle Co. Colo. 1m Aug 24 1994 & 1m Sept. 3 1996, J. Scott; E side Vail, Eagle Co. Colo., Aug. 22, 1997 1m J. Scott; stream NW Minturn, Eagle Co. Colo., Aug. 22, 1969 1f J. Scott; all in J. Scott coll. Paratypes in M. Fisher coll.: West Creek, Unaweep Can., 6500', Mesa Co. Colo. Aug. 21-22 1998, 1m M. Fisher; Hwy. 62, 4 mi. W Ridgway, Ouray Co. Colo., Aug. 11, 1994, 1f M. Fisher. **Range:** the western slope of Colorado, and probably also Utah. Adults from east of the continental divide in Colorado, including the W side of the Sangre de Cristo Mts., and from the Laramie Range in S Wyo., all seem to be ssp. *nigrozephyrus*. **Species status:** Scott (1984, 1988) hypothesized that *P. oreas* (including *silenus* and *nigrozephyrus*) was a subspecies of *P. progne*, for numerous good reasons: they have the same thick male gnathos, the same blackish-gray uns with little difference between inner and outer parts of the uns, very similar hosts, nearly identical larvae, slow flight of adults, and rarity of adults. Plus, they are basically allopatric, so *oreas* is clearly the western representative of *progne*. However, there still seem to be no known specimens that seem to be intermediates or hybrids between them in Alberta (Norbert Kondla pers. comm.) or Montana (Steve Kohler pers. comm.) or British Columbia (Cris Guppy and Jon Shepard), and Cris Guppy has found that they both occur along the Fraser River at Quesnel in central BC (only one *silenus*, however), so they evidently do overlap a little, yet evidently do not hybridize and there are no known intermediates (rarity has retarded results, there are so few specimens). *P. progne* occurs west to the Pine Ridge of Nebraska, the Black Hills, the Bighorn Mts., and E Montana, and in southern Alberta and northern & central B.C., whereas *P. oreas* occurs in the western mountains, east to the mountains of Colorado, western Wyoming, western Montana, and southern B.C. Their ranges do not meet in Colorado, though I caught one stray virgin female *progne* near Apex Gulch in Jefferson Co. in the foothills of the Rocky Mts. May 26, 1998, that might have come from a transplanted nursery gooseberry bush. (I have never caught a *nigrozephyrus* in Jefferson Co., though one adult has been found in the South Platte Can. at the south end of the county and another northward in Boulder Co.) Likewise, their ranges do not meet in Wyoming as far as known. In Montana, both are known from Chouteau Co. in the N-C part of the state, but their resident status is unknown there, so *progne* might be a stray there also. Both occur in the mts. of extreme SW Alberta, but have not been found at the same locality; it is here that intergrades should be found if they occur, but only small numbers have been collected thus far, and I have not examined them, but nobody has reported intermediates. The wing ups is quite different, being much darker on outer part of uph in *progne*, and shows different trends in *P. oreas* and *P. progne*, as summer adults of the several-generation Calif. *P. oreas oreas* are a little paler on uph submargin while summer *P. progne* develops a wide black border on uph, which Scott (1986) called form *umbrosa* as in the same summer form of *Polygonia interrogationis* (Fabr.) & *P. comma* (Harris) (a weird unexplained convergence), thus the two species seem to show an opposite wing response to long photoperiod. Steve Kohler has found 1m1f *P. progne* from Carter Co. in the SE corner of Montana, and 1m from the badlands SW of Sidney, Richland Co. in NE Mont., which has a little 1 mm nubbin in the hw margin just posterior to the apical point (this nubbin is present on most *P. oreas* ssp., and is mostly absent in *P. progne* which has that part of the hw margin straighter) (the rest of Kohler's ~30 Mont. *progne* lack this nubbin), and Gary Marrone's Butt. North Dakota illustrates a specimen of *progne* from SW S.D. with the nubbin also. Maybe there has been a little introgression from *oreas* into *progne* to produce that nubbin. Anyway, *P. progne* and *P. oreas* have to be considered separate species, as there are no known hybrids, the ups differs greatly, and they seem to have opposite wing response to photoperiod. **Other ssp. of *P. oreas*:** Ssp. *oreas* is a distinct ssp. from C Calif. that has the uns a little lighter and a bit browner. Guppy & Shepard (2001) named ssp. *threatfuli* from SE BC (a few corrections in that book: the p. 254 photo of *threatfuli* male holotype is a female, the ups of *P. oreas*

threatfuli is not darker, the wing margins of *silenus* are not reddish, and the wings of *oreas* are not more scalloped). Scott was surprised to see *threatfuli* named, as he had treated them as a near-*oreas* or *oreas* X *silenus* intermediate. At first glance, based on the uns, *threatfuli* could be a useful name, as it is fairly constant over a large area. However, the uns is a bit paler in S-C Montana and C Ida., closer to *oreas* (which varies from fairly dark to seemingly more mottled paler brown), and looking at a second character, the size of median black spots on rear of upf and front of uph, we see that *silenus* has the largest spots, and they are smaller in SE BC and NW Mont., still smaller in S-C Mont. like they are in *oreas* (a bit larger in Colo. *nigrozephyrus*), and a bit smaller than “near-*silenus*” from Siskiyou Co. Calif., and these facts seem to fit Scott’s original inclination to treat this as a cline or step-gradient from *oreas* to *silenus*, with *threatfuli* being the intermediate though admittedly stable state in SE BC and NW Mont. Further study may show *threatfuli* grading to *silenus* toward the coast; the rarity of specimens makes this difficult to study (all *oreas* and *progne* are rather rare). Some people may want to use the name (such names may be useful in local areas, even if they fail on a larger map), but I treat ssp. names that are intermediate without any distinctive traits of their own as synonyms.

***Polygonia faunus cenveray* J. Scott & N. Kondla, NEW SUBSPECIES, Plate IV**

Definition: Uns gray with large green spots. Colo. *P. faunus hylas* (W. Edw.) has uns nearly always gray, with small green spots, and smaller wingspan. Calif. *rusticus* has brownish uns with large green spots, and is large. Kondla finds that SW AB & SE BC *faunus* are mostly gray on uns, evidently like Mont. specimens of *cenveray*. He suggests that SW coastal BC has ssp. *rusticus*=*fulvescens*, characterized by large green uns spots, the uns gray in postmedian areas, but the basal 60% of uns is somewhat brownish (these and Ore.-Wash. material will have to be compared to true Calif. *rusticus* to see how well the name *rusticus* really applies to them). Females of *cenveray* vary from moderately spotted on uns, tending toward the male pattern, to nearly unspotted gray (form *silvius*). **TL and holotype** male (BMNH, fig. male ups in J. Scott 1986 book) Halfmoon Park, Crazy Mts., Sweet Grass Co. Mont., Aug. 16, 1966, numerous paratypes same locale from Aug. 1966 in Peabody Museum, other paratypes same data, plus from Granite (male uns fig. Scott 1986), Cascade, Missoula, Ravalli Cos. Mont. in J. Scott coll. **Name:** from CENTral rockies vicinity bug with VERde(i)=green in spanish(latin) & grAY uns.

***Lycaena cupreus lapidicola* is a synonym of *cupreus*, by J. Scott**

The interpretation of the name *cupreus* and its TL in Emmel & Pratt (1998, Chapter 52, System. W N.A. Butt.) is wrong. They named *lapidicola* J. Emmel & Pratt as a new ssp. from the Sierra Nevada, replacing what was known as *cupreus* (W. Edw.), because they restricted the TL of *cupreus* to Ore., which they say has a different phenotype from that of Sierra Nevada. They restricted the *cupreus* TL to Crane Creek, 3 mi. S of Lakeview, Lake Co. Ore., because they assumed that William Gabb collected the specimens and he collected in that area, and they stated that “the phenotype of *cuprea* specimens from this area is consistent with the phenotype of the lectotype of *cuprea*”. Emmel & Pratt imply that their new concept of *cupreus* differs from *artemisia*, but their description of *cupreus* seems similar to *artemisia*, and Warren (2005) and George Austin state that *cupreus* from Lake Co. Ore. (which they should have figured) is the same as *artemisia*, which is thus a syn. of *cupreus*. This story sounds coherent thus far, but is actually wrong, because the *cupreus* types are actually identical to *lapidicola* phenotype, NOT the *artemisia* phenotype, so *cupreus*=*lapidicola*, and *artemisia* is a different ssp.

Brown (Trans. Amer. Ent. Soc. 95:174-6) studied the types of William Henry Edwards, and as part of his study he designated a lectotype male of *cupreus* in the Carnegie Museum. The Carnegie contains the male lectotype and two female paratypes. As Brown wrote, “Each carries on its pin a label wrtten by Edwards that reads “*Cupreus* male [or female]/Oreg.” and a printed label “Collection of /W.H.Edwards.” One of the females carries an additional label “Butterfly Book/pl. 64, fig. 40.” Brown figured the *cupreus* lectotype male from “Oreg.” on p. 176 (male ups and uns). One of the two *cupreus* paratype females from “Oreg.” was fig. in color in Holland (1931, Butt. Book, pl LXIV fig. 40, female ups). (Holland figured a male ups just above the female on pl. LXIV fig. 39, which Holland called “type”, but Brown found that it was a pseudotype, labeled “Tuolome [Tuolumne]...Cal/H. Edwards”, so that specimen is irrelevant here, except that it is also a *lapidicola* and shows that Holland thought *cupreus* and *lapidicola* were identical enough for him to label the pseudotype *lapidicola* as the “type” of *cupreus*, while he treated ssp. *snowi* as a separate species.)

Let’s examine the *cupreus* lectotype male and paratype female in detail. The *cupreus* lectotype actually is *lapidicola*, not *artemisia*. (I named *artemisia* myself in Papilio [New Series] #1 and have a series of toptype-paratypes of them, along with a nice long series of toptype *lapidicola* from Tioga Pass caught by Oakley Shields.) Here are the characters by which *lapidicola* and *artemisia* differ: The UPS COLOR is brighter (redder) orange in *lapidicola*, slightly brassier (yellow) orange in *artemisia*. Brown’s fig. of *cupreus* lectotype is b/w, so we can’t see that trait, but the upf does look pale, not darker as are some *artemisia*. The NUMBER AND SIZE OF BLACK UPS SPOTS. The number of ups spots is actually not a good character, because they all have about the same number, though the size of the spots differs on average. The *cupreus* lectotype has about 10-11 upf spots, but three look very weak; the holotype *lapidicola* (Chapter 52 figs. 5-6) actually has 11 upf spots (2 in discal cell, 1 at end of discal cell, 4 in subapical row, 1 in cell M₃, 1 in cell CuA₁, 2 in cell CuA₂). The size of these spots averages a little bigger in *artemisia* than *lapidicola*, and are always smaller near the tornus. Spot size is somewhat variable in both ssp., though I have some *artemisia* with small spots and some with the spots missing

in cell CuA₂. The *cupreus* lectotype has upf spots like those of many *lapidicola*: the spots in the cell are fairly small, and the spots in cells M₃ and CuA₂ are quite small. The uph spots of *cupreus* lectotype are no bigger than those on the holotype *lapidicola*. I have a male *lapidicola* from Fallen Leaf Lake near Lake Tahoe that is absolutely identical to the *cupreus* lectotype in spot size, though the upf border is a little wider than the *cupreus* lectotype. The BORDER WIDTH ON UPS is a better character distinguishing *cupreus* and *artemisia*, because the border is wider in *artemisia*, not so much on upf but on uph, where the border is wider as it goes around the apex (centered on vein M₁). The border on the *cupreus* lectotype is narrow on upf, and very narrow on uph, and actually is narrower on uph than all but one of my *lapidicola*. Another good character is the BLACKISH SUFFUSION NEAR ANAL MARGIN OF UPH: this area has less blackish suffusion in *lapidicola* than in *artemisia*. The *cupreus* lectotype seems to have been attacked by the mold that ate a lot of Edwards' specimens (Edwards sold his collection to Holland, where many specimens molded in Holland's cellar; the unnatural blackish is visible on ups and uns near the body [much blacker than my specimens of both spp.]; confirming evidence that the black is mold is the position of the wings on lectotype: butterflies are mounted with fw unnaturally far forward, but their wings move toward the natural position when subjected to high humidity, so humid mold-inducing air would have to have surrounded the lectotype for some time to cause the wings to move backward into the natural flying position as they are now). The mold obscures this character near the wing bases, but where we can see the tornus of the left uph on the *cupreus* lectotype the amount of blackish suffusion is very little, which is consistent with *lapidicola*. RED SUBMARGINAL LINE ON UNH: This is the best character (the spectacular difference between *lapidicola* and *artemisia* in this line is so large that some people would call it a species-level difference, which is more diagnostic than most of the characters that differentiate species in *Speyeria*). The red line in *lapidicola* consists of a row of about 6 red dashes that form almost a continuous line, plus just beyond it next to margin there are a couple of very tiny black lenses (a very teeny black lens in cell M₃ and a bit larger tiny black lens in cell CuA₁) plus very weak tan dashes in the other cells. In *artemisia* this submarginal line consists of two rows of black dashes: the main row is a line of black dashes that are weak near the tornus where they are edged distally by a little orange (thus the long red line of *cupreus* is limited to just a couple weak orange dashes in *artemisia*) and the black dashes continue anteriorly, but those black dashes anterior to CuA₁ often are triangular; while the second row just inside the margin is 3-4 blackish dashes (weaker at tornus); in other words the nice long red line of *cupreus* is replaced in *artemisia* by TWO lines of black dashes and the red is limited to just a couple weak orangish dashes edging the blackish. A spectacular difference when you see it; the *artemisia* phenotype does not vary far toward *lapidicola*. The *cupreus* lectotype obviously has just the one row of red dashes (we can see that they are not black on Brown's figure because they are much lighter than the regular black unh spots), and the distal line is limited to just a couple tiny weak lenses that you can see with a magnifying glass. Another character is the COLOR OF UNS: it is paler creamy-tan in *lapidicola*, grayer-creamy-tan in *artemisia* with the grayer basal area extending farther toward the tornus. The *cupreus* lectotype seems quite pale like *lapidicola*, beyond that blackish smut or mold near the body. The FEMALE UPS COLOR is reddish in *lapidicola* (almost as red as are males), whereas it is much yellower (creamy-orange) in *artemisia*; this character doesn't apply to the male *cupreus* lectotype, but the female *cupreus* paratype fig. by Holland (1931, labeled "Oreg.") is identical to *lapidicola* in this and all other characters: it is rather bright orange on ups (not creamy-orange as is *artemisia*), the upf border is narrow (wider in *artemisia*), the uph border is very narrow (much wider in *artemisia*), the uph is not dusky (broadly suffused with dusky blackish in *artemisia*); this female is exactly like *lapidicola*, & totally unlike any *artemisia* female I have ever seen. (The male pseudotype from "Tuolome" fig. by Holland is identical to *lapidicola*, and has bright orange ups, small spots [much smaller than average], narrow upf and uph border, and narrow uph blackish anal margin, exactly like *lapidicola*.)

Now the locality. The *cupreus* lectotype and *cupreus* paratypes were labeled "Oreg.", but this must be wrong, because the specimens are *lapidicola* which flies only in the Sierra Nevada. The female *cupreus* paratype is *lapidicola* (Andrew Warren agrees), thus its Oreg. label has to be wrong because *lapidicola* does not occur in Oregon (it only occurs S of Mt. Shasta according to this chapter). If the female's label was wrong, the identical label on the male must be wrong also, and it also looks like *lapidicola*. A lot of the very old specimens in museums were mislabeled, so we need not be surprised that these were too. Brown wrote "While there is no positive evidence to support it, there is a strong likelihood that Dr. Behr received the types of *cupreus* from William Gabb, the geologist. If this is so, then the material came from the mountains in the south central part of Oregon." No positive evidence to support it, Brown wrote--but there is definite evidence against it, specifically the *lapidicola* phenotype does not occur in Oregon. You can label a *Papilio homerus* "Oreg.", but there is 100% certainty that it was mislabeled. A label is wrong if the bug does not occur there. Now where did the *cupreus* types come from? From the Sierra Nevada, because the *lapidicola* phenotype occurs there, and because Behr had a large number of specimens from the high Sierras, far more than he had from Oregon. Looking at Chapter 6 of Syst. W. N. Amer. Butt., we see that Behr lived in California, and named many high-Sierra bugs such as *whitneyi*, *egleis*, *hoffmanni*, *montana*, *nubigena*, *battoides*, *cilla*, *argyrotoxis*, *aehaja*, *daedalus*, etc., and those are just the neotypes in that chapter. If we rely on "likelihood", the probability is high that Behr got it from the Sierras because he named so many more bugs from there (the home of *Colias behrii*), and the certainty is that the *cupreus* types are not from Oregon because they are they are Sierra Nevada phenotype, not the Oregon phenotype. Brown was guessing as to the source of the specimen; Brown liked to make informed guesses at the source of material because he liked to study the history of butterflies more than the biology, and he was not aware that there were differences in the phenotype of *L. cupreus* in Calif. and Oregon. In a chain of four

assumptions and guesses, Brown assumed the “Oreg.” labels were valid because he did not know that butterflies with that phenotype only occur in the Sierra Nevada; then with “no positive evidence”, Brown guessed that Behr received them from Gabb who collected in Ore.; then “If this is so” he surmised that they came from S-C Oreg.; then Emmel & Pratt guessed that they must have come from Lake Co. (a wrong guess because the *cupreus* types have Sierra Nevada phenotype, and Lake Co. [according to George Austin and Andrew Warren, Warren 2005] has *artemisia* phenotype). There is no solid evidence that Gabb collected them, but there is concrete proof he did not: they are Sierran phenotype, thus were collected in the Sierra Nevada and mislabeled “Oreg.”, so Gabb could not have collected them.

The course of action is obvious, since the identity of the lectotype and paratype is so clear: *lapidicola* is identical to *cupreus* thus is a syn. of *cupreus*, and *artemisia* is a different ssp. The chain of guesses leading to the current *cupreus* TL of Lake Co. Ore. was wrong and *cupreus* was actually collected in the Sierra Nevada. The correct TL can’t be farther north because this chapter states that a different phenotype from *lapidicola* occurs north of the Sierras (photos of Crook Co. Ore. specimens in Butt. Cascadia show the unh pattern like *lapidicola* but female unh grayer; photos from Klamath Co. Ore. in Dornfeld’s Butt. Ore. show *lapidicola* unh but female unh is darker), and Lake Co. Ore. has ssp. *artemisia*; thus the *cupreus* types couldn’t have come from those areas. The ICZN Code has no special rules regarding type localities, so we can correct the erroneous TL of *cupreus* to where the phenotype of the *cupreus* types actually occurs, the Sierra Nevada. Therefore, I hereby correct the *cupreus* TL to Tioga Pass, the TL of *lapidicola*. Some minor mistakes in Emmel & Pratt (1998): *lapidicola* does not have two gen. as p. 664 surmises is possible, and *snowi* is brassier colored dorsally.

***Lycaena dorcas michuron* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: orange markings reduced on ups. Uph marginal orange spots typically reduced to just one small spot at tornus. Females seldom have postmedian ups orange though most have small postmedian patches that are lighter-brown than the ground color. Ssp. *dorcas* (W. Kirby) has more orange markings (averaging more orange on uph margin and more fulvous markings on female upf), and ranges at least from Man. to N Alta. and central BC. The TL of *dorcas* is The Pas, Man., and in Man. (Klassen et al. 1989, see pl. 12) “...there are several red-orange submarginal crescents in the hindwings...Females usually have buff or orange-buff patches (occasionally forming complete bands) in the forewings”. The neotype female *dorcas* (fig. 59 in Ferris 1977) is a dark specimen from TL The Pas; my several females from The Pas have several orange lunules on uph and have a little orange or considerable orange on upf. The other figs of ssp. “*dorcas*” in Ferris (1977, figs. 60-61) are the current dark ssp. *michuron* from Mich. There might be a hostplant difference between the two ssp. also, as *Potentilla fruticosa* is a host in the east, but not the west (see below). The local Springfield Maine ssp. *claytoni* (Brower) is just as dark as *michuron* on ups, but differs by having the upf postmedian black dots vestigial in males (the spots appear ghostlike, and smaller); these dots are present in all other ssp. **TL and holotype** female (BMNH)(fig. in my book Scott 1986 on color plate 30) Fenton Road, N of Hwy. 59, Livingston Co. Mich., July 20, 1971. Paratypes: 7 females same site and date; 5 male (one fig. pl. 30) 1 female same site July 12, 1971; 11 males (one male fig. pl. 30) Rose Lake Game Refuge, Clinton Co. Mich., July 12, 1971; all types coll. John E. Hafernik, Jr. These types were studied and compared to *L. helloides* and *L. castro* by Scott (1978a). **Range:** S Michigan at least, the area they call the “Lower Peninsula”, between Lakes Michigan and Huron (hence the **name**). S Ontario populations are near *michuron*; my long series from Howdenvale, Ont. July 30 1981 & Aug. 5, 1969 (coll. Jim T. Troubridge) is dark but has slightly more orange. Perhaps all eastern Canada populations should be called *michuron*, as *claytoni* from Maine is equally dark. Man. populations of *dorcas* may be toward the west end of a possible gradient or step-gradient in increasing amount of orange, as my series from NE of Edmonton Alta. and from near Quesnel in central BC (see below) have even more orange, typically with several orange lunules on uph margin and females very frequently having postmedian orange on ups. One would have to chart the frequency of orange spots in a thousand specimens across Canada to study this fully. At any rate, it has not been fully appreciated in the past that western *L. dorcas* have more orange spots and that ssp. *dorcas* applies more properly to western pops., not to the darker eastern ones, although Bird et al. (1995) made this comparison: “Kondla has compared our boreal specimens with *L. dorcas dorcas* collected from Manitoba (the province of the type locality) and found them to be the same.” Biogeographically, the Saskatchewan River runs from W Alberta (N of the Bow River Valley) through Edmonton and then on to the TL The Pas Man., so this river valley is surely a corridor of gene flow for this bog/fen species.

***Lycaena dorcas*, *L. castro*, & *L. helloides* are separate species, by J. Scott, Norbert G. Kondla, & Crispin S. Guppy**

This group has been controversial. Ferris (1977) argued that *castro* (and *florus*) belongs in *L. dorcas*, because it shares similar boreal habitats and has a dark appearance. Scott (1978) in rebuttal vehemently argued that *florus* belongs in *L. helloides*, because they share the same hostplants and similar details of wing pattern, wing shape, and size. Actually, recent research in BC and Alta. has proved that *florus* is a distinct species, distinct from both *dorcas* and *helloides*. Guppy has found that *L. dorcas dorcas* is common associated with *Potentilla palustris* in numerous wet bogs, fens, and “swamps” in central BC (Scott has several dozen of these from Deacon Creek, W end Black Lake, near Quesnel BC which are correctly identified with the usual real *dorcas* traits of small size and stubby fw etc. and are the phenotype of *dorcas* such as occurs NE of Edmonton Alta. and at the *dorcas* TL in Man., which frequently has orangish upf postmedian patches on females),

and *florus* individuals have been found near Quesnel BC also. Kondla finds that a true *dorcas* (undescribed ssp.) occurs on the south coast of Alaska, and real *dorcas* occurs along the Dempster Hwy. in Yukon just north of *L. castro arcticus* (below we show *castro* is a ssp. of *florus*, and *castro* is the older name, so the species must be called *L. castro arcticus* in C Yukon). Yukon collectors have failed to properly identify their *Lycaena*. And he has a real *dorcas* specimen from just west of the isolated northern BC record of “*heloïdes*” mapped in Guppy & Shepard (2001) which is undoubtedly a *castro arcticus*. Thus the ranges of *L. castro* (from Colo. to BC/Alta. to Yukon) and *L. dorcas* overlap greatly, on a large and small scale. (Note that the map of *dorcas* ssp. on p. 18 of Ferris 1977 is not supported by specimen review by us, we see a different geographic pattern of the phenotypes and named entities.) Kondla is not aware of any intergradation between *dorcas* and *florus*. And in SE BC, Kondla has found localities where *florus* and *L. heloïdes* are sympatric (Record Ridge near Rossland BC), *florus* with a single generation, and *heloïdes* with two generations, and they are still distinguishable phenotypically, although the *heloïdes* there are a little darker than *heloïdes* from Calif.-Colo. And at Beaver Mines Lake in SW Alta., Kondla found a similar situation with *heloïdes* and *florus* sympatric with voltinism and flight period differences correlated with the phenotype differences. Kondla knows of multiple locations of sympatry between *florus* and *heloïdes* in S BC and SW Alta., and considers that *florus* and *heloïdes* are separate species. In Alberta Kondla has not seen *florus* north of the Bow River Valley in the cordillera, where it occupies meadows and forest openings, and all material north of the Bow Valley that he has seen is true *dorcas* from bogs and fens. *Florus* is quite local and uncommon in SW Alta. In the Bears Paw Mts. of Montana (Rocky Boy ski hill), Kondla found a male *heloïdes* collected with *florus*. In Colorado *castro* occurs up on the top of the first group of foothills (7700 feet altitude at Critchell in Jefferson Co.) just six miles from plains *heloïdes* at 5500 feet altitude; ordinary *heloïdes* occurs on the floor of the Wet Mountain Valley in Custer Co. just a couple km from ordinary *castro* in the E side of the Sangre de Cristo Mts.; and extremely orange *heloïdes* (the orangest in Colo.) occurs on the flat dry floor of the San Luis Valley in SE Saguache Co. just a mile or two from ordinary *castro* in the W side of the Sangre de Cristo Mts.; though Scott doesn’t know of any sites of actual sympatry in Colo. Scott hasn’t seen any localities where intergradation is complete between *heloïdes* and *castro* in Colo. either (the multivoltine pops. are all *heloïdes*, the single-gen. populations all *castro*), although the variability of *castro* makes determining intergradation somewhat difficult (a *castro* population even in high mts. has specimens varying continuously from almost no orange to orange like *heloïdes*, so how would one distinguish that from an intergrade population?, since it already looks like an intergrade population). Thus there seems to be considerable conclusive evidence that *L. castro* (ssp. *castro* and *florus* and *arcticus*) belongs to a separate species from both *dorcas* and *heloïdes*. Therefore, we formally raise *castro* to species rank. *Florus* was originally named as a species, and Kondla & Guppy (2002) called it a species based on the opinion of Steve Kohler and surveys of CNC specimens, but did not provide any data. The species status of *castro* necessitates reconsidering the status of all the taxa formerly included in *dorcas* and *heloïdes*.

Readers beware!, most published books have lots of misidentifications. The male “*dorcas*” in Guppy & Shepard 2001 from a bog near Valemont looks like *L. heloïdes* or maybe *florus* to Scott (Guppy states it is definitely not *heloïdes/florus*, and perhaps it is also not *dorcas*, but this rules out all the possibilities, so we’ll have to call it *florus*), and the female is *L. castro arcticus* from Yukon. Pyle (2002) figures all three species: p. 183 the left male and female from Opal Alta. (N of Edmonton) are *L. dorcas dorcas*, upper right and lower right from Kittitas Co. Wash. look like male & female *florus* to Scott. Jonathan Pelham [pers. comm.] tells Scott that there are dark forms throughout Wash. (thus even in *L. heloïdes*), esp. in darker-on-average univoltine pops. where oranger females also occur; the univoltine pops. we presume are *florus*. Ferris (1977) recognized *florus* present in Wash., and Kondla is certain *florus* occurs in Wash., as it is common near his area in BC just a few miles N of Wash. In Bird et al. (1995) the male “*dorcas florus*” looks like *L. heloïdes* to Scott & Kondla. The male and female figs. of “*heloïdes*” in Guppy & Shepard (2001) need more study, as they are from Vancouver Island and look like *florus* to Scott, and Kondla also states that Vanc. I. pops. look like *florus*, so the possibility should be considered that they might be *florus*; however Guppy finds that they have two generations, and Guppy and Kondla have found that S BC *heloïdes* (also having 2 gen.) are somewhat darker than Calif.-Colo. *heloïdes*, so perhaps they could be *heloïdes*, and probably at least the mainland S BC *heloïdes* (and maybe the *heloïdes* from Wash. too) should be given a name as a new darker ssp. of *L. heloïdes*.

***Lycaena castro dospassosi*, NEW COMBINATION, by J. Scott**

Ssp. *dospassosi* never fit into *L. dorcas* properly, because its wing characters and size are not like *dorcas*. It has been included in *dorcas* in the past (Scott 1986 etc.), merely because of taxonomic inertia. Recently (Layberry et al. 1998) treated it as a separate species from *dorcas*, because a *dospassosi* colony at St-Simeon-de-Bonaventure Que. is only 6 km from a colony of *dorcas* at Bonaventure and there is no evidence of intergradation. With the recognition that *castro* is a species separate from *dorcas* and *heloïdes*, we have to reassess *dospassosi*. Actually, its wing traits and size (discussed by Scott 1978, who argued that Colorado mountain *castro* belonged to *L. heloïdes* and not to *L. dorcas*) are unlike *L. dorcas* and are mostly those of *L. castro*. *Dospassosi* is the size of *L. castro* and *L. heloïdes*, not small as is *dorcas*. The fw shape of *dospassosi* is elongate like *L. castro* and *heloïdes*, not rounded like *dorcas*. The amount of orange on male hw margin and female hw margin is like that of *L. castro*, not *heloïdes* or *dorcas*. The amount of orange on female ups is like that of many *dorcas*, but is very similar to *L. castro* and extremely similar to that of *L. castro megaloceras* Ferris. Actually, the

wing size and shape and pattern of *dospassosi* seem to be extremely similar to *megaloceras*. The *dospassosi* coloration is like that of *megaloceras*, both in the extent of orange macules, and half of the *dospassosi* females even have creamier color to the paler postmedian ups areas like *megaloceras*! The only *dospassosi* trait that is closer to *dorcas* is the little bits of ground color on inner edge of the unh postmedian black dots, which are slightly darker. The large black spots of *dospassosi* are like those of many of the *L. castro* near *megaloceras* that occur in NW Wyo. and S-C Mont. (the TL of *megaloceras* is the Bighorn Mts., and that population has paler unh color than NW Wyo.-S-C Mont. populations, but all of them have the postmedian orangish areas on female ups creamier in color so I place the NW Wyo.-S-C Mont. pops. into near *megaloceras*), and if one were to place a bunch of *dospassosi* into a museum series of near-*megaloceras* from that area, I doubt that any Lepidopterist in the Rocky Mountain area would notice. They look very similar to each other in my museum drawers, despite the several thousand kilometers separating them (if distance were a taxonomic character, they would be separate species). The main difference is that on average *dospassosi* has slightly larger postmedian black dots in males esp. on hw, though some have small spots, and on unh the sl. larger spots and sl. darker ground color basad of those spots make the postmedian spot band more conspicuous. Other differences are very small (*dospassosi* a tiny bit smaller in wingspan on average, upf border of many males a bit more invaded by discal color along the veins). Of course, anything is possible in stenochospecies, including the independent evolution of similar-appearing bugs from dissimilar but variable genetic stock, which many people would like to believe actually happened to produce the similarity of *dospassosi* to *megaloceras*. But we have to operate on what we observe, which is the obvious similarity of *megaloceras* and *dospassosi* in every trait. We can't act on what we wish would happen. Stenochospecies drag the researcher by the nose, kicking and screaming, to whatever irrational (to humans) conclusion the bugs suggest. Therefore, I hereby transfer *dospassosi* to *L. castro*. Some people's species concept would elevate any taxon that is several thousand km distant to species rank even if the differences are small, but the similarity of *dospassosi* to *megaloceras* is clear, and proving the similarity is just convergence will require study of additional characters such as immatures or nuclear DNA.

Hostplants of these bugs were once thought to be helpful in assigning species, though mysteries remain in host preference. *L. helloides* eats Polygonaceae (numerous species of *Polygonum* and *Rumex*), though a coastal marsh population at Suisun Bay in California eats *Potentilla egedii* var. *grandis* (now considered a syn. of *P. anserina pacifica*). *L. dorcas* eats *Potentilla fruticosa* (a shrub, that is also named *Pentaphylloides floribunda*) only over the eastern part of its range in Canada and Michigan. However, R. Hooper's Butt. Saskatchewan reports "marsh cinquefoil" (*Potentilla palustris*) as well in Sask., and N. Kondla (Alberta Naturalist 22:14, ~1993) reported only *P. palustris* grows in the fens at Redwater (NE of Edmonton) Alta. so is the assumed hostplant of *dorcas* there, and Kondla (pers. comm.) notes that at some Alta. fens *P. palustris* is the only plausible host because *Pot. fruticosa* is absent, and there is no evidence that *P. fruticosa* is eaten in W Canada. C. Guppy found that near Quesnel BC *L. d. dorcas* is assoc. with *Potentilla palustris* in wet bogs/fens. Additionally, Q. Hess & A. Hanks reported female *dorcas* ovipositing on *Vaccinium oxycoccos* in Ont. (Occas. Pub. Toronto Ent. Assoc. #9-78 p. 28), and David M. Wright (pers. comm.) states he has records of *dorcas* ovip. on *V. oxycoccos* and *Myrica gale* (W. Brodie 1909 Can. Ent. 41:293 merely stated that *Myrica gale* is "suspected" as a hostplant). *L. castro dospassosi* eats *Potentilla egedii* (now presumably also considered a ssp. of *P. anserina*). *L. castro castro* in the Colo. mts. eats *Polygonum* and *Rumex* (Scott 1978). *L. castro* near-*florus* in the high mts. of Utah and Idaho and Wyoming eats *Vaccinium cespitosum*, *V. scoparium*, & *V. membranaceum* (Clyde Gillette records in the Uinta Mts. in Wasatch, Summit, Duchesne Cos. Utah and Fremont Co. Idaho [near Yellowstone], in his Utahensis papers, and pers. comm.). David Parshall (pers. comm.) observed ovipositions of *L. castro arcticus* on *Solidago decumbens* in Yukon, which could have been laid just near another plant a real host. Thus more work is needed on the hosts of *L. castro*, and maybe Colo. *castro* females sometimes oviposit on *Vaccinium* also? Thus the *Potentilla egedii* host of *dospassosi* may not be particularly important information for assisting its taxonomic placement.

The larva and pupa of *dospassosi* is more green, and lacks the brownish mottling of *L. dorcas*, according to Reginald Webster (in Layberry et al. 1998). Thus the larva is more similar to the *L. helloides* I have found. (Evidently other *L. castro* larvae and pupae are unknown.)

Checklist of *Lycaena helloides*/*L. castro*/*L. dorcas*, by J. Scott

This group is another stenochospecies. Ssp. *castro* in Colo.-Wyo. is extremely variable, evidently because it has greatly introgressed with *L. helloides*, resulting in the complete range of variation from very dark orangeless adults to those like *helloides*. Because adult *castro* vary in appearance from *florus*-like to *helloides*-like, and *castro* hostplants are wholly (partly?) Polygonaceae like *helloides*, it might be possible to call *castro* just a ssp. of *L. helloides*, and list the remaining *L. castro* ssp. (*megaloceras*, *florus*, *arcticus*, *dospassosi*) as ssp. of *L. florus*. But because of the similarity of so many/most *castro* to *florus*, and the presence of oranger adults within *megaloceras* and Wash. *florus* and *arcticus*, I place them all in *L. castro* now. On the Beartooth Plateau in Wyo.-Mont., and in high altitude in the Yellowstone area of NW Wyo., N. Kondla found very dark populations with almost no orange, evidently the same as what Clyde Gillette calls the "alpine form" in the high Uinta Mts. Utah, for which he found eggs on *Vaccinium*. Montana-Wyo. specimens seem to have only one orange uph spot usually (on tornus), and the unh orange band is weak, whereas Canada *florus* have a little more orange there. In typical *megaloceras* from the Bighorn Mts., females are "yellow-ochre to almost white" in the paler areas of ups (typically the

postmedian area of upf etc.) rather than orangish, and the unh is “distinctly pale gray-ochre”; populations in C and S Mont. have similar pale female ups but usually a tawnier unh (Little Belt Mts., Crazy Mts., and the Yellowstone caldera Mts. of 4 Mile Crk. in Sweet Grass Co.) though S. Kohler has some from Crazy Mts. that also have paler unh.

L. helloides (Bdv.) 1852, TL restricted to San Francisco city and county, Calif., by J. Emmel, T. Emmel, & S. Mattoon (chap. 2 p. 12 in Syst. W N.A. Butt., T. Emmel ed., 1998).

L. castro castro (Reakirt) 1866, TL “Rocky Mts., Colorado Terr.”, lectotype FMNH designated by Ferris (Bull. Allyn Mus. #45:25, 1977). The lectotype and paralectotypes are illustrated by Ferris (1977, figs. 68-72), of which 69, 71, & 72 look like they are *L. helloides* to Scott, and their localities of merely “Col.” indicates that they may just be plains *helloides*; fig. 70 from “Col.” is the only obvious *L. castro*, and the lectotype fig. 68 from “Col.” “Rocky Mts.” is a little ambiguous also as it might be a *helloides* with fewer hw orange spots, but it is somewhat dark with at most only 2 orange uph lunules, so, because of the variability of *castro*, Scott will not upset stability and will accept the lectotype designation and recognize the name *castro* as belonging to the same species as *florus*. Occurs only in S Rockies, and not in Utah. Has more ups orange than other ssp., though *arcticus* also has much ups orange.

L. castro megaloceras (Ferris) 1977, **NEW COMBINATION**, TL 5-Spring Creek, Big Horn Co. Wyo.

L. castro near *megaloceras*, (NW Wyo., S-C Mont.)(unh normal in color). The name *hulbirti* Field 1936, J. Ent. Zool. (Pomona Coll.) 28:25, TL Broadwater Co. Montana, HT USNM, was named as a female form, but evidently cannot be used for this taxon because it was named as infrasubspecific.

L. castro near-*florus*, dark subalpine ssp. (high-altitude Beartooth Plateau and Yellowstone mts., Wyo., and evidently also the high-altitude Uintah Mts. Utah and Idaho and Wyo. areas where host is *Vaccinium*). This may be a good ssp. near *florus*, m & f have very little orange, though Utah females usually have a little upf postmedian orangish. In Utah it is limited to higher-altitude in 5 Uinta Mts. cos., and *castro* does not occur in Utah as Ferris wrote (Clyde Gillette, pers. comm.).

L. castro florus (W. Edw.) 1884, **NEW COMBINATION**, TL “Red Deer River”; F. Brown (Trans. Amer. Ent. Soc. 95:172-173, 1969) restricted TL to Didsbury, Alta. and designated 1st lectotype from Calgary; however that 1st lectotype had no Edwards’ label so was evidently not a syntype so is invalid; 1st lectotype therefore rejected and 2nd lectotype from Crows Nest Pass designated by Bird & Ferris (Can. Ent. 111:637-9); that 2nd lectotype confirmed by Kondla & Guppy (2002) and TL corrected to Garrett’s (not Garnett’s) Ranch, near Lundbreck, mouth of Crowsnest Pass Alta. (Another syntype that has Edwards’ label and a “Crows Nest Pass” label in CNC is also available for designating as a new [3rd] lectotype were one to be needed, but at any rate the TL seems fixed as Crowsnest Pass.)

L. castro arcticus (Ferris) 1977, **NEW COMBINATION**, TL Mayo Lake Road, Yukon. A good ssp., with 3-5 thin (much thinner than *helloides*) orange lunules on uph, and female upf about 30% orange, tending toward *L. helloides* in this extra orange, thus considered a separate species by Kondla, but definitely belonging to *L. castro* in Scott’s opinion.

L. castro dospassosi McD. 1940, **NEW COMBINATION**, TL Bathurst, New Brunswick

L. dorcas dorcas W. Kirby 1837, TL The Pas, Man. Range Man. to BC

L. dorcas michuron Scott 2006, **NEW SSP.** (current paper), TL Livingston Co., Mich. Range E N.A.

L. dorcas claytoni Brower 1940, TL Springfield, Maine

***Satyrium californica brashor* Norbert G. Kondla and J. Scott, NEW SUBSPECIES, Plate IV**

Definition: The dorsal orange uph spots are much reduced and often more red than orange, venters are often greyish, and uppersides are darker in comparison to named taxa to the south (and adults are larger than some southern populations). The orange uph spots are reduced in number. In BC, one spot is normal in males but some have two more weak ones, and females have two spots and sometimes three; in Chelan Co. Wash. there is only one conspicuous orange spot in all, but some males have a weak one on each side, and most females have 1-2 weak extra spots beside the big one. In contrast, ssp. *californica* (W. Edw.) has a band of smeared orange along the uph margin. The ups is darker brown than ssp. *californica* (which has a tawnier tint of brown), and is darker than ssp. *wapiti*. It was fig. by Guppy & Shepard from S BC (2001, p. 203). **TL and holotype** male Mica Creek, near Osoyoos, British Columbia, collected by D.L. Threatful 29 June 2001 (deposited in the Royal British Columbia Museum, Victoria, BC). Paratypes 3 male 4 female same data, and 50 from other sites in BC, in Kondla collection. N Washington populations are near *brashor*. BC specimens (from the TL, and near Waneta) seem to usually have many red/orange unh spots which are usually more reddish and sometimes orangish, whereas in Chelan Co. Wash. (5m4f Cooper Mtn. Road, 10 mi. W. Chelan, Chelan Co. Wash., July 3, 1961, coll. Robert E. Woodley, in J. Scott coll.), those unh orange/red spots vary from few to many and are usually orangish (seldom reddish).

Name: from BRitish-columbia-wASH.-Orange-Reduced. **Range:** S. BC, south into N Wash. Additional material examined: 50+ *obscurafacies* from Nevada in Kondla collection; the following *californica* in Scott coll. from Colorado (~50), the Sierra Nevada (33), NE Calif. (20), W Nev. (7), NE Nev. (8 “*obscurafacies*”), which are all the size of *brashor*, and North Coast Range Calif. (16) and Tehachapi Mts. (8) which are smaller but otherwise resemble *californica*. Note: *coolinensis* (Watson & W. P. Comstock) TL Coolin Idaho, is not this taxon. Mike Fisher (1998) examined the *coolinensis* type and found it to be *S. acadica* (W. Edwards), which evidently means that the types were mislabeled from Coolin Idaho,

because *acadica* has not been found anywhere at or near that area since (see maps on p. 203 & 358 in Guppy & Shepard 2001). Kondla has examined a photo of that type and agrees that it is *S. acadica*. Kondla notes that *S. californica* occurs in SE BC despite those maps. Various researchers have noted that the nominal species *californica* is in need of taxonomic review to determine if there is indeed only one species, variable in genitalia as well as phenotype and larval food plant (but Scott [1986, 1992] found that *californica* is rather polyphagous on a variety of bushy plants). We note that the TL population of *brashor* lives in *Purshia tridentata* (the presumed hostplant) habitat.

***Satyrrium californica wapiti* Michael S. Fisher, NEW SUBSPECIES,
common name Elk Mountains Hairstreak. Plate VI**

Definition. Distinguished by reduced ups orange, a grayer, less golden brown dorsal ground color, and a lighter gray-brown ventral ground color, compared to *californica* in the Front Range west of Denver and east of the Continental Divide. The dorsal side of the male is devoid of any fulvous spots or patches on the forewing as is also the female. Both sexes have a single, well pronounced orange “Thecla” spot on DHW, accompanied by faint orange scales next to it toward tornus. The VHW orangish spots are reduced in size compared to *californica*, and consist of two primary spots, well developed macules that are more red in color than orange: the largest spot corresponds to the “Thecla” spot on DHW, and the second spot is smaller by about 50%. A third orangish spot is barely noticeable, about the same size as the black, elongated crescents that edge the orangish spot series inwardly, toward the apex, which are larger on the female than the male. The tornal blue patch is small and capped inconspicuously with reddish scales. The red along the inside of the anal margin is also reduced. *Ssp. brashor* from BC/Wash. is evidently independently evolved, and differs a little in its darker ups and often redder unh spots. **Types.** Holotype and allotype: Hwy. 133 near Oliver, 6860 ft., Gunnison Co., Colorado, 16 July 1973, M. S. Fisher, collector. Both types deposited in Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado. Paratype specimens are also in Gillette Mus. (ex. Scott L. Ellis coll.) and in University of Colorado Science Museum, Boulder, Colo. Other paratypes from Delta and Gunnison Cos., Colorado collected between 1964-65 and 1974 reside in the Fisher collection. **Range.** So far, typical *wapiti* is known only from the West Elk Mountains in the North Fork of the Gunnison River drainage (the TL, plus Smith Fork River, Leroux, Hubbard, Muddy and Coal Creeks) and northeast on the E side of the Elk Mountains (Maroon Bells) in the Roaring Fork River valley near Aspen (Pitkin Co.), from 6000 to 8200 ft. altitude. **Name.** Wapiti, (pronounced wop-itee), is the name given by the Algonkian Indians for the North American Elk. It is used for this butterfly because its distribution appears to be restricted to the Elk Mountains of west central Colorado. The type locality is in the western portion of this range, the West Elk Mountains. (The -i at the end of the name is not a latin suffix, so must not be altered or emended in any manner.) **Variation and Discussion.** Dorsally, some females may have an orange spot at the tornus of the FW, and accompanying the primary “Thecla” spot on either side on the HW. There is never a fulvous patch at this location on the wing as there is on eastern Colorado Front Range populations of *californica*. Brown et al. (1957, Colorado Butterflies) and later Scott et al (1968) listed “*Strymon* [*Satyrrium*] *acadica coolinensis* Watson & Comstock” records for what is certainly called *wapiti* here. All these records fall within the distribution area given. A similar situation exists here as noted by Fisher (1998) in his description of northwestern populations of *Satyrrium sylvinus nootka*. *Ssp. wapiti* certainly belongs to *californica* and not *acadica*, a more eastern willow-feeding species, for the same reason pointed out in the discussion of *nootka*: the blue anal patch of the hindwing is capped by reddish, unlike *S. sylvinus*. Generally, populations of *californica* are scattered in western Colorado but seem to be more frequent in the northwest part of the state in oak-scrub habitats (such as the lower west side of Rabbit Ears Pass and the immediate Steamboat Springs area of Routt Co.). In these populations some specimens are closest to the eastern Front Range Colorado and southern Wyoming *californica* ssp. by having more extensive fulvous spots or patches dorsally in both sexes and larger VHW red-orange spots, blue anal patch and anal margin color marking, while some specimens appear intermediate in these characters, having the reduction of the characters toward topotypic *wapiti*; thus NW Colo. populations are somewhat intermediate toward *wapiti*. **Hostplant and Behavior.** A female was observed to oviposit on Serviceberry (*Amelanchier*) by Scott Ellis (Scott et al, 1968). This may not be a major host because Mountain Mahogany (*Cercocarpus*), a confirmed hostplant of *californica* in eastern Colorado, is also widespread in the area occupied by the new subspecies, but is no doubt a frequent host because Scott (1986) found *S. californica* to be polyphagous on a wide variety of shrubs. The butterfly is most attracted for nectar to the flowers of Dogbane (*Apocynum* sp.).

***Satyrrium sylvinus nootka* M. Fisher, types, Plate VI**

The original description of *nootka* (in Papilio [New Series] #11) had only b/w figs. of types, so the holotype and allotype are illustrated in color here, for comparison with *S. californica brashor* and *S. c. wapiti*. Note that the *nootka* types were deposited in CSU collection, not LACM.

***Callophrys sheridanii sacramento* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: like ssp. *sheridanii* (W. Edwards), but unh white stripe narrower (not as narrow as ssp. *newcomeri* Clench), with wider black inner edging, the fringes darker (a little brownish), unf has a little more extensive areas of grayish and that grayish is a little more brownish-gray, wingspan larger. **TL and holotype** male (BMNH) 1 mi. E. Cloudcroft, Otero Co.

New Mex., April 21, 1972; 12 male 4 female paratypes same data. **Range:** higher Sacramento Mts., New Mexico.

Hostplant: No *Eriogonum* inflorescences were seen, so evidently oviposits on leaves of the associated presumed host *E. jamesii* var. *wootenii*.

Gorelick (2005) recently named *C. affinis albipalpus* from the Sacramento Mts., which looks like ssp. *homoperplexa* with the unh band somewhat interbred toward ssp. *apama* (W. Edwards).

Evidently during glacial ice advances, the fauna of the foothills of the Front Range proceeded southward to the Sacramento Mts. in S New Mexico, as many butterflies occur now in both the Front Range and Sacramento Mts. (this *Callophrys* is similar to the Front Range ssp., as is *Phyciodes pulchella sacramento*, and *Euphydryas anicia capella* occurs in both places as *cloudcroftii* Ferris & R. Holland seems the same, *C. affinis albipalpus* is similar to *homoperplexa*, *Poanes hobomok wetona* occurs on the mountain front in S Colo. S to the Capitan Mts., *Piruna pirus* and *Stinga morrisoni* and *Paratrytone snowi* range far north in the E slope of the Front Range, etc.)

Of course the *Callophrys* (*Callophrys*) are stenchospecies, as they have numerous taxonomic problems. Scott (1986) first lumped *apama* into *affinis* because of reported intermediates in S Wyo. & W Neb., and Gorelick (2005) listed intermediates from there and W Neb., but did not analyze these specimens much it would seem (I would have liked a photo of all of them ganged together), and the figured specimen (fig. 5) looks like some *homoperplexa* to me (although the russet area on unh is less than most *homoperplexa*, and the hw fringe is paler than most, traits tending toward *affinis*), and its habitat in gulches is the same mate-locating site as *homoperplexa* (*affinis* males mate-locate on hilltops); we have to trust that these SE Wyo.-W Neb. specimens are intermediate. And one reason people consider *perplexa* a distinct sp. from *affinis* is that they range within about a mile of each other near Satus Pass Wash. (*affinis* 1,100' higher in altitude) without evidence of intergradation, yet the same closeness happens between *affinis* and *apama* in S Utah (they occur very near, *apama* in gulches, *affinis* higher on the sagebrush hills, no apparent intergradation), so that same reasoning would separate *apama* as a distinct species too. Scott (1986) first lumped *lemberti* Tilden and *comstocki* Henne into *C. sheridanii*. But in Nevada Austin (1998) named *C. comstocki interrupta* as a distinct ssp. and separated *lemberti* as a distinct species, yet it is obvious from that paper's illustrations and my series that *interrupta* is just intermediates between *lemberti* X *comstocki* and is thus not a valid distinct taxon at all (as it has no distinctive features of its own that aren't just intermediate). Yet the apparent eastern representative of *comstocki* is *paradoxa* Scott, which will surely prove to occur at low altitude in the arid canyons of W Colorado, very near to ssp. *sheridanii* higher up on the moister mtn. slopes, thus by the above closeness logic *paradoxa* and *sheridanii* will probably have to be considered separate species also (or maybe people will have to conclude that they can't often rely on that closeness logic). Jonathan Pelham (pers. comm.) and Andrew Warren (2005) state that some of the specimens studied by Scott and Justice (1981) were misidentified between *affinis* and *C. sheridanii* because these are rather similar in that area and some studied specimens were worn; the newer identifications were aided by location of mate-location (males perch higher above ground on hilltops in *affinis*, lower to the ground in little hillside depressions in *sheridanii*); details were not supplied for the exact specimens misidentified, but any changes would have to be in the *affinis* rows on Scott & Justice's fig. 1, such as the Blue Mts. sample; anyway, evidently *affinis* and *oregonensis* Gorelick don't intergrade quite like Scott & Justice thought. Recently, Emmel, Emmel, & Mattoon (1998) named *C. "perplexa" pseudodumetorum* and *C. perplexa superperplexa*, which are both mired in controversy. They claim that *pseudodumetorum* larvae are close morphologically to *perplexa*, but Gorelick (1968) found that they were close to *dumetorum*, and Ballmer & Pratt (1988, p. 40) state that the subdorsal ridges on larvae are usually larger in *dumetorum*, *lemberti*, & *comstocki* vs. smaller in *perplexa* (*perplexa* seems to have lower ridges than *affinis* and *apama* and its relatives also, see Gorelick 2005). Also, Warren (2005) places *pseudodumetorum* (and *dumetorum* [Bdv.]) into *C. sheridanii* near *dumetorum*, with Josephine and Polk Co. Ore. populations that also eat *Eriogonum*, and suggests that these populations are intermediate between *newcomeri* and *dumetorum* and are similar to *newcomeri* (*pseudodumetorum* is not similar to *newcomeri* in Scott's specimens or opinion) and will likely prove to belong in *C. sheridanii* with *dumetorum* and *lemberti*; Warren's assignment seems likely to be correct, as real *perplexa* occurs very near to *pseudodumetorum* at the TL and near Del Puerto Can. The name *superperplexa* is also a classic stenchospecies mess, as its unh band is shaped like *apama* and *comstocki*, the uns is grayer more like *comstocki*, and larvae are intermediate between *comstocki* and *perplexa* (thus *perplexa* may not always have small larval ridges after all?), though adult traits are said to intergrade clinally into *perplexa*, and its habitat and host are like *perplexa*; Scott (1986) stated that *superperplexa* intergrades to *comstocki*, but that was based on pers. comm. that is no longer believed (or refers to larva), as Emmel Emmel & Mattoon make no mention of that. Ken Davenport has found adults similar to *superperplexa* also occur on the W side of the S Sierras. At any rate, these *Callophrys* show complex geographic variation, with apparent convergence and introgression mixed with incomplete study, disagreement, and reversals of opinion, thus exhibit the definite stenchospecies aroma. Every lepidopterist who studies them goofs up in some manner, yet they are attracted to them like moths to the flame. I caught two adults that appear to be F1 hybrids between the two species *C. s. sheridanii* and ssp. *C. a. homoperplexa* (from Indian Gulch and Tintytown, Jefferson Co. Colo.)! We need a lot more rearing and biological study to complement existing study of thousands of adult specimens that can often not even be identified. In a checklist, there may be four species, or just two, depending on how one feels about closeness of parapatry (or even seven, with some people's species concept): 1) *C. dumetorum* (an older name than *sheridanii*, so must be used for the total unless the ICZN intervenes as Warren 2005 wishes, which they will probably not do, as the names within

Callophrys have moved around like jumping beans lately)(includes ssp. *sacramento*, *sheridanii*, *neoperplexa*, *newcomeri* [may be a syn. of *neoperplexa*], *lemberti*, *pseudodumetorum*, *dumetorum*, [*lemberti* X *comstocki*]=syn. *interrupta*, *comstocki*, and *paradoxa*); 2) or 2a) *C. perplexa* (includes *oregonensis*), *superperplexa*, 3) or 2b) *affinis* (includes *washingtonia*), 4) or 2c) *C. apama* (includes *homoperplexa*, *albipalpus* Gorelick [a weak ssp.], *apama*, *chapmani* Gorelick).

***Cupido* (=Everes) *comyntas pacnowe* J. Scott and Norbert G. Kondla, NEW SUBSPECIES, Plate IV**

Definition: the unf postmedian dots are blacker and more round than in other ssp., and this spot row is strong anteriorly as well as posteriorly. The unf submarginal light brown spots average a little stronger also. The hw orange spot is rather small also, and is absent on uph on a high percentage of males. It was fig. by Guppy & Shepard (2001, p. 223) from Pend d'Oreille River and Waneta Dam in BC, and fig. by Pyle (2002) from Douglas, Ore. **Range:** W Ore. to S BC. **Name** is from PACific NorthWest. **TL & holotype** male (BMNH) & 6 male 1 female paratypes Adair Village, Benton Co. Ore., May 13, 2001, coll. Andrew D. Warren, 1 male paratype vic. Oak Creek, McDonald Forest, Benton Co. Ore., July 14, 2001, A. Warren. **Discussion.** It has been assumed that *C. comyntas* (Godart) is scarce in the Pacific Northwest and the few populations were just introductions from elsewhere, but the difference in spotting seems to prove that these populations are endemics, not agricultural immigrants. This is not *sissona* (Wright) 1905. Austin (2002) proved that *sissona* (TL Mt. Shasta City, Calif.) belongs to *E. comyntas*, and he tentatively applied the name *sissona* to Calif. pops. However, the characters he used to distinguish Calif. specimens from those from Colo. and E. N.A. do not seem to work, based on my specimens from near Davis, Yolo Co. Calif. and from Colo. and E U.S. California lowland specimens appear similar to eastern U.S. *comyntas*. The fig. of *sissona* in Wright (pl. 30 fig. 400) is not a great photo, but does show that the unf postmedian dark spots are weak near the costa and get stronger halfway to rear margin like *comyntas*, unlike *pacnowe* which has this spot row strong all the way; the unf submarginal spots are weaker (about 2 ½ weak spots) than *pacnowe* which has about 2 ½ to 5 stronger ones (these spots are always strongest toward rear in both ssp.); on hw the left unh has more postmedian dots than right and they are arranged strangely on both wings, unlike either *comyntas* or *pacnowe* (aberrant on right unh and appearing oddly-arranged on left unh because this wing was crumpled-folded when mounted); thus Wright's fig. seems to be *comyntas*, not *pacnowe*.

***Cupido* (=Everes) *amyntula immaculata* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: much whiter than ssp. *amyntula* (Bdv.) on uns, the black dots smaller. The same name *immaculata* was used as an infrasubspecific form in my book (Scott, 1986); here it is raised to ssp. rank. (The ending -a is merely intended to sound good and is not latinized and thus should not be altered or emended to -us or -um or anything else.) It was fig. by Pyle (2002) from Klickitat Co. Wash. **TL & holotype** male (BMNH) Oak Creek, Yakima Co. Wash., June 5, 1998, coll. Robert E. Hardwick. Paratypes: 1 male same data; 3 males 2 mi. N Carson, Baker Co. Ore., June 3, 1961, coll. Robert E. Woodley; 4 males Mt. Townsend Trail, 5700 ft., Jefferson Co. Wash. July 12, 2004 R. Hardwick. **Range:** N Oregon and S Washington. **Discussion.** These butterflies are rather variable as noted by Warren (2005), but based only on uns whiteness and spot size, the extremes of this ssp. like the Baker Co. paratypes are quite spectacular, with the uns white, and a bluish bloom near anal margin of unh, and the variation seems more like a ssp. than an individual form, as the average is whiter. Evidently this ssp. occurs in the middle of the range of ssp. *amyntula*, which occurs to the S and N of it at least. I have specimens from The Pas Man. that are also very white on uns also, which currently have no name.

***Celastrina lucia lumarco* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: These are spring univoltine butterflies from the west slope of Colorado mts., the male ups blue (not violet-blue), unh always or nearly always having the dark wing margin (form *marginata*, plate IV var. 1, male from TL May 14, 1984), and nearly half the specimens have a black blotch in middle of wing (form *lucia*, plate IV holotype) which is very often truly enormous in size, filling most of the unh (plate IV var. 2, male from TL May 22, 1984)(form *lucimargina* has both dark blotch and dark margin), the fw rather stubby in shape, as stubby or stubbier than other *Celastrina*, fringe on hw generally fairly dark and checkered. The unh *lucia*-patch is very often spectacularly huge in size, taking up most of the wing, and is larger than anywhere else I have seen specimens. Its relationship with other *Celastrina* is not entirely clear, except that the color of the ups and most other traits suggests that it is a ssp. of the eastern slope *sidara*; *lumarco* differs from *sidara* by having a high frequency of *lucimargina* and *marginata* phenotypes on unh and fringes more checkered. It does not seem to be related to *nigrescens* because that has a violet ups color (my comparison series of *nigrescens* is from near TL at Riondel near Kootenay Lake BC, L Apr.-E May 1995, coll. Chris Schmidt, and a series from St. Mary, Glacier Co. Mont.). Ssp. *cinerea* from Ariz. has the fw perhaps not quite as stubby (in staring at all my *Celastrina* from N.Amer., I don't really see any with long fw as Warren 2005 describes, all *Celastrina* look rather stubby on fw on average). The hw fringes of *cinerea* are not checkered as often as in *sidara* and *lumarco*, and *echo* fringes have weak or absent checkering. The *lumarco* ups blue is lighter in color, and together with the high frequency of unh dark areas and its boreal Rocky Mts. habitat, these traits seem to link it with *Celastrina lucia* of NW Canada; true *lucia* from Yukon and Edmonton Alta. are small and have silvery-blue ups unlike any other N.A. *Celastrina*, but in E Canada-New Jersey *lucia* "Auctorum" (unnamed ssp.) becomes bluer on ups, so maybe the same thing happens in the Rocky Mts. as *lucia* ranges toward Colorado. It may

take a few decades to determine its proper relationship, but maybe naming it will hurry the process. **Name** from LUCIA-form-MARGINATA-form-in-COLORADO. **TL and holotype** male (BMNH) Surface Creek, 7.6 mi. NNE Cedaredge, Delta Co. Colo., May 22, 1984. Paratypes same site: 4 males 4 females same date, May 23 1984 1 male, May 14 1984 4 males, May 21, 1984 1 male 3 females. Paratype 5.2 mi. NNE Cedaredge May 13, 1984 1 male, all J. Scott coll. Paratype 1 female Junction Crk. Cgd., NW Durango, La Plata Co. Colo., June 9, 1978, coll. J. Scott. Paratypes 6 males 2 mi. SE Yellow Jacket Pass, Archuleta Co. Colo., May 7, 1977 coll. Glenn R. Scott. **Range:** mts. west of the continental divide in Colorado and the San Juan Mts. of NW New Mexico; probably SW Wyo. as well.

***Agriades glandon labrador* B. Chris Schmidt, J. Scott, & Norbert G. Kondla, NEW SUBSPECIES, Plate IV**

Description & Definition: characterized by having large, black ventral AM, M and PM spots, with the band of PM white spots much more pointed proximally (arrow-shaped) than any other North American *Agriades* segregates. Unh ground colour dark tan-brown. Unf submarginal spots sometimes weak but usually strong and black to brownish-black. Upf of male only slightly bluish, with whitish dashes near margin. Upf of male with much more silvery blue, and with whitish circles along margin containing a darker center. Female ups with a little silvery-blue wash, plus on Upf submarginal and postmedian whitish dashes in each cell, and on Uph the whitish circles along margin plus postmedian-submarginal dashes also (these dashes are weak on ups of some females, very strong and white on some). **Types:** HOLOTYPE male Smokey Mtn., Labrador City, Labrador, Canada; 19 July 1993 (collector unknown), allotype female same site 17 July 1993 (both CNC), PARATYPES: 4 males same site 19 July 1993 (3m) and 17 July 1993 (1m), all in C. Schmidt collection; L'Anse au Loup, Labrador, coll. Lionel Paul Grey, 2 July 1983 4 males, 3 July 1983 2 males 1 female; Forteau, Labrador, coll. Jim & L. Troubridge, 7 July 1983, 5 males 1 female; all in J. Scott collection. **Range:** west-central to coastal Labrador, possibly also those populations from Newfoundland and northern Quebec mapped by Layberry et al. (1998). Klots (1951, Peterson Field Guide) figured a male from Battle Harbour, Labrador.

Other subspecies: *suttoni*: Although the Churchill, Manitoba populations show large ventral black spots similar to *labrador* (illustrated by Klassen et al. 1989), they are on average larger overall with a darker ground colour, and may be referable to subspecies *suttoni* (TL: Coral Inlet, Southampton Island, northern Hudson bay, Nunavut). Freeman (1939) stated that *suttoni* (TL Southampton Island, northern Hudson Bay) falls within the normal range of variation of "*aquilo*" (see below), however he then wrote that Leussler's recording of Churchill *Agriades* as *suttoni* was a mistake as Churchill specimens "appear to be identical with typical material from Labrador.", thus implying that *suttoni* differs, evidently by having smaller black pupils on unh. Freeman (1939) listed *labrador* (in part, as *aquilo*) from Bradore Bay, Que. (Strait of Belle Isle), Lake Harbor on Baffin I., Ellesmere I., and Churchill, Man. He noted that a few specimens from SE Hudson Bay (the E coast of James Bay and Charlton Island) resemble *labrador*, except that they are larger, with a darker unh ground color; based on examination of Churchill specimens (NGK) and the larger, darker phenotypes noted by Freeman, these coastal Hudson Bay populations could be treated as *suttoni*, but more work is needed to compare series of Churchill, coastal, and true *suttoni* specimens. At any rate, *labrador* is distinct from these populations and occurs to the east of the central part of *suttoni*'s range. The high arctic populations (eg. Ellesmere Island) are much smaller with a washed-out ventral pattern unlike both *suttoni* and *labrador*; it is currently unclear what, if any, name applies to these populations. ***aquilo*:** Both Freeman (1938) and Klots (1951), treated *labrador* as "*aquilo*", since they assumed the TL of *aquilo* was Labrador. However, Miller & Brown (1981) did not include *aquilo* as a N.A. taxon, because (note 404) they state that *glandon* and *aquilo* are Palearctic taxa. Higgins (in his book Classification of European Butt.) and Higgins & Riley (in A Field Guide to the Butterflies of Britain & Europe) treated *aquilo* as European, with the TL of North Cape (Cape Nord) at the N end of Norway, the most northerly point in Europe. All the pictures of *aquilo* in European butterfly books (Tom Tolman's, Higgins & Riley, etc.) show *aquilo* as looking like *franklinii*, with a dark unh ground, and much ups silvery-blue on males, but with the white PM unh marks more elongate; it looks nothing like Labrador butterflies. There are two apparent *aquilo* syntypes in the USNM, one male and one female (BCS); both have labels reading "Type *aquilo* Bdv. a/c Hofer" (this label written by Foster Hendrickson Benjamin in 1926, explaining that Carl Hoefer's list showed this specimen as a type of Boisduval's *aquilo*, the a/c means "according to"), "ex musaeo Dris. Boisduval", and "Oberthur collection". The male has a label "Lycaena *aquilo* Bdv. type.", the female has a label "Aquila Boisd. Icon. Lapp. Labrador." The male has no locality but the female has a dual locality of Lapland and Labrador. The unh of both male and female are tan-brown like most arctic *Agriades*, and the unh PM black pupils are present but small in the male and a bit larger but moderate in size in the female, nothing like the large pupils in *labrador*. The white rings around the pupils are mostly coalesced with the white crescents that basally cap the submarginal dark crescents, making the white areas very long and mostly continuous, and not pointed basally to the same extent as *labrador*. The small pupils and coalescent white marks appear to be a trait of the arctic European *aquilo*, which can be seen in the illustrations in European books (by Tom Tolman, and Higgins & Riley, who mentions these elongate white areas as a diagnostic trait for *aquilo*). This trait does occur in some American specimens, such as a male from Eskimo Point NWT in Scott's coll., but is presumably more prevalent in Europe. The ups of male and female seems to be consistent with European *aquilo*, as they have conspicuous whitish markings near wing margins (weak whitish spots enclosing darker center along uph margin, elongate weak whitish dashes near upf margin). The unh brownish submarginal spots are fairly strong on both male and female *aquilo* syntypes;

these spots are very strong in *labrador*. Overall, it would seem that because the unh white spots are long as in European *aquilo*, and the only locality on these syntypes (the female) reads "Lapp. Labrador." with Lappland listed first, it would seem that there is justification for Higgins to have declared Cape North as the TL of *aquilo*, thus placing *aquilo* as a European name, not an American name. ***franklinii***: The name *franklinii* (Curtis) (in Ross, 2nd Voyage Search Northwest Passage, lxix, 1935) was applied to arctic butterflies, and the figure shows a male with fairly large black pupils in the unh white spots, but the text states that the pupils vary to absent, so *franklinii* may not be significantly different from *suttoni*. The TL of *franklinii* is unknown, but is presumably in northern continental Nunavut or one of the offshore islands as the butterflies are considered to be dark ventrally with the PM unh black pupils small. The islands north of the mainland (thus excluding the Boothia Pen., see below) were placed in the Franklin District (versus the Mackenzie District in western NT, and the Keewatin District in eastern mainland NU, including Southampton I.). However, NT/NU was only divided into Mackenzie, Keewatin, and Franklin Districts in 1920, and *franklinii* was named in 1835, so these political names evidently don't have any relevance here. According to Kondla, Jonathan Pelham looked into the possible TL of *franklinii* (evidently by looking at expedition logs?) and decided that the TL of *franklinii* may have been the Boothia Peninsula. There is an apparent *franklinii* syntype male, with labels "ex musaeo Ach. Guenee", "Oberthur collection", "Polyommatus 15 franklinii Curt.", "Type franklinii Curt. a/c Hofer [label again written by Foster Hendrickson Benjamin in 1926, as above], and "Lycaena franklinii, Curtis type. Amer. pal" in the USNM (BCS). This *franklinii* male syntype has dark brownish unh, with moderate-small black pupils in the PM white spots. The unf submarginal squiggly marks are weak (pale). Overall, this *franklinii* syntype looks like other arctic American *Agriades* (except for Ellesmere Island), and is unlike *labrador*. ***lacustris***: The name *lacustris* (T. N. Freeman) 1939, applies to central Manitoba populations (TL: Norway House, N shore of Lake Winnipeg, Man.) that have the ups grayish-blue on males lessened, rather weak, with the upf being mostly dark on the outer part of the wing (the name does NOT apply to Great Plains populations). The unh of *lacustris* (photos [by N. G. Kondla] examined of holotype, allotype, and paratypes from TL and Cormorant Lake) has noticeable unh black pupils in the PM white spots, though not as large as Labrador or Churchill ones. Butt. Canada included *lacustris* as a syn. of *megalo*, but the unh PM pupils are a bit larger than in *megalo*, and there is less blue on the male ups than in *megalo*. Preliminary molecular data shows that *lacustris* is more closely related to the unnamed Great Plains segregate than to the Cordilleran segregate (Schmidt et al. in prep.), and it is possible that *lacustris* may apply as a subspecies level name for the Great Plains (as suggested by Guppy & Shepard 2001) and Canadian Shield populations, with nominate *lacustris* as a slightly darker, more well-marked segregate of the Shield region. The taxa *megalo* (McDunnough, Can. Ent. 59:161, 1927)(TL Mt. McLean, Lillooet, BC) and *bryanti* Leussler (Bull. Brooklyn Ent. Soc. 30:58, 1935)(TL Black Mtn., 30 mi. SW Aklavik, NWT) are part of the northwestern cordilleran group, which is distinct from the Arctic, Canadian Shield and Great Plains populations. ***Rustica*** (W. H. Edwards) (Proc. Ent. Soc. Philadelphia 4:203-204, 1865) (TL "Pikes Peak", restricted to vic. Empire, Clear Creek Co. Colo. by F. M. Brown, Trans. Amer. Ent. Soc. 96:404, 1970) is not closely related to either the northern cordilleran or Great Plains populations; the relationships of these taxa will be dealt with in a forthcoming review of the North American *Agriades* (Schmidt et al., in prep.).

***Plebejus shasta platazul* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: Ups blue much more silvery in color, silver-blue rather than violet-blue as in *pitkinensis*. **Name** is from the spanish plata=silver, and azul=blue. **TL & holotype** (BMNH) male Hermit Pass, ~12,000', Sangre de Cristo Mts., Custer Co. Colo., Aug. 1, 1971, paratypes same site July 23, 1970 15 male 4 female, same site Aug. 1, 1971 3 male, all coll. J. Scott; paratype Hermit Pass road July 22, 1968 1 female coll. Glenn R. Scott. **Range:** the middle Sangre de Cristo Mts. in Colorado. In the northern part of the Sangre de Cristo Mts., populations seem to be *platazul* X *pitkinensis*, and silvery males as well as bluish males both occur, at these known sites: Hayden Pass, Saguache Co. Colo. July 22, 1971 (subalpine habitat); Baldy Peak, Custer Co. Colo. July 29, 1970; West Creek Lake, Fremont Co. Colo. Aug. 18, 1970; Silver Lake, Lake Creek, Custer Co. Colo. Aug. 16, 1968, all coll. J. Scott. I have not collected in the southern part of the range (the Culebra Range), so those populations would be interesting to see. *P. shasta* evidently does not occur in the Sangre de Cristo Mts. in New Mex. On the small area of alpine tundra on the Wet Mts. is a population near *pitkinensis* but a little bigger, and a bit darker blue, based on 3 specimens (Greenhorn Peak, 12,000 feet, Huerfano Co. Colo. July 13, 1970, J. Scott). **Habitat:** cushion plant community on tundra at and above timberline. **Hostplants** are the usual cushion-plant legumes (Scott, 1992).

***Plebejus lupini* (*P. spangelatus*?) *cotundra* J. Scott & Michael S. Fisher, NEW SUBSPECIES, Plate IV**

Definition: This alpine tundra ssp. differs from *lutzi* (dos P.) of the lower mts. of Colo. and *texanus* Goodpasture from the southern plains as follows: the male upf lacks their 1.5-mm dark-gray border, the uns is darker grayish-white, and the uph orange band is narrow and reduced to small spots, or (in 30-50% of adults) each spot is so small as to be almost absent. *Cotundra* was discussed and its hosts given by Scott (1992, 1998), who lumped it into "*spangelatus*". It is similar to *spangelatus* Burdick of the Olympic Mts. Wash. (which also lacks the male upf border) in its alpine habitat and small orangish spots and darker uns coloration, but the *cotundra* uns is more whitish (uns is definitely light-tan in *spangelatus*), the hw spots are more reddish-orange (averaging lighter-orange in *spangelatus*), and those orangish spots are taller

(averaging shorter in *spangelatus*, thus its orange band is flatter on uph too). There are lots of theories about *Plebejus lupini* containing more than one species, but the only species conclusively proven thus far are *P. acmon* (Westw. & Hew.), *P. chlorina* (Skinner) (with *monticola* [Clemence]), and *P. lupini* (Bdv.), so we place *cotundra* in *P. lupini* for now. If the latter is split further as some people wish, it will most likely still be in a species that includes *spangelatus*. **Name:** is from its habitat the Colorado dry alpine TUNDRA (the word tundra is an english word and is not latin or latinized, thus its ending should NOT be changed to -us or -um or anything else). **TL and holotype** male Hall Valley, 12,000', Park Co. Colo., July 29, 1968 Michael S. Fisher (deposited in Gillette Museum, Colorado State University, Colo.), paratypes in Fisher collection same data 2 males, same site July 29 1969 1 female, same site Aug. 3, 1975 4 males, all coll. by M. Fisher. Paratypes coll. J. Scott in Scott coll.: McClellan Mtn., 12,800-13,000 feet altitude, a sloping climax tundra habitat, Clear Creek Co. Colo., July 30, 1991 2 male 3 female, July 15, 1980 2 males, July 10, 1992 3 males 2 females, July 16, 1990, 1 male 2 females; Mt. Bross, 13,500 feet, Park Co., Colo., July 31, 1982 3 males 2 females, July 17, 1990 1 male; Mt. Massive, 12,500 ft., Lake Co. Colo., Aug. 1, 1982, 1 male 2 females; Dry Lakes, 11,500 ft., Custer Co. Colo., July 16, 1968 1 male; Baldy Peak, 12,500', Custer Co. Colo., July 29, 1970 2 females; Hermit Pass Road (below the tundra), Custer Co. Colo., July 22, 1968, 2 males; E end of Cottonwood Lake, 9600 ft., Chaffee Co., Colo., June 21, 1969, 1 male (below tundra unlike most of the previous sites, but resembles this ssp.). **Habitat** is climax dry alpine tundra, consisting of cushion plants and grasses and bare soil, generally on E- or S-facing slopes. **Range:** It occurs along the continental divide in the Front Range (McClellan Mtn., Hall Valley) and the Sawatch Range (Mt. Massive, Cottonwood Pass), in the Mosquito Range W of South Park (Mt. Bross, Horseshoe Mtn.), and the Sangre de Cristo Mts. (Dry Lakes, Baldy Peak, Hermit Pass Rd.). It is apparently strangely absent from the San Juan Mts., though it might possibly occur there because it is very local thus is easy to miss, because the hostplant *Eriogonum flavum chloranthum* tends to occur in local colonies. Scott found *E. f. chloranthum* at the McClellan Mtn., Mt. Bross, Mt. Massive, Baldy Peak, and Dry Lakes sites. A study of herbarium specimens of that plant might lead to new colonies. Scott found a few plants in the cirque 1 mile NW of Loveland Pass, Summit Co., but no adults were found (the tundra above E end of Eisenhower Tunnel might have it). **Range of ssp. *spangelatus*.** The TL of *spangelatus* is the high Olympic Mts. in Wash., where its host is *Eriogonum ovalifolium*. It also occurs in Alberta even though Bird et al. (1995) failed to list the taxon: Scott has three males from alpine zone in Alberta (Snow Creek Pass, Aug. 1, 1966 2m; mile 72 Coleman-Kananaskis Hwy., July 15, 1966 1m, all coll. by Scott) that seem to be *spangelatus* based on the uns color and the orangish spot size & shape; the host is unknown in Alta.

***Plebejus saepiolus*, revision of subspecies, by J. Scott**

Recent papers in Syst. of W N.A. Butt. named some ssp. of *P. saepiolus* and reviewed others. While reviewing that volume I found some errors that require correction, esp. in the ssp. occurring in Calif. My series from the Sierra Nevada are abundant enough to correct the distributions of *aehaja* & *rufescens*. So here's my current treatment of *saepiolus* ssp. Kondla & Guppy (2002) note that nearly every author disagrees on the definition and distribution of ssp. of *P. saepiolus*, which implies that the differences are small and not clear-cut, so under those circumstances it is prudent to use as few ssp. names as possible. Ssp. *hilda* (S Calif.; *aureolus* is an extreme thus a syn.) females have very orange ups margins, uns spots are large, males deep blue with wide upf border. Ssp. *aehaja* (Tulare Co. to Mather & Tioga Pass Calif.) also has deep blue males with wide upf border, but females have less (some) ups orange. The remaining ssp. have more silvery-blue males. Ssp. *rufescens* (N Sierra Nevada [incl. Sonora Pass-Tahoe]-N Calif., & Inner Coast Range Calif.) has somewhat-more-silvery-blue males (even more silvery in Inner Coast Range, tending toward *saepiolus*) but have narrow upf border, and females have some ups orange on margin. Warren (2005) states *rufescens* occurs in most of Ore., but he was victimized by those errors in the range of *aehaja* & *rufescens* in Calif., and real Sierra Nevada *rufescens* is still deeper blue than N Calif. *saepiolus*, and my few Ore. specimens are rather silvery blue not at all like real *rufescens*. Ssp. *saepiolus* (coastal Marin-Sonoma-Mendocino Cos.) has silvery-blue males with narrow male upf border, female uph has not much orange on margin and female ups base has some blue. (Only ssp. *saepiolus*, *littoralis*, & *gertschi* have much ups blue on females.) Ssp. *littoralis* (coastal Del Norte Co. to coastal SW Ore., a few are similar inland in Siskiyou Co.) is a var. of *saepiolus* (perhaps a weak ssp.) said to have smaller unh spots with white rings. Ssp. *maculosus* (C-E Nev. in O.D., but I will expand its range to C. Ore.-Wash.-NW Colo.-Mont., because those bugs have fairly large spots too) has silvery male ups with narrow upf border, ordinary-to larger-sized uns spots (larger uns spots than *amica*), and little blue on female ups (resembles *rufescens* but has more-silvery males and females a little less orange). Ssp. *gertschi*=*albomontanus* (S Colo.-S Utah-Ariz.-White Mts. Cal.), resembles *maculosus* but has the female ups mostly blue, & male uns is a little browner-gray (*whitmeri*, from the Front Range E of continental divide up to alpine zone in Colo.-S Wyo., is a syn. because it's an intergrade to *maculosus* with some blue on female ups). Ssp. *amica* (Alaska-S BC-E Canada-E U.S.) has small uns spots. (Kondla & Guppy 2002 illustrate the types of *amica* and *insulanus*, and illustrate many more *insulanus*; after viewing those photos Scott believes that TL *insulanus* is a synonym of *amica*, while an extinct unnamed isolated pop. on Saratoga Beach at N end of Vancouver I. BC had even smaller uns spots and thus could be named as a distinct ssp.). Ssp. *kodiak* in N BC-Alaska is like *amica* but small with grayish uns (it was accepted as valid by Kondla & Guppy, who state that it is smaller with darker-gray uns with more pronounced dark spots, and state that the male uns. fig. as "*amica*" in Guppy & Shepard 2001 is actually *kodiak*); however my 3 specimens look like a syn. of *amica*. The main trouble with the above treatment is

that I have only have 2m of the coastal *saepiolus*, so I have to trust that the females are usually fairly blue (the uns of males is not darker in my 2 as p. 14 claims), and have not seen specimens of the Nev. *maculosus*, so the name applicable to the C Ore.-Wash.-NW Colo.-Mont. pops. is somewhat uncertain; the holotype *maculosus* has ordinary-sized uns black spots (typical?, it would be bad practice to choose an atypical holotype, so I'll assume that specimen is typical) but the other 3 syntypes in photos have large spots (if large is typical then the C Ore.-Wash.-NW Colo.-Mont. bug is unnamed, as the blue is more silvery than *rufescens*, though maybe "near ssp. *saepiolus*" could still be used for them as traditionally thought if *saepiolus* can be applied more broadly than coastal Calif.).

***Plebejus icarioides*, revision of subspecies, by J. Scott**

The Syst. Butt. W N.A. volume named a lot of *icarioides* ssp., so I'll tackle it too. My current synopsis (call it a revision) of *P. icarioides* ssp. is this: Ssp. *pheres*=*parapheres* (Pt. Reyes and SF, unh postmedian spots white with no black center, female uph has central white spot)(*missionensis* from Twin Peaks was intermediate between *pheres*X*pardalis* thus is invalid, San Bruno Mts. pop. is also intermediate but nearer *pardalis*). Ssp. *pardalis*=*atascadero* (E & S of SF) has white rings round unh pm spots almost absent, and unh is gray in male and tan in female. Ssp. *icarioides*=*helios* (most of Cal. incl. Coast Range and lower Sierra & Tehachapis & W Ore.) resembles *saepiolus* because uns is whitish and the black unf spots are round, the black unh postmedian spot pupils are moderate and encircled by weak white rings that mostly vanish in the whitish ground color, and most females have orange on uph margin. Ssp. *evius*=*santana* (S Calif.) is similar but unh black pupils are absent in 50%, unf spots small, and females have a lot of orange on ups margin (convergent with *P. saepiolus hilda*). Ssp. *fenderi* (Willamette Valley) is like *icarioides* with distinct unh pupils, the uns a bit darker, the ups a bit deeper blue, the male uph margin darker. Ssp. *moroensis* (SLO Co.) has small round unf dots, small black dots in unh rings (the unh darker making rings visible), females fairly blue. Ssp. *fulla*=*ardea* (Nevada & high Sierras) has no black dots in unh spots. Ssp. *pembina*=*montis* (C Nev.-Utah-NW Colo.-Wind R. Mts.-W Wyo.-Mont.-Ida.-Ore.-Wash.-E BC.-Sask.) is similar but has a gray dot in unh white patches (it looks mostly intermediate between *fulla* [closer] & *lycea*, but barely avoids my intermediate-is-invalid rule because in *lycea* both the unh spots and unf spots are larger). Ssp. *lycea* (C-N Ariz.-NM-S & C Colo., Bighorn Mts. Wyo., Great Plains, and Steve Kohler finds it in SE Mont.) has large unf spots & small black dots in the unh spots (like "*albihalos*=*austinorum*"), females brown or bluish. Ssp. *panamintina* (Panamint Mts.) has larger unf spots (not small & round) and that in cell CuA₁ averages longer [extends basally], and unh is fairly dark so rings are visible with rather large black pupils, females mostly blue on ups with borders not very orange. Ssp. *albihalos*=*austinorum* (White Mts., Spring Range) is the same but unh black pupils are smaller like ssp. *lycea*. Ssp. *buchholzi* (White Mts. Ariz.) resembles *lycea*, but has wide dark ups border, and females often have an orange uph spot. Ssp. *blackmorei* (Vancouver I.) has silvery-blue males with wide dark ups border, and black spots are small on the whitish unf and absent on unh.

***Plebejus (Lycaeides)* classification in North America, by J. Scott, Plate IV**

The *Lycaeides* (a subgenus of *Plebejus* blues in P. Gorbunov's book The Butt. of Russia, Ekaterinburg 2001) is a mess. The few characters studied of wing pattern and male genitalia and habitat and hostplant vary a lot, often independently, and one can come up with many interpretations of their classification depending on the characters you emphasize. There is evidence on both sides of the battle line about the species or subspecies status of many taxa. In view of this chaotic mess, and the fictional literary history of a prior expert on this group, this writeup is somewhat different from the rest of the paper, and at times journeys away from standard scientific practice into different literary territory, which I hope will not offend the reader. A recent paper using the latest technological fads (Nice & Shapiro 1999) couldn't find any very significant difference between any of the taxa in the *idas/anna/melissa* group in their allozymes or mitochondrial DNA. They stated they do not know of any localities where *melissa* and *idas* interbreed, and don't know of any localities where they are sympatric (and Pyle's Butt. Cascadia also states "we have never found any of them [*anna*, *idas*, *melissa*] together"), suggesting they could be the same species. They concluded that evolution of *idas/melissa* is incomplete. Nice et al. (2002) found that mtDNA haplotypes were scattered with little correlation among the named taxa. A later paper (Nice et al. 2005) added genitalic measurements to the mix but the "clades" their computer ground out were a hodgepodge mess of numerous traditional taxa (one clade included *fridayi*, *anna*, *nabokovi*, *ricei*, and *melissa*, another clade included *samuelis*, *inyoensis*, Warner Mts. pop., *annetta*, *ricei*, and *melissa*!), so they suggested that the traditional names were not natural groupings. Vladimir Nabokov (his main *Lycaeides* study was 1949 Bull. Mus. Comp. Zool. 101:479-541, 9 pl.) found that the gnathos of *idas longinus* and *idas sublivens* is longer and varies from like *idas* to like *melissa*, and I found great variation also in Colo. *sublivens*, also suggesting they could be the same species. And European workers lump ssp. with little orange and ssp. with a lot of orange into the same species *idas*, and it seems that high altitude/latitude ssp. have smaller spots, making it seem that wing pattern is not very important in distinguishing the species in Europe.

But other evidence suggests *melissa* is a distinct species from *P. idas*, and suggests that Nice & Shapiro (1999) were wrong in stating that *idas* and *melissa* are nowhere sympatric. *Anna/ricei* is evidently a distinct species, as Norbert Kondla has found *anna* and *atrappaetextus* sympatric on Grassy Mtn. E of Castlegar BC in late Aug. (however Kondla tells me that Chris Schmidt found that both phenotypes here have *atrappaetextus*-like gnathos, whereas northward in the Selkirk Mts.

adults are both phenotypic and genitalic *anna*, thus there is range overlap, as there are good *atrappaetextus* populations to the SW between the Selkirk *anna* and the Cascade/Coast Mts. *anna*). David Threatful has found both *anna* “*ricei*” and *atrappaetextus* phenotypes together at Shorts Creek Can. in the Okanagan area of S BC (The Taxon. Report, vol. 4 #2). *Anna* “*ricei*” occurs very near *atrappaetextus* in the Ochoco Mts. Ore. I found a female exactly like *melissa* at an *idas*-like colony in the Warner Mts. Calif. And A. Shapiro (J. Res. Lep. 29:149) states that the Ball Mtn. (E slope above 1550m) Siskiyou Co. Cal. “*melissa*” population is like that of the Warner Mts. (although the flight dates he lists show two gen. June 8, 22, July 12, Sept. 1?, 4, suggesting the taxon is perhaps actually *melissa*, though it would seem to be *idas*, as Shapiro found a typical *melissa* female Sept. 1 on S slope Ball Mtn., so we subtract the Sept. 1 record, and maybe the Sept. 4 record was for real *melissa* also, making it really univoltine June 8-July 12) while an *anna/ricei* population occurs at Martin Dairy & Little Shasta Meadow 6-8 km away that is quite distinctive with no sign of phenotypic intergradation; that information would fit the separation of *anna* from *idas* only if his “*melissa*” is really the Warner Mts. type of *idas*, as Shapiro later did assign it (in Nice & Shapiro 1999). N. Kondla has found *melissa* and *atrappaetextus* flying in the Rocky Mtn. trench in SE BC (the Columbia River valley) at low altitude, where *melissa* has 2 gen. and *atrappaetextus* 1 gen., though they have not yet been found at the same spot. He found *melissa* and *atrappaetextus* flying together (with slight temporal overlap) at about 1000m altitude in south-central BC (at Rock Creek/Bridesville Road, and at Conkle Lake Road near Rock Creek), where *melissa* flies at low- to mid-elevation prairie & large grassland openings in two generations May/June & Aug., and *atrappaetextus* flies at mid- to higher-altitude forest & small forest clearings mostly in July (the BC book wrote that *idas* is found above 1000m and *melissa* below, evidently referring to S-C BC); they differ in gnathos length and in wing pattern (though S BC *melissa* have less orange than *melissa* does farther south). According to Chris Schmidt, Ted Pike found *melissa* & *idas* flying together in Calgary, Alberta. The Butt. Manitoba book shows the ranges of *scudderii/nabokovi* and *melissa* overlapping at a number of localities around the south end of Lake Winnipeg & W of Lake Winnipegosis, but *scudderii/nabokovi* is in evergreen forest with one gen., whereas *melissa* is in dry sandy prairie (and open meadows in woods) and roadside ditches with two gen. *Samuelis* & *nabokovi* are also overlapping or adjacent in N Wis. (County maps by Opler show both *melissa* and *nabokovi* in Ottertail Co. Minn. [the latter based on “*scudderii*” in Macy & Shepard’s book], but Robert Dana tells me that *melissa* *melissa* does occur in W and S edges of Ottertail Co., but *nabokovi* is an error from the county because no specimens are available and there is almost no suitable coniferous habitat and no *Vaccinium cespitosum* in Ottertail Co. R. Dana also tells me that the Clearwater Co. Minn. record of *nabokovi* in Opler’s map is also an error, based on a misidentified *P. saepiolus* female. Dana notes that all recent records of *nabokovi* in Minn. are from the northeast in Cook, Lake, and St. Louis Cos. R. Dana also notes that the Crow Wing Co. Minn. record for *nabokovi*, based on Leussler’s 1919 record on road between Pequot & Pelican Lake, and Nabokov’s mention of a specimen coll. by Wolcott from Pequot in MCZ, may not be *nabokovi*, as *Lupinus perennis* grows in the area, so these might represent *samuelis*.) Butt. Alta shows them overlapping in the foothills in S Alta. and nearby aspen parkland (a few of those dots might have been misidentified of course). Butt. Alta also shows both “*idas*” and *melissa* on the Peace River grassland in W-C Alta. (*melissa* coll. at Wembley by Kenneth Bowman)(there has been some disagreement about what flies in the Peace River grassland, as some say only *idas* occurs there, but Chris Schmidt has collected what he is convinced is *melissa* [with slightly reduced orange compared to S Alta. *melissa*] near the Peace River townsite in mid June [worn] and early Aug. [fresh] at the exact same site, and N. Kondla has some from a pine barren not far away with lots of blueberry=*Vaccinium* which are probably *scudderii*, and furthermore Schmidt notes that a July bug flies in slightly more mesic grasslands/parkland in the Peace River area which could be *atrappaetextus*). And Nabokov’s 1949 paper (Bull. Mus. Comp. Zool. 101-479-541) shows evident sympatry on his plate 1 figs. 17-21 & 23, where he overlays the gnathos of *idas* onto that of *melissa* at the same localities, indicating that they fly together at seven localities: 1) *anna* and *fridayi* fly together at Gold Lake Calif. (fig. 17; fig. 136 says this is *fridayi*); 2) *lotis* and *melissa* fly together at Mendocino Calif. (fig. 18, and Nabokov’s fig. 79 shows male uns and fig. 130 female ups of “*melissa*” from Mendocino Co. June 7, 1937)(but this is surely an error, as Stanford’s maps do not show *melissa* in the coast range anywhere near there, and *melissa* isn’t known from the coast range N of San Francisco); *ricei* and *melissa* fly together at 3) Fort Klamath Ore. (fig. 19) and 4) Brewster Wash. (fig. 20) and 5) Semilkameen BC (fig. 21); and 6) *scudderii* and *melissa* fly together at Riding Mts. Man. (fig. 23; Butt. Man. seems to show nearby dots only at Duck Mtn.). However, Nabokov’s last case (#7) of “*ferniensis*” and *melissa* together at Didsbury Alta. (which is N of Calgary, fig. 24) is another error, as Chris Schmidt tells me he collected at Didsbury for a number of years, and found only bivoltine *melissa*, and states that the “*ferniensis*” must have been collected farther west in the foothills, where there is montane habitat. Maybe these bugs are not precisely sympatric at all of these exact sites, they could have been caught a few miles apart and still have been given the same specimen label, but they surely range near each other. In some of these cases such as Mendocino the gnathos may just be variable, as it is in *longinus* (figs. 29-37) in which the gnathos varies from *idas*-like to *melissa*-like. In Ore., Shepard and Dornfeld disagreed on the genitalic identification of most of the specimens, so maybe there is variation there too, although Jonathan Pelham (pers. comm.) suggests that everyone since Dornfeld has misidentified NE Ore. *atrappaetextus* as *melissa*.

Nabokov did a lot of detailed study of these bugs, and he seemed to enjoy describing individuals in detail. He even made up special names for color patterns on the wings (vadum, insulae on ups, pulvis, scintillae, haloes, cretules, semimacules, aurorae, etc.) and he even counted the number of scale rows for some spots, though he did not make much

use of these details and stated that the scaling patterns were variable. He made up words such as “locotype” and “salmonier”, and used odd words such as “praeterminal”. He measured the lengths of parts of the male genitalia, and considered them very important, and he set up a turgid system of measuring the parts of the gnathos (F=forearm, H=humeralus, E=elbow, U=uncus lobe) and even set up a bizarre system of describing variations of its shape (N normal, W weak, C semicircle). All this minute turgid-almost anal-retentive-terminology frankly turned his papers into nearly incomprehensible morasses of detailed descriptions, which evidently tend to impress those people susceptible to pomp, but at the expense of effective communication. He was so focused on minute details that he tended to report measurements of individual specimens, and generally forgot to include summaries or averages, making it difficult to discern the differences between taxa (just try to find in his *ricei* writeup whether it has less or more orange than *anna*). (It’s no wonder that he never worked on lepidoptera again, as this kind of tedious minutiae is tiresome to carry out, especially when he did not process the trivia in a way that would bring pleasurable conclusions that would make continued research a happy undertaking.) Nevertheless, from his conclusion on gnathos on p. 540, we can calculate the ratio of the gnathos (which he called falx) “forearm”=F to its upper arm “humeralus”=H, which ratio F/H is 1.16 in *anna*, 1.22 *ricei*, 1.21 *lotis*, 1.25 *aster*, 1.30 *scudderii*, 1.23 *alaskensis*, 1.30 *ferniensis*, 1.33 *atrappaeatextus*, 1.35 *sublivens*, 1.39 *longinus*, 1.51 *pseudosamuelis*, 1.51 *samuelis*, 1.51 *annetta*, 1.53 *melissa*, 1.56 *inyoensis*. Nabokov basically defined his species genitally, as the forearm is shorter in the species he called *argyrognomon* (which is now called *idas* because of gruesome mixup of European types etc., which was settled in ICZN opinion 269, 1954, which specified the published illustrations of genitalia that characterize *argyrognomon*, *argus*, and *idas*) than in what he called *ismenias* (now called *argyrognomon*) and *melissa*. But some taxa were found to have variable gnathos (*longinus* in figs. 29-37) that vary from *idas*-like to *melissa*-like. It is rather disturbing that the gnathos of his *argyrognomon* “*ismenias*” (figs. 39-40 & 42-44) also varies greatly, as the gnathos forearm is longer than *idas* in most figs. but short in several, leading one to suspect that his species *argyrognomon* “*ismenias*” is an artificial conglomeration; maybe those taxa have been reshuffled among species since then. And Chris Schmidt & N. Kondla (mss.) cite papers stating that *idas* in Italy has the ratio of 1.01-1.24 (Stempffer 1933, Bull. Societe entom. De France 38:108-112), 1.09 in Italy (Beuret 1961, Lycaeniden der Schweiz, vol. 3), and *argyrognomon* has 1.38-1.61 (Stempffer 1933), which measurements are not consistent with Nabokov’s names (according to those figures, *idas* has gnathos more similar to *anna*, and *argyrognomon* and *melissa* have similar long gnathos). But Nabokov’s figs. of palaearctic *idas* genitalia look similar to American ones, so the use of the name *idas* in N. Amer. may still be justified. But we have to wonder whether N.A. *melissa* could possibly be called *argyrognomon*, because the gnathos is long in some (fig. 44), and the wing pattern of Nabokov’s Korea (fig. 23)-Japan (fig. 24)-China (figs. 19, 25-26) and nearby Russia (fig. 20) *argyrognomon* and even European *argyrognomon* (pl. 28 in Tom Tolman’s book) looks like our *melissa*. (Europe has numerous similar blues, and *Plebejus argus* and *P. pylaon* look similar to *idas* and *argyrognomon* in wing pattern, though *argus* has a middle process on the juxta and longer teeth on the valva and a male foreleg spine [Tom Tolman’s book states *idas* lacks the spine, but Gorbunov says it is merely small], and *pylaon* is missing an orange lunule near unh tornus.)

Lycaeides have a lot of variation in the Palaearctic. Pavel Gorbunov’s 2001 book shows the gnathos of *idas* to be fairly short like N.A. *idas/anna*. His fig. shows the gnathos forearm of *argyrognomon* to be longer, closer to N.A. *melissa*, and he claims the tibia of middle leg is a bit shorter (ratio of tibia to 1st tarsus segment length 5/4 in *argyrognomon*, versus 5/3 in *idas*); *argyrognomon* eats *Securigera* (family?) and *Astragalus*. Higgins’ Classif. Of European Butt. also shows *idas* with short gnathos forearm and *argyrognomon* with long gnathos like our *melissa*. Nabokov agreed the gnathos forearm was much longer than its basal arm the “humeralus” in *argyrognomon* and *melissa*, though he thought (dubiously) that the two formed a more acute angle in *argyrognomon*, so he placed *melissa* and *argyrognomon* as distinct species, as his 1944 Fig. 1 shows them evolving independently from *idas*. Nabokov shows *anna/ricei* having the shortest gnathos forearm. The Russian *idas* are all allopatric and have no consistent differences in genitalia despite some conspicuous wing differences in male upf border and bluer/more violet color etc., so Gorbunov treated them as one species until proven otherwise, though he stated that both *idas* and *argyrognomon* might be artificial conglomerations in Russia. He treated *P. idas kamtschatica* as a member of our N.A. *scudderii* group.

European wing pattern variation is interesting, and seems to devalue wing pattern. Thus *idas* at low altitude in Sweden and Greece have wide orange bands on uns, but ssp. *haefelfingeri* above 1800 m in the alps and the similar *lapponicus* in N Scandinavia have the orange spots small (small in Tom Tolman’s book, much larger in the Higgins & Riley book), suggesting that the orange band gets smaller with altitude and cold. European *P. argyrognomon* have fairly wide orange bands on uns but none of the European taxa have wide orange bands on female ups like our *melissa* (though Greek *idas* are fairly wide). European *argyrognomon* in appearance and more southern distribution and mostly bivoltine habit is more like our *melissa*; genitalia rather than wing pattern is supposed to distinguish it from *idas*.

A number of **hostplants** have been reported for these bugs, mostly legumes (numerous sources, incl. a few new ones [pers. comm.] from B. Chris Schmidt & Crispin S. Guppy, some new ones from Wis.-Minn. from R. Dana et al. 2005 [J. Lepid. Soc. 59:175-177] and some J. Pelham hosts from Warren’s [2005] Butt. Ore.)(butterfly names are those accepted for bookkeeping species in the conclusion to this essay):

Plebejus idas in Europe eats legumes: *Cytisus scoparius*, *villosus*, *Genista pilosa*, *depressa*, *Lotus corniculatus*, *Melilotus alba*, *Anthyllus vulneraria*; plus Ericaceae: *Calluna vulgaris*; and Eleagnaceae: *Hippophae rhamnoides* in French Alps.

- P. anna anna*: *Lupinus*, *L. latifolius* in Wash., *L. arcticus subalpinus* Wash., *Lotus oblongifolius* var. *oblongifolius* (“nevadensis”), *Lupinus polyphyllus* (at one site in the Sierra Nevada Cal. at Leek Springs, females oviposit on *Lupinus polyphyllus* in nature but in lab prefer *Astragalus whitneyi* & even *Lotus nevadensis*, Nice et al. 2005, Nice et al. 2002).
- P. anna anna*=*ricei*: *Lathyrus torreyi* & *Vicia ludoviciana ludoviciana* (“*exigua*”).
- P. anna lotis*: probably *Lathyrus vestitus bolanderi* because is the only legume in the site (reportedly perhaps *Lotus formosissimus* but it only grows outside the site).
- P. anna vancouverensis*: assoc. *Lupinus*.
- P. scudderii alaskensis* eats *Vaccinium* in central interior BC according to Crispin Guppy. *Alaskensis*? oviposits on *Oxytropis* and is assoc. with *Lupinus* near Carcross Yukon according to Chris Schmidt.
- P. scudderii scudderii*: *Vaccinium cespitosum* ovip. in Ont., assoc. *Vaccinium* in jackpine barrens of C-N Alta.
- P. scudderii aster* assoc. *Empetrum nigrum* Nfld.
- P. scudderii aster*=*empetri*: *Empetrum nigrum* (main host by assoc. in N.S. & Prince Edward I. & Cape Breton I., and most eggs were laid on this in lab and few on *Kalmia* & none on *Ledum*), *Ledum palustre* in N.S., *Kalmia polifolia* in N.S., assoc. *K. angustifolia* in Que. (all Ericaceae).
- P. scudderii nabokovi*: *Vaccinium cespitosum* ovip. in Wis. & Minn. and proven in Minn.
- P. atrapraetextus atrapraetextus*: Chris Schmidt found numerous ovip. records on legumes in Alta. incl. *Hedysarum sulphurescens* & *Oxytropis sericea* in SW Alta. mts.; *Astragalus canadensis* var. *mortonii* in NE Wash.; D. Threatful found ovip. on *Lupinus* in Okanagan region of BC.
- P. atrapraetextus benwarner* (named below)=“Warner Mts. taxon”: *Astragalus whitneyi siskiyouensis* for subalpine *idas* ssp. (evidently the Warner Mts. type) in Trinity Alps-Mt. Eddy (this butterfly was not *anna* or *melissa* as Warren’s Butt. Ore. mistakenly lists this host under both those species).
- P. atrapraetextus fridayi*: *Astragalus whitneyi* at 4 sites, & assoc. *Lupinus argenteus* at Crooked Creek Lab. 10500’ in White Mts.
- P. atrapraetextus sublivens*: *Astragalus alpinus*, *Lupinus parviflorus*, assoc. *Lupinus argenteus* var. *tenellus*.
- P. atrapraetextus annetta* in Utah: *Lupinus parviflorus*.
- P. samuelis*: *Lupinus perennis*.
- P. melissa melissa* hosts are many legumes, including *Medicago sativa* (alfalfa), *Astragalus mollissimus*=*drummondii*, *miser* (& var. *oblongifolius*), *halli*, *caryocarpus*, *parryi*, *bisulcatus*, *agrestis*, *whitneyi*, *flexuosus*, *canadensis* var. *brevidentis*, *douglasii*, *lentiginosus* var. *lentiginosus*, *purshii* var. *glareosus*, *adsurgens* (& var. *robustior*), *racemosus*, *inflexus*, *missouriensis*, *lotiflorus*, *crassicaupus*, *Sphaerophysa salsula* (in Colo. & Wash.), *Lupinus argenteus* (& var. *alpestris*), *caudatus*, *barbiger*, *prunophilus*, *Glycyrrhiza lepidota*, *Oxytropis sericea*, *lambertii*, *Vicia*, *Hedysarum boreale*, *Lotus purshianus*, *americana*, *nevadensis* var. *douglasii*, *Hosackia*, *Melilotus officinalis*, *alba*, *Trifolium fragiferum*, *Coronilla varia*. Alfalfa is chosen in Minn., Kansas, Colo., Utah, Calif., Nev., etc., everywhere in the range essentially (except not in S BC or Alta. according to N. Kondla), and I don’t think *melissa* adapts to it at all as Nice & Shapiro (1999) claim (they mistakenly claim the alfalfa pops. rarely if ever use native hosts), as *melissa* is polyphagous on legumes everywhere and can move into an alfalfa field and become common without any adaptation.
- P. argyrognomon* eats legumes in Europe: *Coronilla varia*, *Astragalus glycyphyllos*; and *Securigera* (family?) in Russia.
- Eggs hibernate in these bugs, so presumably several reports of larvae overwintering in ant nests in Europe are wrong. *P. idas* in Europe is said to be strongly myrmecophilous, and they pupate in ant nests, presumably after ants carry larvae there (but how would the larvae finish eating when they were in the ant nest, unless they eat ant brood?, or unless the fully-fed larva somehow changed its behavior to make sure it was captured by ants?). Larva of *melissa* is green with a white lateral line and subdorsal whitish streaks and several rows of whitish streaks below that, or larva may be unmarked green. A *scudderii* larva in BC book is shown as green with a lateral creamy line. G. Ballmer & G. Pratt (J.Res.Lep. 27:53-54) state that larval setae are the same in *idas* and *melissa*, though larvae from near Mono Lake & Warner Mts. have much smaller dendritic setae and dorsal & subdorsal abdominal setae are truncate. But this is unfortunately a jumbled writeup, as the species of those Mono L. and Warner Mts. pops are not mentioned! and the species source of three hosts are not named, so we have to ignore that inadequate nonpresentation of actual data.

Now, let’s wander among the various N.A. populations and note their peculiarities.

Anna/ricei are always variable in amount of orange, as the orange varies from none to considerable in both, and the variation seems to be much greater than any weak geographic differences that may exist, and there does not seem to be much average difference, so I assume that *ricei* is a syn. of *anna*. Howe’s book claims *anna* has less orange, but my Sierra *anna* have a little more orange than N Calif. ?*ricei*, but then the BC book figures *ricei* with more orange again. Nabokov wrote about a lot of variation within *ricei*, but did not clearly state how *ricei* is distinguished from *anna*.

BC collectors (Cris Guppy) insist that the coastal *vancouverensis* belongs to *anna/ricei*, even though it has a full *idas*-like set of uns orange and black spots, because of its pale-white uns. Nabokov illustrated the gnathos of one Vancouver I. “*ricei*” male (pl. 1, fig. 2), which is short but a bit longer than Mt. Rainier male. *Vancouverensis* is assoc. with *Lupinus*.

The extinct coastal Calif. *lotis* has a full set of orange spots, like *vancouverensis*. Maybe we should put *lotis* into the *anna/ricei* species, because it has a very short forearm like they do (the F/H=forearm/humerulus ratio Nabokov found to be

1.21 in *lotis*, 1.16 in *anna*, and 1.22 in *ricei*), even though it has more of an orange band than *anna/ricei*. (If we believe Stanford's maps that *melissa* does not occur in Mendocino Co., and believe Nabokov's pl. 1 fig. 18 right, the gnathos varies to long like *melissa*, though maybe his *melissa* from Mendocino Co. [in MCZ from Carnegie Museum] were mislabeled.) If *vancouverensis* is lumped into *anna/ricei*, why can't we lump the coastal *lotis* into *anna/ricei* also?

Ssp. *azureus* Emmel, Emmel, & Mattoon in the Yolla Bolly Mts. of Trinity Co. in NW Calif. is a *lotis*-like critter with bluer female ups and larger uns black spots, and has a short gnathos (dot 41 in Nice et al.'s 2005 fig. 4), so I'll put it into *anna/ricei* with *lotis*.

I labeled the pop. on top of the Warner Mts. Calif. ssp. *lotis* in my book (Scott 1986), as the Cedar Pass pop. looks most like *lotis* and has a fairly short gnathos forearm (I caught one female there with wide orange bands that seems to be ordinary *melissa* with coloration and spotting identical to *melissa*, which thus is sympatric). Nice & Shapiro (1999) also found that the Warner Mts. pop. (on Emerson Peak & Eagle Peak) which was once called "*melissa*" is closest to *idas* in gnathos, even though some males have gnathos resembling *melissa* (wings mostly resemble *lotis* with a little influence of *anna*); they found the Ball Mtn. Siskiyou Co. pop. is the same as the Warner pop. Nice et al. (2005) found that the gnathos was intermediate esp. at Cedar Pass but closer to *idas*. But maybe we should place the Warner & Ball Mtn. pops into *idas*, because Shapiro's Ball Mtn. pop. (Shapiro formerly called both pops "*melissa*") was like the Warner pop. and occurred 6-8 km from a real *anna* population (the Ball Mtn. pop. may have just one gen. rather than two gen. like *melissa* as Shapiro once reported, see above). However S. Mattoon (talk at 1996 Lep. Soc. meeting) stated that the odd Warner Mts. pop. occurs at Mt. Bidwell & Cedar Pass, while 2 mi. away ssp. *ricei* occurs, so the Warner pop. evidently has to be *idas* (as its gnathos is more like *idas* than *melissa*) and can't be *anna/ricei* because that occurs only 2 mi. away. And Tom Kral tells me that the pop. near Drakes Peak in Warner Mts. barely into Ore. is definitely *ricei*. It seems reasonable to conclude that both Warner & Ball Mtn. pop. have gnathos near *idas* and occur near *anna* thus have to be called *idas*. Tom Kral notes a pop. at Patterson Meadow (E of town of Likely, E of Blue Lake, Modoc Co.) that resembles *lotis*, which may be this Warner Mts. *idas* also. But one has second thoughts after looking at photos of *anna vancouverensis*, as the Warner Mts. pop. (and *lotis*) seem to resemble *vancouverensis*, thus they may be the same species as *anna/ricei*. Also, the "Warners entity" specimens ended up within a cluster of *anna/ricei* in both Nice & Shapiro's (1999) allozyme tree and their mtDNA tree (assuming that their "unnamed" Indian Valley pop. is part of *anna/ricei*). If we go by the gnathos, which is longer than *anna/ricei* and often tending toward *melissa*, we have to put the Warner Mts. pop. into *idas*. So this is a toughie. But, I will conclude that the near-sympatry with *anna/ricei* on both Warner Mts. and Ball Mtn. and the average longer gnathos and the more extensive orange margins seem to outweigh the idea that the Warner Mts. bug is the same species as *anna*, so I will lump it into the nearest "*idas*" taxon, *atrpraetextus*. At any rate the population seems worth naming, as follows:

***Plebejus atrpraetextus benwarner* J. Scott, NEW SUBSPECIES.** Definition: Gnathos *atrpraetextus*-like with fairly short gnathos forearm, the uns resembling *lotis* with a somewhat whitish ground color though some are tan like *atrpraetextus*, the orange spots complete on unh and unf though weak on unh in a few males and nearly absent on unf in some males, the uns black dots fairly strong like *atrpraetextus* in some but very small in some adults. Overall, a puzzling population that resembles *lotis* a lot but looks like some *anna* and *atrpraetextus* influence has been thrown in as well.

Range: upper Warner Mts. Calif. Nice & Shapiro (1999) and Nice et al. (2005) studied this insect and compared it with other *Lycaeides* (they list it from Cedar Pass where the gnathos is especially intermediate, Eagle Peak, & Emerson Peak, all in Modoc Co.). **TL and holotype** male (BMNH, plate IV) & 7 male 9 female paratypes Cedar Pass, Modoc Co., Calif., Aug. 4, 1974, coll. J. Scott. **Name** is from the Scottish word BEN (meaning mtn.) and WARNER.

The alpine Sierra Nevada pop. is now called *fridayi*. J. Emmel reportedly prefers species status for it, according to Ken Davenport's Yosemite paper. I caught lots of them on top of an alpine peak SE of Sonora Pass, where they oviposited on *Astragalus alpinus*, and the wings look like *idas* while the gnathos is like *melissa*. However Davenport states that the wings vary to *melissa*-like, and he includes in *fridayi* lots of nearby pops. and lower altitude pops., as if this *fridayi* could just be a variety of *melissa*. However, Nice & Shapiro (1999) found that a population from Mt. Rose, Washoe Co. Nev. in the Sierras is similar to Warner Mts. *idas* in wing pattern (*melissa*-*lotis*-like), and has intermediate gnathos, and the Mt. Rose thing also belongs to *fridayi*. And the Carson Pass *fridayi* in Nice et al. (2002, fig. 2) has gnathos intermediate between Mt. Rose *fridayi* and Verdi Nev. *melissa*. Nice et al. (2005) found that in mtDNA the alpine *fridayi* differ from the lowland bugs, and *fridayi* eggs fall off soon after being glued on, which suggests that the alpine bugs are not the same as the lowland ones; and the *fridayi* gnathos is intermediate at Mt. Rose and is at the *idas* end of the *melissa* blob on their fig. 4 because it is a little intermediate at 4 other sites too, so they seem to prove that *fridayi* is a distinctive taxon with somewhat intermediate gnathos (they list it from Mt. Rose in Washoe Co. Nev., Carson Pass 8573' in Alpine Co. Cal., The Nipple 9342' in Alpine Co. Cal., Jeff Davis Peak 9065' in Alpine Co. Cal., and County Line [County Line Hill, <11,229', White Mts., Mono Co.] Cal.). (I have a male from 6 mi. W of Mt. Rose that I have placed into my series of *anna*.) So we can call *fridayi* an intermediate mess whose gnathos has also tended in the direction of *melissa* in its southerly latitude. Nice & Shapiro (1999) also listed *fridayi* from Carson Pass, Jeff Davis Peak, and the White Mts. (County Line Hill). It also occurs above 9000' in White Mts. of Inyo & Mono Cos. according to Davenport. Its taxonomic placement is another toughie, it could remain in *P. melissa*, but its wing pattern is similar to *atrpraetextus*, so by analogy with other southern populations with longer gnathos (*annetta* and *longinus* and *sublivens*), I'll plug *fridayi* into "*idas*" *atrpraetextus* too.

Atrapraetextus has a fairly full set of black uns spots and orange marginal spots (though less orange than real *melissa*), so looks quite different from *anna/ricei* and from *scudderii*. Ssp. *atrapraetextus* in S BC was described with a wide male upf border, but this border varies to narrow according to Kondla, so *ferniensis* is probably a syn. Schmidt & Kondla find that the gnathos of *atrapraetextus* is longer than *anna* (a typical gnathos resembles Nabokov's *longinus* figs. 31 & 37), although Nabokov found that its gnathos was a bit shorter than *longinus*, so I will accept both findings and conclude that it has somewhat variable gnathos as its relatives do in Wyo. (*longinus*) and Colo. (*sublivens*) and evidently C-NE Ore. (where J. Shepard and E. Dornfeld disagreed about identification, probably because the gnathos varies there too so both were right on some variations), etc. Ssp. *longinus* and *sublivens* also have a longer gnathos: Nabokov found that *longinus* gnathos varies from short like most *idas*, to long like *melissa*, evidently because of hybridization with *melissa*, and I found that *sublivens* also has considerable variation in gnathos length, with many longer ones. Here again, the southern end of the *idas* distribution suddenly has a more *melissa*-like gnathos. *Longinus* and *sublivens* aren't much different in wing pattern in my series of dozens of each, though *sublivens* has smaller orange spots tending toward *scudderii*, and they are similar to *atrapraetextus* in wing pattern also, and therefore should also be placed into *atrapraetextus*, as subspecies; *longinus* should be treated as a separate ssp. from *atrapraetextus* if the latter's male upf border really averages wider. Evidently this *atrapraetextus* phenotype ranges at least from the southern Alta. foothills (south of Nigel Creek, which has *scudderii*) and S BC south to SW Colo. and C Ore. Nabokov wrote that the pop. of "*ricei*" at Mt. Rainier is "*scudderii*"-like, so one might think it is actually *atrapraetextus*, but Nabokov's figs. 36-37 look like *anna/ricei*, not *atrapraetextus*.

Nabokov wrote (p. 504) that *scudderii* intergrades with *ricei* or *ferniensis* in BC, and also intergrades with *ferniensis* in SW Alberta. But maybe it doesn't. N. Kondla and C. Guppy doubt that *scudderii* intergrades with *ricei*, as they now treat *ricei* as a distinct species, plus Chris Schmidt & Kondla (mss.) list *anna* from several locales in Selkirk Range and north to near Revelstoke in SE BC and describe a variety of *anna* from Mt. Spieker in E-C BC, the last two locales within the range of *scudderii*, and *scudderii* flies at slightly lower altitude on Mt. Spieker. That same mss. states "The possibility of *atrapraetextus* as a distinct species [from *scudderii*] should therefore not be ruled out", and Kondla notes that S BC "*scudderii*" as mapped in the BC book is not like real C BC *scudderii*, so the neat picture of *atrapraetextus* S of *scudderii* on the BC book map is not quite correct. D. Threatful found that the "*scudderii*" mapped in BC book from Okanagan area are actually *atrapraetextus* (The Taxon. Report vol. 4#2), so BC lepidopterists must recalibrate their eyeballs and reexamine S BC specimens, and be especially aware of a possible species-level difference between the Ericaceae-eating *scudderii* and the legume-eating *atrapraetextus*. (Cris Guppy already recalibrated by March 2005 and now maps these bugs differently, and suggests that N BC *idas* are ssp. *alaskensis*, W-C BC are near-*scudderii*, NE BC near Peace River area are *scudderii*, and slightly more than a third of S BC has a new ssp. [evidently related to *atrapraetextus*].) Furthermore, my specimens seem to prove that *scudderii* and *atrapraetextus* overlap in the Alta. mts. in Banff park area: typical *scudderii* (small, little orange spots, small black uns dots, little variation) has been found by dozens of people and myself along Nigel Creek at the N end of the park, and I caught an identical male 3 mi. NE of Lake Louise (Nabokov lists *scudderii* from Lake Louise [and the same town Laggan before the name was changed] also and from Banff [evidently the town] and Cascade Valley [evidently along the Cascade River that flows S into Lake Minnewanka, NE of Banff] and Mt. Park [which could be a corruption of Mtn. Park S of Cadomin] and Mt. O'Brien [which Kondla seems to remember is near O'Brien Lake, which is NW of jct. hwy. 1 & 93=Castle Junction=Eisenhower Junction] and Ptarmigan Valley [in Jasper NP]), and I have specimens of the much-different-looking *atrapraetextus* from Eisenhower Forestry Station, bog near Spray Lake near Canmore, mile 10 of Minnewanka to Snow Crk. Pass Rd., Snow Creek Pass, Kananaskis & Kananaskis Ranger Stn., bog near Kananaskis Lakes, Eau Claire Cgd. S of Kananaskis Lakes, & Plateau Mtn. Thus Alta. *scudderii* & *atrapraetextus* appear to be quite distinctive without intergradation and at least come within about 21 miles of each other (the distance between Lake Louise and Eisenhower Jct. on the map), and actually overlap if Nabokov's "Banff" and Cascade Valley and Mt. O'Brien specimens are at the locations noted above. Kondla states that *scudderii*-like bugs fly far south in the Alta. rockies (thus have overlapping distributions) but is not sure *scudderii* and *atrapraetextus* are sympatric there (his photo of male *scudderii* from Window Mtn. Lake N of Crowsnest Pass looks to me like it could be *scudderii*, but might be variant *atrapraetextus*). And Chris Schmidt watched females exhibiting oviposition behavior (crawling and antenna waving) on *Astragalus* as far north as Jasper in Alta., so those are evidently the *atrapraetextus*-type; he surmises that either *scudderii* and *atrapraetextus* are broadly sympatric through the central Alta. rockies, or the mtn. "*scudderii*" is just an ecotype (in more mesic/cooler sites) of *atrapraetextus*. Then Chris Schmidt notes (as mentioned above) that the Peace River grassland in W-C Alta. has a July bug in more mesic grasslands/parkland, which could be an *atrapraetextus*-type bug (on legumes). And Schmidt even suggests that bugs flying near Carcross Yukon, currently called "*alaskensis*" because they look most like that, are part of the cordilleran legume-feeding *atrapraetextus* bug, not *scudderii*, because he watched "*alaskensis*" oviposit on *Oxytropis* in low-elevation sandy pine woods near Carcross in 2004, where females showed no interest in lots of bearberry (*Arctostaphylos uva-ursi*), and he states that at more mesic sites near Carcross including higher altitudes up to near treeline, "*alaskensis*" is assoc. with *Lupinus*, and females there vary to the typical female form of the central Alta. rockies (with blue-purple extending only about halfway along upf). Obviously more biological work is needed.

Hostplants are one more major reason why it seems likely that *scudderii* is a different species from *atrapraetextus*. The *scudderii* eats only Ericaceae (only *scudderii* and its close relatives *alaskensis*, *aster*, *empetri*, *nabokovi* eat Ericaceae, and no

other N.A. taxa do), *atrapraetextus* only legumes (the identity of the legume feeders in Yukon is questionable, and may be *atrapraetextus*, but look more like *alaskensis*). That seems to be a major difference to me, and I don't know any other butterflies that are able to eat both (except totally polyphagous bugs such as *Strymon melinus*). If it turns out that the Carcross Yukon *alaskensis* is most closely related to *scudderii* even though it eats legumes, then maybe *scudderii* and *atrapraetextus* do belong to the same species (after all, in Europe *idas* also mostly eats legumes, but it is recorded also on Ericaceae [*Calluna*] and Eleagnaceae).

Annetta from the Wasatch Mts. E of Salt Lake City in N Utah (known from at least these sites: Alta on both sides of Little Cottonwood R. 8500-9000' July 12-Aug. 20; Twin Lake beyond the pass above Brighton 9000' Aug. 13; Park City, & Deer Meadow near Park City; American Fork Can.) (assoc. *Lupinus parviflorus*) has *idas*-like wings with very small orange spots (though a few, Nabokov's figs. 85-86, have more *melissa*-like orange), and the female ups often has a lot of blue (figs. 133-5); however Nabokov found the gnathos to be *melissa*-like. Is this an *idas* relative whose gnathos suddenly becomes *melissa*-like at the southern latitudinal range of the species, because it has been hybridizing with *melissa* as did *longinus* etc.? Maybe so, as Nabokov wrote on p. 533 "I suggest that it has arisen from *argyrognomon* with a later admixture of *melissa melissa* blood." And ordinary *melissa* is sympatric, according to p. 535: "Once, among a colony of fresh ssp. *annetta* individuals of both sexes, I took a single very faded female specimen of the oak-scrub form of ssp. *melissa* which had certainly wandered up from the valley...neither *melissa* nor *annetta* were present between 6000' and 8500' along the canyon." [Was the female *melissa* sympatric because it wandered to the spot or because it was a late first-gen. specimen of sympatric *melissa*?] And just N of those *annetta* are dots of *idas* on Ray Stanford's maps, as if *annetta* is really just a var. of *idas*, a pop. at the S end of the *idas* distribution that has interbred with *melissa*. But does *annetta* even exist? When I ask the Utah collectors about it I get blank stares, as most don't seem to even think it exists, or they send me ordinary *melissa* from a lowland locale; maybe they are just very tired of people wanting specimens of what is a local critter, and just don't want to respond. Nice et al. (2005) studied 18 "*annetta*" from Alta. Utah, but didn't state whether those had small orange spots or were ordinary *melissa*. I will be bold and lump it into *atrapraetextus* along with *fridayi*, as it is probably an *idas* population that interbred with *melissa*.

In Colo., I wonder if the high-altitude *melissa* that Nabokov named *pseudosamuelis* even exists as a regular subspecies. I haven't found a large area where it occurs, just occasional individuals that have smaller spots at higher altitude, but no real population with smaller orange spots, and Nabokov found variation in spot size too (his *melissa* from Mt. Ouray 12000-13000', his *argyrognomon*? from Beulah, etc.). I haven't been to the TL, which was given (with the wrong county) by Nabokov (1949) as "vic. Red Mtn. Inn, hwy. 82, between Mt. Elbert and La Plata, Pitkin Co. Colorado, leg. Turner" (no date listed!). Red Mtn. Inn is not in modern gazeteers, but is shown on map and in text of my father Glenn R. Scott's "Historic Trail Map of the Leadville 1°x2° Quadrangle, Central Colorado" (USGS Scientific Investigations Map 2820, 2004); Red Mtn. Inn was located on a stage and toll road for stagecoaches and wagons going over the continental divide, at the same spot as modern hwy. 82 along Lake Creek, exactly 0.7 mi. E of jct. of North Fork and South Fork of Lake Creek, and 6.0 air mi. W of the W end of West Twin Lakes Res., in the valley between Mt. Elbert and La Plata Peaks, about 10,000', Lake Co. (NOT Pitkin Co.). (Nabokov listed other spots for *pseudosamuelis* incl. Lake Co. Colo. July 10, & Snowmass Lake 11000', Pitkin Co. [which is ~13 air mi. SW Aspen, in Pitkin Co.], July 3). I don't know anyone who has been to the real TL since Turner, so someone should go there and find what's there. Nice et al. (2005) analyzed 4 males from "Pitkin Colo." which had ordinary *melissa*-like gnathos and a haplotype A common in *melissa*, but these specimens were perhaps just ordinary *melissa*, because the town of Pitkin (zip code 81241, alt. 9241', ~23 air miles E of Gunnison) is in Gunnison Co. (SW and across the continental divide from Lake Co. the TL of *pseudosamuelis*) which contains *melissa* and *sublivens*; or if their "Pitkin" means Pitkin Co., it's still in the wrong county from the *pseudosamuelis* TL, and based on the haplotype may still be just ordinary *melissa*, and in Pitkin Co. *pseudosamuelis* is known from just Nabokov's specimen from Snowmass Lake. Ken Davenport found it on subalpine prairie hills 2-3 mi. NE Spring Crk. Rd. junction off road going to Taylor Res., Gunnison Co., July 19, 2003, but gnathos has not been examined so these could be *sublivens*. The *pseudosamuelis* TL is at the edge of the range of *sublivens*, so I think it has introgressed with *sublivens* to achieve its wing pattern with smaller orange spots etc., because at the edge of the range of *sublivens* it was especially vulnerable to hybridization (Don Eff and I found *sublivens* at Emerald Lake Gunnison Co. [just south of Pitkin Co.], and *sublivens* is also recorded from nearby Schofield Pass by E. Dornfeld, & Irwin Lake in Gunn. Co. by P. S. Remington). Nabokov hints at this on p. 530: "it shows a certain resemblance to *argyrognomon sublivens* of S. Colo., a resemblance which suggests further investigation (it is not unlikely that a state of affairs similar to the Jackson Hole tangle [in which the gnathos of *longinus* varies from *idas* to *melissa*-like] may be discovered in S. Colo." What to do with *pseudosamuelis*? We could treat the TL as a colony of *sublivens* that has hybridized with *melissa* more than usual, thus we could treat the taxon *pseudosamuelis* itself as basically nonexistent, or if it actually exists, could place it as a ssp. of *atrapraetextus*.

(Other records for *sublivens* are: Cottonwood Pass, W. S. McAlpine & D. Eff; Cottonwood Pass Rd., C. Slater; W side Cottonwood Pass 12,000', Don Eff; summit of Mt. Lamborn 11,000', Delta Co., Scott L. Ellis; Lizard Head Pass, Dolores Co., Mike Fisher, N of Weminuche Pass, & S of Wetterhorn Peak, & Lake Fork Gunnison River near Cinnamon Pass 11400', all Hinsdale Co., Scott; 1 mi. E. Silverton in San Juan Co. Scott, S Fork Mineral Creek 10000', San Juan Co., F.M. Brown; TL=Tomboy Road above Telluride 10000-12000' San Miguel Co., B. Rotger & V. Nabokov.)

However, there is some evidence that *pseudosamuelis* actually exists. Mike Fisher and F. M. Brown note that *melissa* at Fairplay in South Park also has smaller orange spots (however Nabokov's female ups from Fairplay on fig. 72 has wide orange bands, and his fig. 72 female uns from Fairplay has smaller orange spots but large black dots, and he states that Fairplay *melissa* is intermediate between *pseudosamuelis* and SE Colo. *melissa*), and I have a male from the E side of Sawatch Range at Cottonwood Crk. 8500', Chaffee Co. 29 June 1969 that also has small orange spots but has *melissa*-type gnathos (but Nabokov lists ssp. *melissa* from Mt. Ouray 12000-13000' in this range and shows gnathos of one on fig. 27 right); evidently adults vary a lot in these places. And Nabokov had a *pseudosamuelis* from Snowmass Lake in Pitkin Co. Also, in the middle of the San Juan Mts. is an enclave of butterflies that seems to be near-*pseudosamuelis*: I have 5m5f from Slumgullion Pass 11300' Hinsdale Co. and just south of there M. Fisher has 3m from just S of Spring Creek Pass ~10000' Hinsdale Co.; all have larger orange spots and larger black uns dots on average than *sublivens*, as the orange spots on males vary from small to large, while the female ups is variable (from brown to all blue on ups, and orange spots vary from small to large) and the gnathos of 4m of mine are more slender than *idas* more like *melissa* but gnathos is not quite as long as true *melissa*, while 1m has a short gnathos like *idas*, thus the gnathos is rather intermediate. Fisher feels that these are closer to *melissa* in appearance, and notes that his Spring Creek Pass spot is more prairie-like (and might even have *Oeneis alberta*), while he suggests that *melissa* is more of a prairie species and *sublivens* looks more like *scudderii* & occurs in moister habitats (my Slumgullion specimens were in little openings in S-facing woods, and I found *sublivens* mostly in vallies with mixed open areas and trees, not in wetter habitats). Anyway, we could call the enclave of these San Juan Mts. butterflies near-*pseudosamuelis*, and keep the taxon as a local ssp. of *melissa* in C and SW Colo. that has taken on some *sublivens*-like features due to introgression/hybridization, and is thus rather variable (actually, in Colorado there is no evidence that *melissa* and *sublivens* are distinct species at all, the evidence suggests that they are the same species). Should we lump *pseudosamuelis* into *atrapraetextus*, or *melissa*? A tough decision as it seems to be hybridized, but in this case it may be best to leave *pseudosamuelis* in bookkeeping species *melissa*, as it is an intergrade from *melissa* to *sublivens*, and we already have an *idas*-like taxon there [*sublivens*] that intergrades toward *melissa* at least in gnathos.

Note that Nabokov's female of "*argyrognomon*?" ssp. on fig. 66 (& p. 515) from above Beulah in Wet Mts. Colo. is actually just *melissa* (*idas* does not occur in those mts.). Brown et al. (1957)'s Colo. Butterflies cited as questionable a "*sublivens*" from near Pass Creek (just N of La Veta Pass) Huerfano Co., an error as only *melissa* occurs there.

But now we have to deal with ugly matters involving the nomenclatural details of the names *pseudosamuelis* and *melissa*, as the names are currently in a toxtangle. F. Martin Brown, in his papers on Edwards' types (Trans. Amer. Ent. Soc., 96:372-375, 1970), designated a lectotype *melissa* with small orange spots, from "vicinity of Twin Lakes, Lake County, Colorado". Brown also stated that Holland's (1931 Butterfly Book) plate XXXI fig. 25 male ups and plate LXVI fig. 17 female uns were syntypes, while plate XXXI fig. 26 female ups was not a syntype and was actually *anna* (as Nabokov 1949 wrote on p. 486, 521--Brown p. 374 states that fig. 26 was probably collected by T. Mead from the "Summit" area west of Donner Pass in Calif.). Brown's lectotype *melissa* actually had only the data "7-11", and his suggested TL of vicinity of Twin Lakes was deduced by examination of Mead's historical journals. Brown suggested the lectotype was caught "probably on La Plata Peak", which I think is very dubious, as that is an alpine peak 14,336' high, though maybe he meant that it could have been collected from the base of the peak down in the valley, which is [what else, for a toxtaxon within a stenochospecies?] the TL of *pseudosamuelis*! Thus Brown—without saying it—treated *pseudosamuelis* as a syn. of *melissa*, while I--like the Utah collectors who evidently refuse to think that *annetta* exists—formerly doubted that the high-altitude *melissa* even exists as a real taxon in Colo. Thus, if we accepted Brown's work at face value, we would have to consider *melissa* to represent a weakly-orange-spotted taxon with minuscule range. However, an investigation of the original description and the types leads to a different conclusion. Luckily, the ICZN rules and Brown's misguided work provide us with the answer. Brown made several mistakes. N. Kondla informed me that Holland's designation of the plate LXVI fig. 17 female as "type" was in fact a previous valid lectotype designation, which Brown failed to realize. Brown used history rather than science to do his work. Brown failed to read the original description of *melissa*, which described a butterfly with a full set of large orange spots, and wrongly designated a lectotype and TL of a butterfly with small/absent orange spots. Brown failed to state that he was designating the TL of *melissa* as the TL of *pseudosamuelis* (possible to do, but he should have mentioned it—why did he ignore *pseudosamuelis*?). Brown failed to examine the lectotype or any syntypes to see whether the gnathos of them belonged to the species *melissa* or *idas*, thus he didn't even know which species he was dealing with. My study of the 2000 (and 1970) ICZN Code indicates that Holland did validly and properly designate as ***melissa* lectotype the female illustrated by Holland on plate LXVI fig. 17** as female uns (which has the pin label "Melissa male or female/Colo" and "Collection of /W. H. Edwards", and is from Colo. not Calif. as Brown explains on p. 373). This fig. 17 female specimen was a syntype as Brown states on bottom of p. 372, and was a paratype as Brown states on p. 375. Holland labeled only that single pl. LXVI fig. 17 specimen the "type" on his plate legends, satisfying the "equivalent expression" requirement of art. 74.5 regarding lectotypes designated before 2000. In Holland's (1931) text he cited the illustrations "Pl. XXXI, fig. 25, male; fig. 26, female; Pl. LXVI, fig. 17, female, under side, types", but on the explanation for pl. XXXI he wrote "25. *Lycaena melissa* Edwards, male. 26. *Lycaena melissa* Edwards, female.", and on the explanation of Pl. LXVI he wrote "17. *L. melissa* Edwards, female, type, under side." Thus Holland's words on his plate legends clearly indicate that he considered the female on pl. LXVI fig. 17 to be

the type, which constitutes a lectotype designation, because that fig. 17 was a syntype according to Brown. It's true that Holland's book often called specimens "types" that were later found not to be syntypes, and Brown called those specimens "pseudotypes". But Holland did use the words paratype, type, types, and typical in his book, therefore we can't ignore his type designations in those cases in which they were designations of actual syntypes. Holland's lectotype satisfies all the requirements of the Code. Holland properly referenced the fig. 17 specimen as the "type" in accordance with art. 74.6.1.1. Art. 74.1.3 says that Holland's valid designation of fig. 17 female as the lectotype permanently prevented any other of the former syntypes from later being designated as lectotype, thus Brown's 1970 designation of a paralectotype (another former syntype) as lectotype was invalid. Holland's valid lectotype represents the proper phenotype of *melissa*, as it is the large-orange-spotted critter that actually exists in nature and is the phenotype that lepidopterists have considered to be *melissa* for many decades—and thus Holland's lectotype preserves stability, and also preserves the name *pseudosamuelis* for use, even if it mostly resulted from introgression with *sublivens*. Obviously Holland's lectotype is closer to Nabokov's view of the taxon *melissa* also, as Nabokov would not have named *pseudosamuelis* if he had thought that it was the same as *melissa* (it wasn't; Brown designated his *melissa* lectotype wrongly, and I cannot understand why he chose the TL of *pseudosamuelis* for his lectotype). William Henry Edwards' original description of *melissa* (Trans. Amer. Ent. Soc. 4:346-348, March 1873) clearly describes a butterfly with a full set of large orange spots ("Under side...primaries have a row of brown marginal points, above each of which is an orange spot; of these the second and third from inner angle are largest, the others of nearly equal size; each of these orange spots is surmounted by a straight black bar; secondaries have a complete sub-marginal row of large orange spots". "Female...Upper side...both wings have a complete orange band". "distinguished from *Scudderii*...by the presence of orange spots on primaries below...Melissa is brown with a band of orange to both wings"). Edwards wrote "From many specimens taken in Colorado by Mr. Mead, in the summer of 1871. I have also received this species from Nevada, and from Arizona...", and notably Arizona has only the large-orange-spotted butterflies. Why did Brown try to assign the name *melissa* to a small-orange-spotted high-altitude form, contrary to the original description and prior usage? It would seem that Brown was peeved at Nabokov for some unknown reason (coming into Colorado, Brown's turf, and studying the fauna?), and that was the reason Brown tried to assign the TL of *melissa* to Nabokov's TL of *pseudosamuelis*, in order to deliberately make Nabokov's name a synonym. We may never know Brown's reasoning, but I can't think of any other explanation. However, the reason does not matter as the correct Holland lectotype and original description clearly assign the name *melissa* to the lower-altitude large-orange-spotted bug. But now we have to deal with the type locality of *melissa*. Brown's TL is wrong because his lectotype is wrong and his suggested TL has butterflies of the wrong phenotype from the correct lectotype and the O.D. Nabokov (p. 520) stated that the *melissa* TL was Park Co. Colo. between Fairplay and Mosquito Pass, but there doesn't seem to be any evidence for his statement either, and the bugs are often different there too. Since the Holland lectotype is labeled only "Colorado" (thus valid TL was only "Colorado"), and Theodore Mead collected the *melissa* described in the O. D. thus collected the lectotype, and Mead collected specimens at Turkey Creek Junction (Tintytown), Jefferson Co. Colorado (the locality of the *melissa* syntype coll. June 6, 1871 by Mead that Brown listed on p. 374-4b), and that is a well-known locality where the proper *melissa* phenotype occurs, I hereby designate **Tintytown the type locality of *melissa***. The region of Colorado near Tintytown contains only the one species of *Lycaeides*, and its hostplants etc. are well studied, so there can be no confusion as to which species flies at Tintytown, so this TL lets people use the name *melissa* for the widespread low-altitude bug as they have been doing, and preserves the name *pseudosamuelis* for possible use. (This is the second time I have had to reject/invalidate a lectotype designated by Brown, the first being his lectotype of *Phyciodes marcia* Edwards, details of which are in *Papilio* [New Series] #14; Ronald Gatrell also rejected that lectotype, which also could not even be determined to species.)

Continuing on with the *Lycaeides* survey, there's still another variety of *pseudosamuelis*: On the flat "plateau" of the Bighorn Mts., after you get above the steep foothills, I found what looks like *pseudosamuelis*, with a grayish uns with very small orange spots, yet with *melissa*-like gnathos. Butt. Rocky Mtn. States did not show "*idas*" from Bighorn Mts., but Stanford's latest maps show it from Sheridan & Big Horn Cos., based on these *pseudosamuelis* with long gnathos evidently, or perhaps based on specimens with a shorter gnathos also. Are these high-altitude Bighorn Mts. bugs with small orange spots introgressed from *atrappaetextus*, thus another ssp. of "*idas*" *atrappaetextus*? I need to see more of these. In this irreverent essay we could call them bighornimuelis (not a valid ICZN name!). I'll leave them in *melissa*, as with *pseudosamuelis*, for now, and note that the isolated Bighorn Mts. have a strange fauna (amazingly, the plains *P. tharos* *orantain* Scott flies on the plateau too, and the *Oeneis chryxus*-group representative there is strange as well).

Now let's return to *atrappaetextus*. That taxon is surely conspecific with *longinus* (& evidently *sublivens* though its wings tend toward *scudderii*), as they look about the same and all three include a lot of variation in gnathos length. So there does not seem to be much of a leap to also include the peripheral little taxa into *atrappaetextus*, including the Warner Mts./Ball Mtn. *benwarner*, *fridayi*, *annetta*, and maybe even *pseudosamuelis* and Bighorn Mts. *pseudosamuelis*, all of them localized populations or clusters of populations that seem to have introgressed with adjacent more widespread taxa, including *anna* (the Warner Mts. pop. seems to have interbred with this a little, based on wing pattern) and *melissa* (all of them seem to have interbred with *melissa*). The small population size of those isolated little taxa surely made them vulnerable to hybridization/introgression in the past, resulting in some of their characters being similar to surrounding taxa (sometimes *anna*, usually *melissa*). It would seem that *atrappaetextus* is a species (a "bookkeeping" species as defined

below) that evolved in a region between ancestral *scudderii* and ancestral *melissa*, and survived the ice ages in the southern Rockies & Great Basin (while *anna* was in California & Baja, *melissa* was in the southwest and southern plains & Mexico, *alaskensis/scudderii* was in Beringia, and *aster-empetri-nabokovi* was in E U.S.). *Atrapraetextus* seems to have lots of intermediate characteristics between *scudderii* and *melissa*, including gnathos length, so it makes sense that at the edge of its range are various populations that have hybridized more than usual, as reproductive isolation does not seem to be great in any N.A. taxa. We can call the species *atrapraetextus* the Hybrid Blue because of its apparent mixed heritage in introgressing with all the surrounding taxa and having some intermediate traits. The hostplants of the peripheral little taxa are all consistent with the main taxa, as the whole species *atrapraetextus* eats mostly *Astragalus* & *Lupinus*, and *sublivens* & *annetta* share the same plant species, & *benwarner* & *fridayi* share the same plant species.

Samuelis from NE U.S. and adjacent Canada has *idas* wing pattern with small orange spots, yet its gnathos is almost *melissa*-like (but Nice et al. 2005 found that the *samuelis* gnathos is shorter than regular *melissa*, thus the populations were on the upper left of their large *melissa* blob on fig. 4). It eats *Lupinus perennis*, and is a rather pathetic creature with a narrow range of hostplant and habitat and requirement for regular burning of parts of its habitat, yet is killed by burning so requires a large area with only a small portion burned each year, thus seems incapable of surviving modern real estate development that has reduced its range to small colonies. It occurs within at most 50 miles or so of real *melissa* in Minn. (but the Ottertail Co. “*samuelis*” is actually *melissa melissa* as noted above)(and R. Dana et al. 2005 J. Lepid. Soc. 59: 175-177 say it flies 65 km and 85 km from new *melissa melissa* populations that have moved in to eat the introduced *Coronilla varia*). How about calling it another *idas* pop., with *idas*-like wings, whose gnathos has turned mostly *melissa*-like at the southern latitudinal range in the east, especially because Nice et al. (2005) found that *nabokovi* has gnathos that is completely intermediate between *scudderii* and *samuelis*? *Samuelis* was treated as a ssp. of *melissa* by Nabokov, because its gnathos is long, even though the wings are *idas*-like. *Samuelis* occurs just south of the range of *aster/nabokovi*, but I have not heard of any localities where they fly together, though the ranges may come within a few dozen miles of each other in N-C Wis. and N-C Minn. evidently without interbreeding, and even overlap a bit, if the identifications on county dot maps are correct (but there are lots of misidentifications, see below under *nabokovi*, so there is doubt). But there are lots of reasons not to consider *samuelis* a ssp. of *idas* or *scudderii*. Its host is a legume (*Lupinus perennis*) versus Ericaceae for *scudderii* relatives such as *nabokovi*, it has two generations (as does real *P. melissa*) versus one, orange markings are greatly reduced (nearly absent on fw) compared to *nabokovi*, black dots at end of unh veins are weaker, uns is more tan, the black postmedian spot in unf cell CuA₁ is rounder than *nabokovi*, etc. *Samuelis* looks more like *melissa* than *scudderii* or *nabokovi* (except for the tiny orange spots). We could leave it lumped with *melissa*, but I don't think it fits into *melissa* very well because of obvious *idas*-like wing pattern and habitat and host range, and the ranges of *samuelis* & *melissa* come very close without interbreeding (Dana et al. found that *melissa* has spread east into the *samuelis* range in E Minn. and W Wis. by utilizing the introduced *Coronilla varia*). Kondla and Scott are not comfortable treating it as a ssp. of *melissa*. Kondla suggests *samuelis* should be considered a [bookkeeping] species, and that may be the best treatment. Nice et al. (2005) thought that *samuelis* W of Lake Michigan differed from those eastward in mtDNA, even though the adults look the same. They found that *samuelis* contained mtDNA haplotypes A, C, D, and P, which are shared by *nabokovi*, *benwarner*, *annetta*, *ricei*, and *melissa*, and they divided the *Lycaeides* into three genetic groups (a western clade, central clade, and eastern clade), but the first two clades were a hodgepodge mixture of numerous named taxa (their western clade includes populations of *azureus*, *anna*, *ricei*, *fridayi*, *nabokovi*, and *melissa*; the central clade includes populations of *ricei*, *benwarner*, *annetta*, *samuelis*, *inyoensis*, & *melissa*; the eastern clade includes only populations of *samuelis* with haplotypes P & E), which essentially means that mtDNA was polymorphic in the ancestor of these butterflies and it continues to introgress and mix, and is essentially useless to me for determining the taxonomy of these butterflies. A clue is that *samuelis* is the seventh taxon whose gnathos is long at the southern end of a lobe of “*idas*” distribution (the others being *benwarner*, *fridayi*, *annetta*, *longinus*, *sublivens*, *pseudosamuelis*, Bighorns *pseudosamuelis*), so it's tempting to treat it as a ssp. of “*idas*” that has just gotten a longer gnathos from introgression with Pleistocene *melissa* or whatever. A good idea, but we apparently can't lump it with *nabokovi*. We can place it into the *atrapraetextus* species, however, as it isn't that different from some of the *atrapraetextus* southern satellites like *annetta* (it is similar to “*pseudosamuelis*”, whose name Nabokov devised because of its similarity in wing pattern to *samuelis*, but here I reluctantly keep that in *melissa*). Actually there are some cases of butterflies that occur in E Canada and NE U.S. being related to butterflies from the central Rocky Mts.: *Lycaena castro dospassosi* from N.B. resembles *L. castro megaloceras* from Bighorn Mts. quite closely; *Papilio brevicauda* of the Maritime Provinces is similar to *P. machaon bairdii* of Colo. (the main difference being the lack of sexual dimorphism in *brevicauda*, genes it got from *machaon hudsonianus*; actually *brevicauda* has the mtDNA of *bairdii*, and may be a ssp. of *P. machaon*, as hybridization studies have not been done that show it is reproductively isolated). Because this essay keeps *pseudosamuelis* in *P. melissa*, we could leave *samuelis* in it too, but it doesn't fit as noted above, so I'll reluctantly call it another bookkeeping species *P. samuelis*.

Ssp. *scudderii* occurs over most of boreal Canada, and has very small orange spots. I have some *scudderii* from near Jesmond (which is SW of 100 Mile House) and Westwold (which is SE Kamloops) in S-C BC, so it ranges well south, as Butt BC shows (the mapped ranges seem well done, however Cris Guppy now rearranges the ssp. totally differently). Ssp. *alaskensis* is almost identical to *scudderii*, but Schmidt & Kondla (mss.) state ups is blue rather than violet-blue in

scudderii, however I don't notice much difference in mine from Yukon and my few from Alaska, though I have too few to judge, and Kondla (Mar. 2005) says the ups color needs more study as there is contradictory information. *Alaskensis* females are supposed to be bluer on ups, but my single one is only 1/3 blue and my few *scudderii* females are completely blue or completely brown. *Subarcticus* from Great Slave Lake is probably a syn. of *alaskensis*, though Schmidt & Kondla suggest it may be darker.

Nabokovi was named as a S ssp. of *idas* at the E Canada-U.S. border, and Butt. Man. says it occurs in SE Man. *Nabokovi* has the black postmedian spot in unf cell CuA₁ more elongate than *scudderii* or *samuelis* (like the spot in *atrapraetextus* ssp. such as *longinus*), the unh margin has larger black spots at the vein ends than *samuelis*, the female ups is bluer than *samuelis*, the unh black dots are larger than those of *scudderii* and the postmedian dots are larger than the submarginal ones (postmedian spots smaller in *aster*), the uns is whiter than *scudderii* & *samuelis*, while the unh blue-green dusting is supposed to be less than *scudderii* & *aster*. *Nabokovi* was lumped into *scudderii* in Butt. Canada, which I think is an error, as the wing pattern of *nabokovi* is very similar to *aster*, which is in turn basically identical to *empetri*, as all three have much larger uns black spots in my series. *Nabokovi* occurs E of Lake Winnipeg and the Red River in SE Man. (characterized in Butt. Man. as lighter and brighter ventrally), and in NE Minn. and NE Wis., and the O.D. claimed it probably occurs in W Ont., so it seems reasonable that ssp. *aster* occurs all the way from SE Man. through Ont. and Que. to the maritimes. But Nabokov claimed that *scudderii* occurs from Alberta through Canada as far as Labrador and E Quebec, where it intergrades with *aster*; but he also claimed that *scudderii* occurs in Minn., which is wrong as the *nabokovi* there are well-spotted like *aster*, so I'd rather accept Masters' conclusion that the *nabokovi* phenotype is more widespread, all over E Canada. Handfield's Butt. Que. shows a "*scudderii*" male uns with fairly large uns black spots, and female uns with quite large spots, so it would seem that those are not real ssp. *scudderii*, and might better be called *nabokovi*. His male uns of *aster* has rather small spots, and his three *empetri* (2 male 1 female) uns have quite large spots, but my series of *aster* from Nfld. and *empetri* from N.S. have large spots and are very similar to each other, so *empetri* would seem to be a syn. of *aster* as Nabokov placed it (although Nabokov fig. a male uns of *scudderii* from Natashquan Que. and 2 male *aster* from Nfld. & Lab. with small black dots, so some in E Canada do have small dots). Nabokov figured a male from Circle Alaska (fig. 52) with large uns dots, so there must be some variation everywhere, and Butt. Man. fig. a male and female from Riding Mts. with moderately large uns dots, so maybe it will take measurements of hundreds of specimens to properly determine how the dots get bigger through E Canada. There is controversy about whether *empetri* is a syn. of *aster* as Nabokov placed it, because Kondla examined CNC specimens and found no evidence of intergradation, and it may be that *aster* on average has smaller spots, at least at some localities. There must be a voodoo curse on *nabokovi* and on books treating Wisconsin *Lycaeides*, as Butt. Canada missed *nabokovi*, Ebner's Butt. Wis. missed *samuelis* in Wis., and Opler/Krizek missed Wis. on his *nabokovi* map. To clarify the situation in Wis., the *nabokovi* O.D. gave records from Oconto & Marinette Cos. which were also identified by Nabokov (Butt. Wis. states that a colony near Waubesa Lake in Oconto & Marinette Cos. was identified by Nabokov), and there is an ovip. record for *Vaccinium* in Florence Co. surely for *nabokovi* (Butt. Wis. lists other unverified records from near Green Bay in Brown Co. and at Waupaca Co. in Waupaca Co., Keshena in Shawano Co., plus a record that must be actually *samuelis* from 3 mi. N of Webster in Burnett Co. based on the ranges of both in Minn.), while *samuelis* is listed from Burnett, Wood, & Adams Cos. Wis. by Nice & Shapiro (1999), & Nice et al. (2005) listed *samuelis* from more Wis. locales (Fish Lake in Burnett Co., Eau Claire in Eau Claire Co., Black River in Juneau Co., Sandhill in Wood Co., Welch/Hartman in Portage Co., Fort McCoy Military Res. in Monroe Co., Necedah in Juneau Co., Wood Co., Adams in Adams Co. [the counties of these sites provided by C. Nice pers. comm.]) which all seem to be in C or W-C Wis. In Minn., *nabokovi* definitely occurs in Lake, St. Louis, Cook, Itasca Cos., but the Crow Wing Co. record might be *samuelis*, and *samuelis* occurs in Winona Co. In Man., *nabokovi* definitely occurs at Whiteshell Prov. Park, Wanipigow River, near Bissett, and Sandilands. Complicating the situation, Nice et al. (2005) found that their two *nabokovi* pops. (from Marinette, Marinette Co. Wisc., and from Waubesa Lake, Oconto Co. Wis.) had gnathos completely intermediate between the *idas* & *melissa* blobs on their fig. 4, which might suggest that it has been hybridizing with *samuelis* (and might suggest we should plop *nabokovi* into *P. atrapraetextus* which would perhaps require us to plop *samuelis* back into *P. melissa* or into its own species, but the hosts etc. argue against this as noted above under *samuelis*). (Maybe *nabokovi* is a total mess consisting of misidentifications etc. galore, which will require an arduous struggle to fix; *nabokovi* currently puts the "stench" in stenchospecies, so at the moment we can surely call it a toxotaxon. C. Nice informs me that he will soon publish a paper on Wis. *Lycaeides* using nuclear DNA etc., which will surely clarify this situation.)

And now we get to real *P. melissa*. This critter can be common and widespread in mid- to lower-altitude populations, where it even becomes somewhat "weedy". It is rather polyphagous on numerous legumes, and everywhere in U.S. seems to have the ability to move into alfalfa fields and become common, without really adapting to the alfalfa (contrary to Nice & Shapiro 1999), except that N. Kondla notes that there is no evidence that it eats alfalfa in W Canada. (Does this mean that it is not obligately myrmecophilous so doesn't need ants to survive?) Real *P. melissa* always seems to have two generations, and tends to have wider orange bands, although in S BC *P. melissa* has narrower bands almost as narrow as *atrapraetextus*, which Kondla suggests is an unnamed new ssp. Nabokov treated *inyoensis* as a valid ssp., though this is somewhat dubious as its range was just a small area within the range of *P. melissa melissa*, and he lists both *melissa* and

inyoensis from Mono Co., and lists ssp. *melissa* from San Diego Co., so it would seem that his *inyoensis* concept may be more of a form than a ssp.; the genitalia and haplotype of *inyoensis* in Nice et al. (2005) are undistinguishable from *melissa*.

The lectotype *melissa* fig. by Brown (Trans. Amer. Ent. Soc. 96, 372, 1970) seems to have less orange than most *melissa*, so it might be thought that the name *melissa* refers to high-altitude populations with little orange (Brown stated on p. 373 “The series contains both true *melissa* from high altitudes and the better known atypical form from lower elevations in Colorado.”, suggesting that Brown considered *melissa* to apply to the high-altitude bugs), making *pseudosamuelis* a synonym. But other syntypes (the female fig. by Holland 1931 pl. LXVI fig. 17) have a lot of orange like low-altitude *melissa*, and Brown’s suggested TL of near Twin Lakes I expect has *melissa* that is mostly like low-altitude *melissa*, so I will treat *melissa* as applying to the low-altitude critter as it has traditionally been applied. As noted above, Brown merely guessed that the lectotype and two female paratypes were collected on La Plata Peak, and *melissa* may not even fly there. Above in the *pseudosamuelis* part I fixed this mess by showing that Holland already validly designated the *melissa* lectotype as the pl. LXVI fig. 17 female, which better fits the original description, thus Brown’s lectotype is invalid.

Was Nabokov a GOD? Incredibly, there were TWO recent books written about Nabokov--“Nabokov’s Blues”, by Kurt Johnson (an interesting book I have seen), and “Nabokov’s Butterflies: Unpublished and Uncollected Writings” ed. by Brian Boyd & Robert M. Pyle, with new translations by Dimitri Nabokov (a fine compilation I haven’t seen, that includes Nabokov’s *Lycaeides* papers). The incredible interest demonstrated by TWO recent books published by lepidopterists suggests to me that Nabokov has become a true god to a significant number of people, despite the fact that he wrote few butterfly papers. Why is Nabokov so revered? I am mystified. Evidently his approach to studying butterflies, peering at them with a powerful microscope and observing and counting the number of scale rows, and making up a dozen odd names for the various parts of the genitalia and wings, seems to have impressed certain people an astonishing amount. (Of course, the fact that Nabokov quit working on butterflies abruptly helped promote him to godhood; that is known as the Lincoln Effect, which says you’re more likely to become enshrined as a face on Mt. Rushmore or enshrined into god status if you die right after you do something good.) But analyzing *Lycaeides* objectively, it’s clear that Nabokov did not have the final answer at all. For one thing, he lumped *anna* and *idas*, even though they are now considered separate species. His species *ismenias* (now *argyrognomon*) has a lot of genitalic variation including some (fig. 44) that resemble *melissa*, and Eurasian *argyrognomon* often resemble *melissa* a lot (on uns especially), so we have to wonder, if N.A. taxa can be lumped with *idas*, why can’t our *melissa* be lumped with *argyrognomon*? Nabokov also missed ssp. *nabokovi* even though he had specimens from Minn. He lumped *samuelis* into *melissa*, because of a similarity in gnathos, when wing pattern, habitat and host specificity suggest a different placement. He didn’t properly distinguish *anna* from *ricei*. He didn’t recognize *vancouverensis* and lumped it with “*ricei*” even though it has much stronger orange bands. He examined the details of genitalia and wings in a minutely tedious manner, yet did not analyze his results much at all. He wrote that he looked at wing pattern of 2000 specimens, but didn’t properly analyze how and where the uns black dots get larger from W to E in Canada. Some people treat *empetri* as a ssp. even though Nabokov sank it. He separated *ferniensis* for little reason. He didn’t see how *atrappaetextus* and *sublivens* have rather variable gnathos as does *longinus*. He didn’t recognize large differences between *scudderi* and *atrappaetextus* (in wing pattern, gnathos, and hosts) that suggest they are separate species. He elevated a S Calif. ssp. of *melissa* that doesn’t seem to be anything more than a form, while ignoring other geographic variation in *melissa* that seems to warrant subspecies status. His work sorted specimens into taxa, but did not sort them into populations as well. He placed Asian taxa *subsolanus*, *agnata*, & *christophi* into *idas*, but other authors disagree. And finally, his conclusions were far from the final word, as the problems in *Lycaeides* just continued to multiply since Nabokov studied them, with little messes everywhere (Warner Mts., *fridayi*, *annetta*, *pseudosamuelis*, Bighorn Mts. “*pseudosamuelis*”, etc.). So, Nabokov was most definitely NOT A GOD.

To be fair, Nabokov’s work was probably better than most at that time, and R. Pyle tells me “I don’t think it was so much anal retentive as simply deep pleasure taken in careful attention to the details of nature as revealed through the crystal lens”. He failed to analyze his raw data, but it’s just as bad to overanalyze it (Nice et al. 2005 used computers blazing away for hours grinding and regrinding the data until the results that spewed out on their figs. 2-3 were mostly incomprehensible and unusable for me, though part of the problem is that recent work shows that mtDNA is not very useful for the study of phylogeny). And it’s not Nabokov’s fault that *Lycaeides* has so many problems, because those bugs definitely form a “stenschospecies”. Stenschospecies are “species” that fit only the broadest meaning of the biological species concept that includes every hybridizing relative; they are bugs that have hybridized or introgressed or converged in a manner that appears random or incomprehensible, or form a rassenkreis, or are inadequately studied because of haphazard choice of study sites or poor choice of characters or bad analysis, etc. Even a genius will have problems studying stenschospecies, because human brainpower is useless on them, so one must merely plod along and let the bugs tell you what to do, which may not be biological species but just a flawed checklist of compromised “bookkeeping species” (species that work in local lepidopterists’ checklists because there are no problems of intergradation etc. in that local area, even though such bookkeeping species intergrade etc. on a larger map). The word stenschospecies is crude. But species concepts are human constructs: the bugs have not read the book on the 23 different species concepts that currently exist, thus bugs in nature don’t care about any of them, so the stenschospecies is as valid as the “superspecies” concept, which almost noone uses, and the bookkeeping species is a better more honest description of the practical local species concept that some people once

called a “semispecies”. The stenchospecies adds the virtue of being emotionally pleasing, as the taxonomist can comfort himself knowing that it’s the stenchospecies’ fault that his brainpower is useless and the bugs fail to conform to any logical scheme as they introgress and converge and diverge in apparently random senseless ways. The stenchospecies is an honest admission that “hoo-boy, this group is a mess”, and the bookkeeping species is an honest admission that local lepidopterists are going to use a species concept that works in their region, despite intergradation somewhere else. History shows us that the bookkeeping species is the only species concept that seems to be acceptable by local practicing lepidopterists, who will not accept a species concept that has some justification on the largest map but has problems in their local area (such as being sympatric with another taxon). For instance, it is widely agreed that *Euphydryas chalcedona/anicia* intergrade in some areas and do not in others, as detailed above. The scientific treatise above attempted to determine the proper bookkeeping species of *Lycaeides*. There is one more important point: these difficult groups really REQUIRE two different species concepts to adequately report them: one species concept to cover the whole mess, in case it merges into one species in the future due to global warming for 300 years and rapid glaciation thereafter (or some other reasons) and a second concept to cover the little bookkeeping species, in case they do truly speciate and end up in different phylogenetic lineages a million years hence. It seems obvious now to me that one species concept is quite inadequate for these messes, we do need two, because the whole mess is an interlocking tangle like a pretzel, so we need a name for the whole pretzel and we need names for the arms that are quite distinct. Who says that we must use only one species concept at a time, and not two?

Papilio Bonus: My Search for Enlightenment

(a little diversion away from science, in gonzonabokovian literary style), by J. Scott

After doing this *Lycaeides* review, I was still mystified about why Nabokov is so revered, and was pondering the whole stenchospecies mess. I realized that there surely must be something here that is beyond the normal state of scientific practice, something involving human psychology or even more. I began to wonder, what would Vladimir Nabokov himself think, were he alive today and could study all the new samples we have gathered of *Lycaeides*? So I wandered down to Broadway, a street in south Denver, to search the antiquarian bookstores for *Nabokovian* lore, to try to get a greater feeling for the man and his work, and search for clues.

While on Broadway, I searched in half a dozen bookstores for Nabokov’s books, and managed to read parts of many of them before my eyelids grew heavy and my thoughts wandered to greener lands. I even found a copy of “Lolita”, and glanced at a few parts, but found it a bit dated in today’s world, in which we are bombarded with the uninhibited social antics of Paris Hilton and Michael Jackson and Liberace and Paul Rubens (PeeWee Herman), etc. Having achieved only an ambivalent state of boredom and waning interest, I shifted gears a bit and wandered into a dilapidated old antique store, full of strange interesting stuff like cast iron apple peelers and purple bottles with hand-finished necks. My eye roved to a glass case full of various antique implements of weird and lascivious nature, which I will not describe here, owing to the unpredictable effects which their form may elicit on sensitive readers. I did notice a stylish lady resting on a rocking chair nearby, deep in thought as she pored over some ancient tome. While studying the scene, I evidently forgot to notice a ripe plum that had somehow plopped out of a hole in my dilapidated paper lunch bag and must have been rolling along the dark and dusty well-worn wooden floor. When I did spot the plum, I tried to avoid it, but stepped on it anyway with the toe of my shoe, whereupon it squeezed & squozed out one way and compressed and slipped another way along the grain of the wood, with the unfortunate result that my leg was propelled backward at rapid speed, and my torso was leveraged in the other direction. I tried to catch myself, but the plum guts gooshed everywhere and my other shoe caught the mess and I leaped forward, and I would have managed to catch myself without falling, except that the stylish lady was in the way. I’m so ashamed to say that just as she was lifting her large book to her breast in surprise, my knees hit the floor, and my head and face were propelled into that space formerly occupied by her book. Yes, I’m so embarrassed to say even now, my face ended up in that dark region between the proximal portions of her lower extremities. All I could blurt out was, “MOMMY!” Meanwhile, the plum pit shot off into space and hit an antique music player on the wall, which clanged into gear and played a loud ragtime tune. I don’t remember the next few moments, but after looking meekly up, I managed to get to my feet and apologize with a pathetic kind of awkward gibberish. The look of shock and surprise which first froze upon her face gradually gave rise to an awkward look of concern with maybe a hint of amusement, and then I detected a slight smile as she surveyed the situation and said: “that was plum pitiful, wasn’t it?” I managed a weak smile, and sat down on an adjacent chair to inspect my person to make sure there were no serious knee abrasions or contusions or sprains.

After I regained my composure a bit, and the antique music player stopped, I told her about my quest to find some real meaning in Nabokov’s work. She was quite surprised, and told me that she was from Russia also, as was Nabokov, and had immigrated to the U.S. only a decade before, when things got tough after communism crumbled in the former USSR. She said that while in Russia, she had even read some of Nabokov’s books! She said that her name in Russia was Vyadja Nazrinov, at least that’s what I think it was--the way she explained her name and how she happened to be born in Hungary and move to Russia was a little confusing with her slight accent, and kind of left me in the dark at times. But I knew that this was not just some accidental coincidental encounter, it was divine providence! How else could I stumble upon someone whose name was so like Nabokov’s, who knew his work, and how else could I find this miraculous woman at just

the time I was searching for clues to Nabokov's work? It was more than happenstance, my yang had been yinned! Little did I realize the astonishing facts that were yet to come.

I won't bore you with all the details of my time with that stylish lady. She wore a large amethyst ring, that she thought may have come from the court of one of the last Russian czars. We talked about how she happened to know about Nabokov, and about some of her happy and sad times in the USSR. I asked her if Josef Stalin really murdered 20 million people as they say, and starved half the Ukrainians to death, but she said that was before her time in Russia. Her stories were as interesting as her furnishings and antiques. I did happen to glance about her abode, while she was boiling up what smelled like cabbage and bratwurst, and I spotted (in plain sight, underneath some nighties in the bottom compartment of a monstrous walnut armoire) a worn leather-bound diary, written in several foreign languages, probably Hungarian, Russian, and English from what I could decipher. I searched the dates back decades to her time in Russia, to see if there were some clue to why she knew so much about Nabokov. And there I spotted something that didn't seem to belong: an odd piece of paper taped into her diary, which was printed and appeared to be a joke, cut from some book or magazine (judging from the portion of beautiful maiden on the reverse, it was from Playboy Magazine). The joke read: "A flashy showgirl married a 91-year-old millionaire, largely in the belief that the old codger would never survive the wedding night. The wedding night arrived. While her husband was in the bathroom, the woman slipped into a black-lace nightgown and struck her most seductive pose on the bed. When the old man finally emerged, she was surprised to see that he was stark-naked except for earplugs, nose plugs and a condom. "Why are you wearing those?" the startled bride asked. "'Cause if there's anything I can't stand," he grumbled, "it's the sound of a woman screaming and the smell of burning rubber." I started laughing and snorting uproariously, and she must have heard me, because she came into the room and saw me reading the diary, glanced at the printed piece of paper on the page, and confessed to my astonishment that she had actually been married to Vladimir Nabokov for a short time, and was a little short of money then, and needed money badly. She said she wrote it, and got \$50 for it back then. I wondered, did she really send in that joke to that magazine for the money? I was too polite to ask about that part of her life, but I did notice that she walked with a bit of a limp, however I prefer now to think that it was from a twinge of arthritis or lumbago rather than an unfortunate case of scorching and vulcanization of her nether regions. Anyway, she was a good sport about it, and didn't seem to mind too much that I had been leafing through what possibly was her diary.

After consuming mass quantities of cabbage and tea, I told her more about how Nabokov worked on little blue butterflies for a few years, and how his work had inexplicably led people half a century later to write two books about him, and how he now seems to be revered as if he were almost a god, even though his work involved trying to sort the various varieties of these blues into several species based on the measurements of little parts of the male genitalia, and I told her how we now sort the same varieties differently than he did, and there are still half a dozen varieties that cannot be sorted very well. She listened politely, but asked why a grown man would want to study silly little blue butterflies, and why would we want to dissect their sexual parts? This mystified her completely, and I admit I was not able to give her an explanation that satisfied her adequately. But on one point she did agree with me, after I discussed how scientists tried to pigeonhole the varieties of animals into "species" and my theory of how I thought there were some species so muddled that they might as well be called "stenchospecies". She agreed that these little blue butterflies certainly were a stenchospecies. She asked me, "If the butterflies are stenchospecies, why do you want to study them?" I told her that I was suffering from lepaddiction, and was trying to quit. I explained that I have long been aware that my study of butterflies is really lepaddiction, a cocaine-like obsession with collecting and studying butterflies (don't tell me that you the reader haven't gotten the addiction-like "high" when you catch the fabulous *Gonzoella stupendosa* or whatever for the first time). I told her that I was somehow forced by the lepaddiction to pursue these butterflies, despite poor financial rewards and the loss of a promising career in another field, and despite laughter or overt teasing or even bullying by people who witness a lepidopterist in action. She listened politely. After I steered the conversation back to stenchospecies, she went further and said that surely the people who study them and catch them and skewer them on little pins and like to look at the sexual parts through microscopes are pretty weird too, so can they be called stenchopeople? I told her that lepidopterists were all pretty nice and normal, mostly. Then she asked, "why does it matter how they're classified anyway, or how many species there are. Aren't they all going to fry in the global warming anyway?" I agreed she was right, and told her about scientists' efforts to count all the species on earth, and how scientists disagree about whether there are about three million or 20 million species of animals in the world, mostly because there aren't enough people studying obscure creatures such as small flies and tiny mites and germs, and some people see ten species where others see only three, and now there are "butterfly watchers" whose goal seems to be to pass laws that would keep lepidopterists from collecting and studying those obscure butterflies to find out how many species there are. And I agreed that it didn't really matter anyway how many species there were, because the way people are scraping and burning all the land, a third of the world's species are going extinct anyway, and lots more will fry in the global warming. She told me that she had read a story in *Gonzo Gaia Magazine* (if I remember it right) that the only hope for the earth is massive depopulation of the human species, so that the carbon dioxide would stop being spewed into the atmosphere and the forests would regrow and suck the CO₂ out of the atmosphere. Yes that's right, I said. Then she really shocked me by saying "I read that somebody in a gene lab somewhere could combine the flu virus and the plague virus or something, maybe the duck virus, and make a virus that would spread around the world and kill

nearly everybody, couldn't they, really?" I was stunned at her incredible sagacity and could only blurt out "Yes. That's true." "So", she asked, "if you want to save the earth and all those species, shouldn't you quit doing such things to those silly butterflies, and become one of those gene jockeys?" I was so stunned at the truths she spoke, that I was speechless, and could only lift another spoonful of that cabbage stuff to my mouth. It was nearing Saint Patrick's day, and I think I was tasting corned beef swimming among the cabbage. It was kind of salty, and did have those fat blobs that like to hang out on the strings of corned beef. Hmm, paprika. Lots of paprika.

While driving home, I realized there could be no other conclusion: the whole chain of events from searching for Nabokov lore to meeting this mystical woman whose name was similar to Nabokov and who actually seemed to have been married to him for a brief time, totally confirmed my conclusion that *Lycaeides idas* represents a stenchospecies. Surely, Vladimir Nabokov must be reaching out to me by zapping me from the mystical beyond, through this stylish woman, to tell me the real truth about *Lycaeides*, that those bugs are stenchospecies, and Nabokov is NOT a god at all! This experience was surely a kind of reincarnation, through which Nabokov reached forward through time, through a mystical relativistic quantum mechanical action-at-a-distance quirk of space and time, and informed me that I was on the right track in sorting these stenchospecies and bookkeeping species. I realized something else too, the ultimate enlightenment. My concern with stenchospecies and *Lycaeides* was petty, and the tedious minutiae of Nabokov's studies are quite irrelevant compared to what we must do to fix this earth. After all, unless we start caring more about the health of our planet than about stock prices, those butterflies will croak along with the rest of the fauna and flora, and then the stocks will crash anyway.

When I got home, I glanced at the news, and learned that the famous person Hunter S. Thompson of Aspen, Colorado, had just put a pistol to his brain and pulled the trigger, committing suicide. I didn't think much of it then, who cares? In the past I had read about his exploits and got the casual impression that he was just a drunken stoned weirdo who liked to rant and rave and shoot guns. But the stories that appeared about him now all praised his "gonzo" style, as journalists and politicians and people worldwide said he had an uncanny ability to insert his strong opinions and personal antics into his journalistic reporting, and yet somehow he could distill complicated matters into astonishing truths, while other journalists merely reported the dry trivial details like 9 to 5 robots and missed the whole point of the underlying phenomenon. As I read more about Thompson, I thought, hmmm, this gonzo thing does seem to have some value, although we surely should be able to find a way to achieve insights in analyzing complex stuff without getting drunk and stoned and acting like a crackpot. Hunter S. Thompson wrote books such as "Fear and Loathing in Las Vegas", and rumor has it that he was working on another book at the time of his death, titled "Lust and Disgust Among Rich Spoiled Stupid Whores", coauthored with Trey Parker & Matt Stone who write the "South Park" TV series, a book concerning the current young generation of celebrities such as Paris Hilton, Britney Spears, and Ashlee Simpson, whose bimbo attire and moronic escapades seem to have set the women's movement back several decades. Anyway, Hunter S. Thompson seems to have inspired great admiration among journalists and among lots of famous people, including his friends the actors Johnny Depp and Sean Penn. Thompson had said that after he passed away he wanted his ashes to be shot out of a cannon on top of a tower on his beloved ranch at Woody Creek near Aspen, and in a DVD of one of Thompson's works he once specified in detail how he wanted to be shot out of the cannon, so Johnny Depp organized the memorial and filmed it. A tower 15 stories tall was built around an industrial crane at a Hollywood special-effects studio, which supported a giant fist clutching a peyote button (Thompson's gonzo symbol). So, on a fine day in August 2005 on Thompson's ranch, Thompson's ashes came blasting out of the peyote button. This gonzo cannon was evidently financed by selling prints of the apparatus signed by famous personalities. No doubt the ashes drifted eastward in the wind, and showered the type locality of *pseudosamuelis* (east of Aspen) with gonzo dust.

Now, what could be more gonzo than stenchospecies? It adds another name to the array of 23 species concepts that already exist—all of which are human constructs that butterflies in nature care absolutely nothing about, since they have not read the species concept book—and injects an emotional element into the species concept, which helps us cope emotionally with those numerous cases in nature where the taxa do not seem to be either species or subspecies and they seem to hybridize and introgress in a seemingly haphazard or random way that is hard for us to simplify or understand or emotionally appreciate. We can think of the stenchospecies, and its slave the bookkeeping species, as the gonzo version of the "superspecies", and the "semispecies", which are so dull that noone currently uses them. I actually think that calling these megalumped species like *Euphydryas chalcedona/colon/anicia/bernadetta* "stenchospecies", has helped me insult them enough in my mind, that I am able to move onward to the proper mindset to construct the "bookkeeping species", which are the local species that work in those smaller regions where the bugs do behave like biological species (for instance *anicia* and *bernadetta* are separate species in central Wyo. and Mont. and Alta. and Sask., even if they may? intergrade a bit in Colo.). The timing of the passing of Hunter S. Thompson, at the same time that I needed understanding of Nabokov's work, has to be added to the previous "coincidences" of my evidently communing with Nabokov himself through his "wife", and really nails the matter. *Lycaeides* is a stenchospecies for sure. But I digress into biology. Back to the story:

That night in bed, thoughts whirled through my head. Was Nabokov dead? I dreamed of wings, long leggy things, and amethyst rings. The wings were blue, held on with glue, with orange spots too. The bodies were black, two gnathos out back, held on with tacks. As I popped off the tacks, and lowered gnathos with jacks, the feds burst in and made nasty cracks. I let out a scream, in my buggy-wing dream, as I stared at the uniformed team. I didn't feel swell, was I going to a

cell, and then on to hell? I began to wail, would I be sent to jail, to be hung on a nail? The blood in my face drained, but I was restrained, as they curtly explained: “You can’t possess bugs, or anasazi rugs, or hootch-filled jugs.” (Sensing my consternation, the uniformed officers then carefully explained how the new Jeffrey Glassberg Law made it illegal to collect or possess any dead insects, and only binoculars were to be used for entomological work, and all microscopes and electrophoresis machines and DNA sequencer machines were now illegal [plus any other machine to be used on dead parts of insects], and were being rounded up for ecological recycling.) “We flew out this way, many Bush leagues today, to take your bugs away.” With determined looks, they seized my books, and fired them like experienced cooks. Squinting a nasty glare, seeming not to care, they pulled the butterflies rare, until my drawers were bare. The bodies of my critters, they carted off with litters, and fried them into crispy fritters. With devilishly fiendish grins, they yanked the insect pins, and tossed them all in bins. Pins were melted into steel, poured and left to anneal, then formed into binocular wheel. Next they attacked my drawers’ glass, which I thought was very crass, but they smashed them all in just one pass. Using a hand, they dug into land, and found some sand. Glass and sand were melted en masse, then poured and quenched by a stocky lass, and polished into binocular glass. They looked rather smug, as they used Anasazi rug, to polish each glass slug. On to the foam, they did roam, until my bugs had no home. The process looked spastic, but from the foam elastic, they made molten plastic. I didn’t feel well, from the awful smell, of the plastic gel. The scene was so fantastic, I considered doing something drastic (get my gun, shoot every one, then run?), but the smell churned my gastric. Wooden drawers they stacked higher, until they made a large spire, then they tossed them on the fire. They ate up the fritters, that they fried from my critters, and washed ‘em down with hootchy bitters. One nasty bloke, began to smoke, swilled a coke, and told a joke. From the plastic & glass & steel they purloined, they fused and molded and squeezed and joined, for Glassbernoculars--the word they coined. They smoothed the bowels, with plastic and trowels, and installed lenses with dowels. With shiny new screws, and some sticky glues, binoculars were joined in twos. They focused real small, and were stacked by the wall, so they wouldn’t fall. And so it went, until they were spent, and my drawers and bugs were rent. Then they were stoned, as I groaned and moaned. They packed up their stuff, and were pretty gruff, as they left in a huff. About jail I needn’t worry, cause they left in a hurry, after snorting more slurry. For my bugs I grieved, but I was relieved, no jail for me I perceived. I gave a big guffaw, cause I avoided the maw, of the Glassberg Law. As they left in a clatter, I started to chatter, it didn’t really matter. With no specimens to study, will science be cruddy, will scientists go nutty? Not me, I laughed with glee, hee hee hee! No more stenchospecies, no more bookkeeping species, no more “biological” greasies. Taxonomy will be frozen in time, like an Alice-In-Wonderland rhyme, no more nasty e-mail slime. Species will be fixed, opinions unmixed, corrections nixed. Glassberg Law cannot be denied, NABA checklist will decide, which no scientist can deride. The NABA checklist rules!, constructed by fools, no need for scientific tools. It started to seem, as I lay in my dream, that I began to beam. But as I lay asleep, the clock began to beep, and I rose with a leap. I was all wet, covered with sweat, but realized yet, I still had my net. I still could catch, a brand new batch, of this year’s hatch. Those awful binocs, are a pile of crocks, let’s smash ‘em all with rocks! I can still collect I hope, and I need my microscope, but Glassberg Law?--nope! My bugs were still here, but I felt kinda queer, cause this time next year, would they be near? I had a very traumatic night, because my dream was full of fright, but logic and reason is in sight, so maybe laws will turn out right (if only my proposed INSECT STUDY, COMMERCE, AND CONSERVATION LAW in Papilio [New Series] #17 could become U.S. law!).

So, there you have it, the story is finished. If Vladimir Nabokov were still alive today, with all his mental faculties sparkingly-sharp as they were when he brilliantly came down from Mount Harvard and gave us his *Lycaeides* commandments, he would survey the *Lycaeides* situation, and would certainly agree that, indeed, North American *Lycaeides* is a stenchospecies that does contain some bookkeeping species. And he would agree that we still need to collect and study actual specimens, and preserve habitat and stop destroying land and stop spewing out CO₂, rather than blame collectors for the steady loss of butterfly populations. After all, a billion butterflies are whacked by cars each year in the U.S. judging by that Illinois study in J. Lepid. Soc. a few years ago, and 100 million! insects were collected by amateurs in Sweden in 2003-2004 for the Swedish Species Information Center to survey that nation’s fauna (Science magazine, 18 Feb. 2005 p. 1039). And were Nabokov here today, he would surely contribute \$ and some of his precious time to construct a good law regulating all aspects of insect study and commerce and conservation, and send it to all senators and congressmen to make sure that butterflies, and our ability to study them, are preserved.

***Plebejus (Lycaeides)* continued: Conclusion**

Because *Lycaeides* “idas” is a stenchospecies, there are bound to be differences of opinion and no single checklist is likely to be correct, so let’s list all the alternates. To save space, and considering the gonzo style this essay has embraced, I use the name “bighornimuelis” for the Bighorn Mts. “*pseudosamuelis*” population to add a bit of humor (also honoring the braying quadruped which also emits some pretty aromatic stuff), with the understanding that the bug is NOT being formally named here and does not fulfil the requirements of the ICZN code for valid naming and thus should not be used in any other scientific publication.

Stenchospecies Concept:

P. idas includes *kamtchatica*, *anna*, *scudderi*, *atrapraetextus*, & evidently even *melissa*, because there isn’t much sympatry or overlap between these taxa, and where it occurs it is mostly associated with altitudinal or temporal or habitat

differences that allow little interbreeding, and yet all of these taxa seem to have interbred to some extent, the mtDNA is a mishmash of polymorphism, and taxa such as *nabokovi* & *benwarner* & *fridayi* & *sublivens* have intermediate gnathos. This stenospecies perhaps could even include some of the taxa now included in Eurasian *argyrognomon* that I know nothing about, plus *ismenias*. Certainly all popular field guides should adopt this species concept.

My current arrangement of Bookkeeping Species (all of them rather weak)(with NEW COMBINATIONS)

Plebejus anna, incl. *anna=ricei*, *vancouverensis*, *azureus*, *lotis*. Common name Anna Blue.

P. scudderii, incl. *kamtchatica*, *alaskensis*, *scudderii*, *aster=empetri* (perhaps a distinct ssp.), *nabokovi*. Usual common name Northern Blue. I like the common name Eric The Blue, a takeoff on the viking Eric (from the Ericaceae hosts) the Red (changing red to blue because of the ups wing color). Maybe this sp. could be combined with *P. idas*, but P. Gorbunov indicates that the situation across Russia is poorly studied.

P. atrapraetextus, incl. *atraprae.=ferniensis*, *longinus*, *sublivens*, *benwarner*, *fridayi*, *annetta*. Common name Hybrid Blue.

P. samuelis is perhaps best called a separate species, or a ssp. of *atrapraetextus*.

P. melissa, incl. *melissa* (note **Holland's 1931 lectotype designation to pl. LXVI fig. 17 and current TL restriction to Tinytown, Jefferson Co. Colo.**), unnamed S BC ssp., (*inyoensis* if it is not a syn.), *pseudosamuelis* & *bighornimuelis* (not a valid scientific name). Common name Melissa Blue or Orange-Margined Blue.

Other species concepts, that I don't like:

Worship the God of Genitalia Species Concept:

Plebejus anna, incl. *ricei*, *azureus*, *lotis*.

P. idas, incl. *kamtchatica*, *alaskensis*, *scudderii*, *aster*

P. atrapraetextus, incl. *sublivens*, *benwarner*, *nabokovi*, *fridayi*

P. melissa, incl. *inyoensis*, *annetta*, *pseudosamuelis*, *bighornimuelis* (not a valid scientific name), *samuelis*

"Phylogenetic" Species Concept:

Of course every taxonomist thinks that his species are the one and only true phylogenetic species, so the name of this species concept is pompous and demeaning toward others' species concepts. While the biological species concept focuses on reproductive isolation, the "phylogenetic" species concept as Joel Cracraft defined it can ignore that while it focuses on the practical ability to diagnose each species. But Felix Sperling suggests that any diagnosable population (diagnosable with character states) qualifies as a Cracraft phylogenetic species, thus the number of "phylogenetic species" recognized inevitably increases as new genetic markers are studied and better microscopes are used. Thus Cracraft's phylogenetic species concept is a museum taxonomist's dream, as there is no need to bother with messy hybridization studies etc. and one can just designate species based on the characters shown by museum specimens, and one can raise all the distinctive ssp. to species status if one desires, without the bother of rearing bugs and studying their immatures, or doing similarly messy biological research. But if the idea of a true phylogenetic species is to make sure that the "species" includes all the populations that will not be contaminated by genes from other species, then the "phylogenetic species" must be broad and inclusive, and must include *anna*, *idas*, and *melissa*, as they can apparently still trade genes. If the idea for each "phylogenetic species" is to include each taxon that will extend onward through time without extensive modification, then we have real trouble, as *alaskensis-scudderii* and *melissa melissa* will surely continue because of their giant ranges, and maybe *anna* will continue, but *samuelis* will surely fry in the global warming and development, and *atrapraetextus* and the peripheral little bits near it (*benwarner*, *fridayi*, *annetta*, *pseudosamuelis*) is a mess that has introgressed with surrounding taxa so who can say how those bits will change or be absorbed into *melissa*. But I can't really predict what this "phylogenetic" species concept would produce, as apparently practiced by people who say they do not believe in subspecies (and say that they do not use reproductive isolation in their species concept) so they inevitably raise all the distinctive ssp. to species status; I do not understand how reducing the infinite number of degrees of difference that occurs in nature to only one degree (species) is an adequate description of nature (subspecies and infrasubspecies and tetrasubspecies would add more degrees of difference, thus making the checklist accord more with nature). My guess is these four species:

P. anna; *P. idas*; *P. samuelis*; *P. melissa*

This scheme without ssp. is much too skimpy for me!

Hostplant Species Concept:

P. scudderii (includes *alaskensis*, *aster*, *empetri*, *nabokovi*) eats Ericaceae.

P. idas (includes all the others, *anna*, *atrapraetextus*, *melissa*, etc.) eats legumes.

***Hesperia comma colorado* (Scudder), by J. Scott**

In Papilio #11 I treated *colorado* as a distinct species, from *H. comma* (L.). After further review of the situation in Canada, I now believe that the published information was incorrect or insufficient, and that *colorado* may actually be just a ssp. of *H. comma* after all, as there is no actual sympatry of *manitoba* (Scudder) and *assiniboia* (Lyman) in the Cypress Hills as was alleged. There does not seem to be any convincing published evidence as yet that there is more than one species in North America. The gene sequencing work done so far (M. Forister, J. Fordyce, A. Shapiro 2004, in Molec. Ecol.) did not support that particular division (it suggested that there were four groups, Eurasia-Alaska, Oregon-N Calif., S Calif., and BC-Rocky Mts.). More work is required. In the western foothills of the Sierra Nevada several phenotypes

(resembling *yosemite* and near *leussleri/idaho*) occur, near-sympatrically but allochronically, one of them preferentially on serpentine, as A. Shapiro and his students and Ken Davenport have discovered. Cris Guppy notes that there are several entities in BC that appear distinct. Steve Kohler finds three major groups in Montana which do not fly together because of different altitudes and flight times. But the group is a mess, and a lot of work is going to be required, more than just mtDNA analyzed from a few specimens. The group is nearing stenospecies status, but thus far there seems to be no strict sympatry in which two entities fly together at the same place and time, and no reproductive isolation has been demonstrated anywhere, so the group still qualifies as just one species thus far to me, until research might prove otherwise.

Hesperia comma "oregonia" (W. Edw.), toxotaxon, by J. Scott

A. Shapiro and A. Warren questioned my treatment of the name *oregonia* (Scott 1998, Papilio [New Series] #11), in which I lumped it in with *yosemite* Leussler as being another synonym of *harpalus* (W. Edwards). I did that merely to try to get rid of the *oregonia* name because the name is ambiguous, and because the lectotype resembles *harpalus*=*yosemite* somewhat, and does not fit MacNeill's concept of *oregonia*. The TL was only "Cal.", but as F. Brown and L. Miller noted, Oscar Baron's itinerary suggests Trinity County as a plausible site, and Shapiro has found populations that are incredibly variable intergrade messes in northern California, so it is most likely that the *oregonia* type came from such an intergrade mess. So, I hereby retract everything I wrote about *oregonia*, and I now return it to the intergrade mess it came from. Thus it is still a useless ssp. name (definitely a toxotaxon), but people can perhaps stretch its concept to fit whatever phenotypes they want in that intergrade mess. The dark Cascade mts. creature is better called *hulbirti* Lindsey than *oregonia*.

***Polites peckius surllano* J. Scott, NEW SUBSPECIES, Plate IV**

Definition: The unh yellow patch averages smaller. This patch varies greatly in size individually throughout North America, which has been noted by numerous people. But the average size is less in NE Colorado and Nebraska, and also appears to be smaller in specimens from Missouri. Ssp. *surllano* is a prairie taxon, from the southern Great Plains, hence the **name** *surllano*, from the spanish language words sur=south and llano=plains (pronounced suer-yano). Strangely, its presence in Colorado seems to be a recent spread from Nebraska, because it was not known in eastern Colorado when F. Brown, D. Eff, and B. Rotger published the book Colorado Butterflies in 1957 (they only knew of one mountain record, from Saguache Co., of ssp. *peckius* [Kirby]). The earliest record from eastern Colorado seems to be Donald Eff's 1965 specimen from Bluebell Can., Boulder Co. Colo. By 1971 it was enormously common in the Denver metropolitan area, and remained common for a decade or two, then it and *Polites themistocles* became scarce in Denver, perhaps because parasitoids finally followed *peckius* into Denver and multiplied and reduced the numbers of both species. In the last few years (2002-2004), both *Polites* seem to have become common again in Denver. In the 1970s one could catch more than 100 adults in just a few hours at the type locality, where males would perch in grassy swales and adults loved to sip nectar from *Liatris punctata*. **TL & holotype** male and allotype female Green Mountain, Jefferson Co. Colorado (holotype male Aug. 30, 1971, allotype female Aug. 12, 1977, both BMNH). About 519 paratypes from NE Colo. and Neb. in J. Scott collection. **Range:** Ssp. *surllano* occurs on the Colorado plains, east to Nebraska and W Missouri and evidently Iowa and perhaps Illinois. My specimens from Missouri have small unh patch, like the male and female fig. by Heitzman & Heitzman (1987). The range may extend to central Indiana also, because both specimens fig. by Shull (1987) have a small patch. In contrast, the adults fig. from Wis. (Ebner, 1970) and Man. (Klassen et al. 1989) have the large patch that is usual in ssp. *peckius*. Nominate ssp. *peckius* seems to occur over most of boreal and eastern North America. Ssp. *peckius* occurs in Colorado only in the higher mountains (in the broad valley in eastern Gunnison Co. and adjacent Saguache Co.), and in the boreal White Mts. of Arizona (these mountain populations in Ariz. and Colo. have a large unh patch thus seem to be ssp. *peckius*). Ssp. *peckius* ranges northward in the Rockies to B.C., and eastward across Canada, then southward in eastern U.S. Ronald Gatrell (pers. comm.) informed me that 31 specimens from 4 locations in the S Appalachians (Rabun Co. Ga., Clay & Macon Cos. NC) are normal *peckius* on the unh, and suggests that photos in books indicate that all eastern U.S. material is ordinary *peckius*. He has 3 specimens from Iowa (Shelby Co. in W Iowa, Johnson Co. in central Iowa) and 1 from NE Illinois that resemble ssp. *surllano*. Evidently ssp. *surllano* is a prairie entity with about the same range as *Problema byssus kumskaka* and *Euphyes bimacula illinois*. **Other names:** The name *peckius* was named by Kirby in 1837, from "North America", the type apparently lost. Kirby's painting has a rather large unh patch characteristic of the boreal ssp. Kirby's name was surely from NE U.S. or Canada, so I will not designate a neotype here, but to avoid confusion I will simply restrict the type locality of *peckius* to "NE U.S. or SE Canada"; this restriction will set *peckius*' range apart from *surllano*'s, and allow a subsequent Kirby expert to perhaps declare a neotype if necessary or restrict the TL of *peckius* further. The name *wamsutta* (Harris), TL Mass., historically has been treated as a synonym of *peckius*. The *wamsutta* type is "lost", but R. Gatrell (pers. comm.) tells me that there is a holotype of *wamsutta* in MCZ; however, Gatrell thought that none of those MCZ Harris types may be valid because none of them were designated as type by Harris and none have a type label on them written by Harris, so someone at MCZ may have just gone through Harris' material and stuck "type" labels on them long after the names were published. I will not deal with the name *wamsutta* further here because it still seems to be a syn. of *peckius* and has nothing to do with ssp. *surllano*. **Biology:** Females of this species drop eggs into the turf grass without glue, and the larvae evidently wander a bit to find green grass, and then larvae must construct semi-

underground silk tube nests to remain hidden in the turf. In Denver the species can be common on *Poa pratensis* lawns, where the underground/underclump larval nests are not visible.

***Notamblyscirtes* J. Scott, NEW GENUS within Hesperidae, Hesperinae**

This genus was inadvertently but validly named by Scott (1992) in Papilio (New Series) #6. That publication fulfilled all the requirements for valid naming in the ICZN code, including the designation of the type species *simius* (the only species in the genus), definition of how the genus differs from real *Amblyscirtes* (with which it was formerly combined), etc. The only change is that Scott (1992) used the name *Not-Amblyscirtes*, which according to the code must be emended to *Notamblyscirtes* by removing the hyphen and quotation marks. Thus the full citation is *Notamblyscirtes* Scott (1992), Papilio (New Series) #6 (if anyone believes that it was not validly named in 1992, they will then use the present publication date 2006). *Notamblyscirtes simius* differs from true *Amblyscirtes* in numerous ways: the aedeagus and saccus are shorter versus very long; aedeagus has 2 cornuti vs. none; uncus tips are not connected to gnathos tips vs. connected; lamella and ductus bursa rather membranous vs. well-sclerotized; 3rd palp segment shorter and directed more anteriorly vs. longer and nearly vertical; mating occurs on hilltops during early morning, versus gulch bottoms all day long; hostplant a narrow-leaf turfgrass vs. broad-leaf hay- or hay-bunch grasses; egg develops red rings vs. no rings; unfed 1st-stage larvae hibernate vs. fed mature larvae; larval nest in soil and lower part of leaves vs. aerial among leaves; older larval head lacks fangs vs. spectacular dracula fangs; mature larval collar green vs. black; side of mature larval head unstriped vs. conspicuously striped; mature larva lacks waxy powder vs. usual powder; pupal cremaster extends ventrally and lacks crochets vs. posteriorly with crochets. These numerous differences are spectacularly immense, and suggest that these genera are not even close relatives of each other. This is another case—along with *Atrytone* versus *Anatrytone* (which Scott 1992 split into two genera, also in Papilio #6)—in which adult differences are not great, but the differences in immatures and biology are huge and clearly prove that the species belong to very distinct genera.

CONCLUSION, by J. Scott

In 1961, Paul R. Ehrlich published a paper “Has the Biological Species Concept Outlived its Usefulness?” (Syst. Zool. 10:167-176), in which he questioned whether the biological species concept has much value, and suggested that newer concepts such as numbers from numerical taxonomic studies etc. might be more useful. Ironically, he thought that the taxa recognized as species within the *Oeneis chryxus* group were a matter of personal opinion. Now we have clarified that group of bugs considerably, so we’re dealing more with facts than opinion. But we’re still having a lot of trouble with species concepts. Some kind of species concept will always survive, because people have to name the bugs something, and the “something” automatically becomes a species concept. And the biological species concept still has a logical foundation that is just as admirable as ever. But it’s not just the biological species concept that is having trouble, ALL of them are hard to apply because the bugs don’t care about any of them. (And maybe soon it will be possible to zap the DNA with a little machine and identify each wild bug fairly well, making cumbersome Linnaean taxonomy mostly unnecessary.) But one aspect of the biological species concept should be more widely respected: If two bugs are sympatric but allochronic, that situation is really equivalent to being synchronic but living a long distance apart, because in either case they cannot possibly meet to hybridize, so a case of sympatric but allochronic is not a fair test of reproductive isolation. So the frequent current practice of people automatically assigning two populations to two different species if their ranges overlap but are completely allochronic, is wrong. Also, for difficult groups that suffer from multiple problems of hybridization and introgression and convergence and poor study etc., we should use TWO species concepts SIMULTANEOUSLY: the stenospecies concept (or superspecies if you prefer a more polite term) for the whole mess that can trade genes (the links of the mess being hybridization), and the bookkeeping species (semispecies if you wish) for those local species that work in those parts of the mess where several taxa look distinct. This dual species concept still involves the biological species concept in a way (the stenospecies uses hybridization to construct a network linking all the taxa that can exchange genes over a large range, the bookkeeping species uses lack of hybridization to separate species in a small area). The popular books can use the stenospecies (in many cases, the bookkeeping species cannot be identified very well anyway), while the local scientists can struggle to try to devise the best local checklists of bookkeeping species.

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LITERATURE CITED

- Austin, G. T. 1998. *Callophrys* (Lep.: Lyc.) in Nevada, with description of a new subspecies of *C. comstocki*. Syst. W N.A. Butt., Chapter 49 p. 619-628.
- Austin, G. T. 2002. Female N.A. *Everses* and the identity of *Lycaena sissona* W. G. Wright, 1905 (Lyc.). J. Lepid. Soc. 56:292-5.
- Austin, G. T., & D. D. Murphy. 1998. Patterns of phenotypic variation in the *Euphydryas chalcedona* complex (Lep.: Nym.) of the southern intermountain region. Syst. W N.A. Butt. chap. 31:419-432.
- Austin, G. T., D. Murphy, J. Baughman, A. Launer, E. Fleishman. 2003. Hybridization of checkerspot butterflies in the Great Basin. J. Lepid. Soc. 57:176-192.
- Ballmer, G., & G. Pratt. 1988. A survey of the last instar larvae of the Lycaenidae of Calif. J. Res. Lepid. 27:1-81.
- Bauer, D. L. 1975. Tribe Melitaeini. In: W.H. Howe (ed.), The Butterflies of North America. Doubleday, New York. 633 p.
- Bird, C., G. Hilchie, N. Kondla, E. Pike, F. Sperling. 1995. Alberta Butterflies. Prov. Museum, Edmonton. 349 p.
- Brown, F. M. 1973. The types of the pierid butterflies named by William Henry Edwards. Trans. Amer. Ent. Soc. 99:29-118.
- Brown, F. M., D. Eff, & B. Rotger. 1957. Colorado butterflies. Denver Mus. Nat. Hist., Denver. 367 p.
- Brown, F. M., & G. Brown. 1996. Chasing butterflies in the Colorado Rockies with Theodore Mead in 1871. Bull. #3 Pikes Peak Res. Stn., Colo. Outdoor Educ. Center, Florissant CO, 73 p.
- Daily, G. C., P. R. Ehrlich, & D. Wheye. 1991. Determinants of spatial distribution in a population of the subalpine butterfly *Oeneis chryxus*. Oecologia 88:587-596.
- DeVoto, B., ed. 1953. The journals of Lewis and Clark. Houghton Mifflin Co., Boston, New York. 504 p.
- Ebner, J. A. 1970. The butterflies of Wisconsin. Milwaukee Public Mus. Popular Sci. Handbook #12. 205 p.
- Emmel, J. F., & G. F. Pratt. 1998. New subspecies of Lycaeninae from Calif. and a stype locality restriction for *Chrysophanus cupreus* W. H. Edw. (Lep.:Lyc.). Syst. W N. Amer. Butt., Chapter 52 pp. 661-680.
- Emmel, J. F., T. C. Emmel, & S. O. Mattoon. 1998. New Theclinae ssp. of Lycaenidae from Calif., separation of *Inc. mossii* and *I. fotis*, and seven species groups of the subgenus *Callophrys*. (Lep.: Lyc.). Syst. W N.A. Butt., chapter 13, pp 159-170.
- Emmel, T. C., M. C. Minno, & B. A. Drummond. 1992. Florissant butterflies. Stanford Univ. Press, Stanford, Calif. 118 p.
- Ferris, C. D. 1972. Notes on certain species of *Colias* (Lepidoptera: Pieridae) found in Wyoming and associated regions. Bull. Allyn Mus. #5:1-23.
- Ferris, C. D. 1973. A revision of the *Colias alexandra* complex (Pieridae) aided by ultraviolet reflectance photography with designation of a new subspecies. J. Lepid. Soc. 27:57-73.
- Ferris, C. D. 1977. Taxonomic revision of the species *dorcas* K. and *helooides* Bdv. in the genus *Epidemia* Scudder (Lyc.). Bull. Allyn Mus. #45:1-42.
- Ferris, C.D. 1993. Reassessment of the *Colias alexandra* group, the legume-feeding species, and preliminary cladistic analysis of the North American *Colias* (Pieridae: Coliadinae). Bulletin of the Allyn Museum 138:1-91.
- Fisher, M. 1998. *Satyrrium sylvinus nootka*, In J. Scott 1998, New western North American Butterflies. Papilio (New Series) #11, p. 4-5.
- Freeman, T. N. 1939. Notes on the distribution of *Plebeius aquilo* Bdv. with the description of a new race from Manitoba (Lep., Lycaenidae). Can. Ent. 71:178-180.
- Gillette, C. F. 1983. A revision of the "megalithic" *Colias alexandra* complex (Pieridae) with the discovery of a newly recognized species of *Colias* in Utah. MS Thesis, Dept. of Geography, Univ. of Utah. Reprinted in Utahensis vol. 7(#3), 1987.
- Gillette, C. F. 1989 ("autumn 1988", May 17, 1989). The general biology and distribution of *Colias occidentalis* in Utah with the naming of a new subspecies. Utahensis 8:38-51.
- Gorelick, G. A. 1968. A biosystematic study of two sp. of *Callophrys* (Call.) in Calif. (Lyc.). J. Lepid. Soc. 25:suppl. 2, pp 1-41.

- Gorelick, G. A. 2005. A review of *Callophrys affinis* (W. Edw.), with descriptions of two new ssp. from New Mex. and Mex. J. Lepid. Soc. 59:181-199.
- Guppy, C. S., & J. H. Shepard. 2001. Butterflies of British Columbia. UBC Press, Vancouver. 414 p.
- Hammond, P. C., & D. V. McCorkle. 2003. A new desert ssp. of *Colias occidentalis* (Pieridae) from southeastern Oregon. J. Lepid. Soc. 57:274-278.
- Harry, J. 2005. Immature stages of *Colias occidentalis sullivanii* from Oregon (Lep.: Pier.). The Taxonomic Report of The Int. Lep. Survey. 6(2):1-4.
- Hayes, J. L. 1980. Some aspects of the biology of the developmental stages of *Colias alexandra* (Pier.). J. Lepid. Soc. 34:345-352.
- Heitzman, J. R., & J. E. Heitzman. 1987. Butterflies and moths of Missouri. Missouri Dept. Conservation, Jefferson City Mo. 385 p.
- Holland, W. J. 1931. The butterfly book, revised edition. Doubleday & Co., Garden City, New York. 424 p., 77 pls.
- Hooper, R. R. 1973. Butterflies of Saskatchewan. Sask. Mus. Nat. Hist., Regina. 216 p.
- Klassen, P., A. R. Westwood, W. B. Preston, W. B. McKillop. 1989. The butterflies of Manitoba. Manit. Mus. Man & Nature, Winnipeg. 292 p.
- Klots, A. B. 1951. A field guide to the butterflies of N.A., east of the Great Plains. Houghton Mifflin Co., Boston. 349 p.
- Kondla, N. G. 1981. Skippers and butterflies of a disjunct aspen parkland in the Wintering Hills. Blue Jay 38:4-12.
- Kondla, N. G. 1993. The *Colias alexandra* complex in Alberta. Alberta Naturalist 23:57-61.
- Kondla, N. G. 1995. Sulphur butterflies of the *Colias alexandra* complex in Alberta. Blue Jay 53:15-27.
- Kondla, N. G., & C. S. Guppy. 2002. Name-bearing types and taxonomic synopsis of three Lycaenid butterfly taxa from W Canada (Lep.:Lyc.). The Taxonomic Report of Int. Lep. Survey 3(6):1-11.
- Layberry, R. A., P. W. Hall, & J. D. Lafontaine. 1998. The butterflies of Canada. Univ. Toronto Press, Toronto. 280 p., 32 pls.
- Leussler, R. A. 1920. A new *Euphydryas* from Nebraska (Lep.). Entomological News 31:102-103.
- Nice, C. C., & A. M. Shapiro. 1999. Molecular and morphological divergence in the butterfly genus *Lycaeides* (Lep.: Lyc.) in N.A.: evidence of recent speciation. J. Evol. Biol. 12:936-950.
- Nice, C. C., & A. M. Shapiro. 2001. Patterns of morphological, biochemical, & molecular evolution in the *Oeneis chryxus* complex (Lep.: Satyridae), a test of historical biogeographical hypotheses. Molecular Phylogenetics & Evolution 20:111-123.
- Nice, C. C., J. A. Fordyce, A. M. Shapiro, R. Ffrench-Constant. 2002. Lack of evidence for reproductive isolation among ecologically specialised lycaenid butterflies. Ecol. Ent. 27:702-712.
- Nice, C. C., N. Anthony, G. Gelembiuk, D. Raterman, R. Ffrench-Constant. 2005. The history and geography of diversification within the butterfly genus *Lycaeides* in North America. Molecular Ecology 14:1741-1754.
- Pyle, R. M. 2002. The butterflies of Cascadia. Seattle Audubon Soc. 420 p.
- Royer, R. A. 2003. Butterflies of North Dakota: atlas and guide. 2nd ed. Science Monograph No. 2, Minot State University, Minot, North Dakota, 192 p.
- Schmidt, B. C., D. A. Macaulay, N. G. Kondla, D. Lawrie and G. Anweiler. 2003. Additional butterfly records from Alberta, 1999-2002. Blue Jay 61:110-124.
- Scott, J. A. 1974. Adult behavior and population biology of *Poladryas minuta*, and the relationship of the Texas and Colorado populations (Lep.: Nym). Pan-Pac. Ent. 50:9-22.
- Scott, J. A. 1978a. The identity of the Rocky Mountain *Lycaena dorcas-helloides* complex (Lyc.). J. Res. Lepid. 17:40-50.
- Scott, J. A. 1978b. A survey of valvae of *Euphydryas chalcedona*, *E. c. colon*, and *E. c. anicia*. J. Res. Lepid. 17:245-252.
- Scott, J. A. 1984. A review of *Polygonia progne (oreas)* and *P. gracilis (zephyrus)* (Nym.), including a new ssp. from the S Rocky Mts. J. Res. Lep. 23:197-210.
- Scott, J. A. 1986. The butterflies of North America. A Natural History and Field Guide. Stanford Univ. Press, Stanford, Calif. 583 p.
- Scott, J. A. 1988. Biology of *Polygonia progne nigrozephyrus* and related taxa (Nym.). J. Lepid. Soc. 42:46-56.
- Scott, J. A. 1992. Hostplant records for butterflies and skippers (mostly from Colorado) 1959-1991, with new life histories and notes on oviposition, immatures, and ecology. Papilio (New Series) #6, 185 pages (incl. p. 21a-m).
- Scott, J. A. 1998. New western North American butterflies. Papilio (New Series) #11, 12 p.
- Scott, J. A. 2006. *Phyciodes (Phyciodes)*: more progress. Papilio (New Series) #13, ~40 p.
- Scott, J. A., S. L. Ellis, J. D. Eff. 1968. New records, range extensions, and field data for Colorado butterflies and skippers. J. Lepid. Soc. 22:159-171.
- Scott, J. A. & J. A. Justice. 1981. Intergradation between *Callophrys dumetorum oregonensis* and *C. dumetorum affinis* in Northwestern U.S. (Lyc.). J. Res. Lepid. 20:81-85.
- Scott, J. A., N. G. Kondla, & S. M. Spomer. 1998. *Speyeria hesperis* & *S. atlantis* are distinct species. Papilio (New Series) #8, 31 p.

- Scott, J. A., & G. R. Scott. 1978. Ecology and distribution of the butterflies of Southern Central Colorado. *J. Res. Lepid.* 17:73-128.
- Shull, E. M. 1987. The butterflies of Indiana. *Indiana Acad. Sci.*, Bloomington. 264 p.
- Smith, M. J., & J. Brock. 1988. A review of the *Thessalia leanira* complex in the SW U.S. (Nym.: Mel.), with a descr. of two new ssp. of *Thessalia fulvia*. *Bull. Allyn Mus.* #118.
- Warren, A. D. 2005. Butterflies of Oregon. Their taxonomy, distribution, and biology. *Contrib. Gillette Mus. Arthropod Diversity, Colorado State Univ., Lepid. North Amer.* 6:408 p.
- Werner, J. K., B. A. Maxell, P. Hendricks & D. L. Flath. 2004. Amphibians and reptiles of Montana. Mountain Press Publishing, Missoula, Montana. 262 p.

Papilio Bonus:

JOB ANNOUNCEMENTS

The International Commission on Zoological Nomenclature announces the following career position openings for immediate placement: DEOBFUSCATOR (one position). The deobfuscator will examine correspondence from zoologists worldwide and will properly convey corrections to the Code to the Commission for correcting the next edition. This position is necessary because errors in prior code were not corrected. Scott & Wright (see 1991, *J. Res. Lepid.* 30:257-260) officially informed the ICZN that the example at the end of 1985 Art. 45(g) was grossly misleading in implying that infrasubspecific names raised to subspecies rank take authorship and date from the original publication of the infrasubspecific name. 1985 article 87(b) states that "Examples do NOT form part of the legislative text of the Code", so the example must be ignored because the implication contradicts articles 23(j), 50(c)(i), 10(c), & 45(g)(ii)(1), etc. The ICZN ignored the correction, and published in the 2000 4th ed. Code, a different Polinski example 45.6.4.1 which repeated the same mistake in implying that names raised to subspecies rank take authorship and date from the original publication of the infrasubspecific name!, contrary to all other articles in the code. The morons responsible for errors such as this have been fired, so a deobfuscator is required. SEX-TROLLERS (twelve positions). 4 years training in the latin language is required; no knowledge of biology is needed. These employees will troll through the world's checklists of animal species, and catch those species and subspecies names whose suffixes have not been correctly latinized, as is required by that crucially important 50% portion of the Code that regulates the latinization of scientific names. Such names will be properly altered to make each genus-species-subspecies combination properly male-male homosexual or properly female-female lesbian, depending on the determined gonadal-sexual status of each genus name (no heterosexual names will be permitted), and will be published in the Bulletin in a new section called Sex Trollers Digest. Preference will be given to candidates who demonstrate excitement during the process of determining gonadal status of each name. For position application requirements, contact the Secretary of the Commission. The ICZN is an Affirmative Action Employer: if you have melanocytous pigmentation or estrogenous gonads (bonus points for possessing both), we will respond in the affirmative.

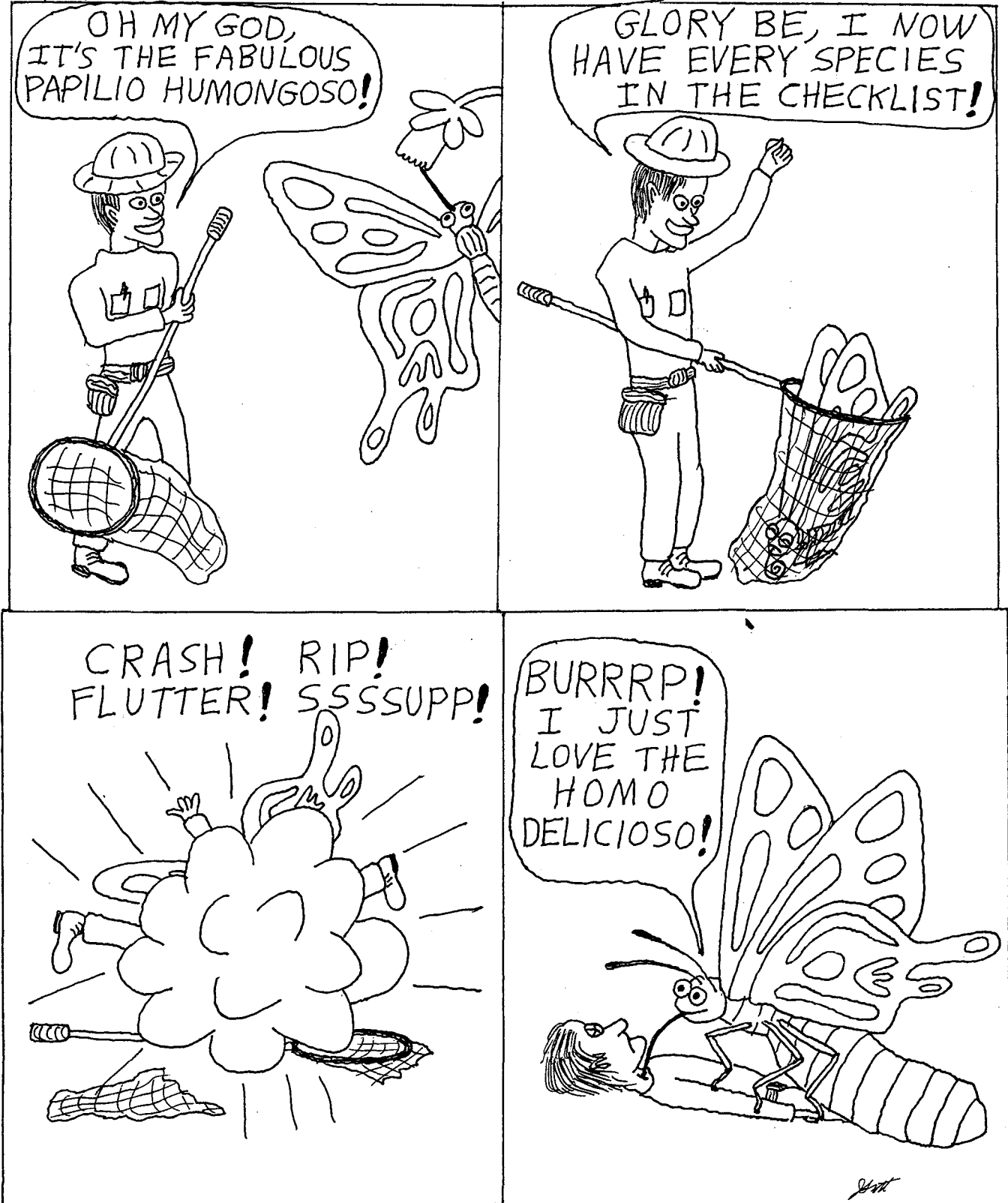
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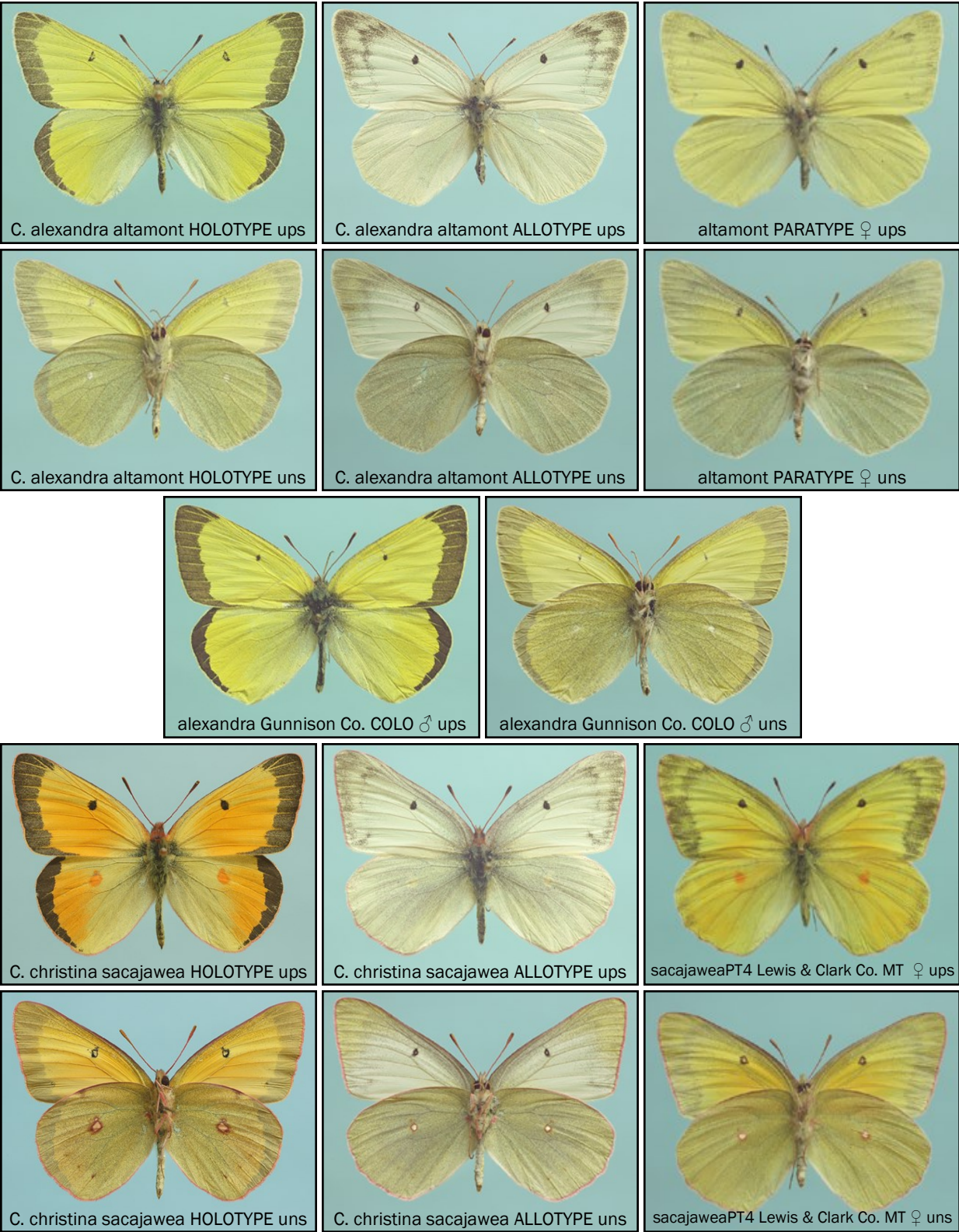
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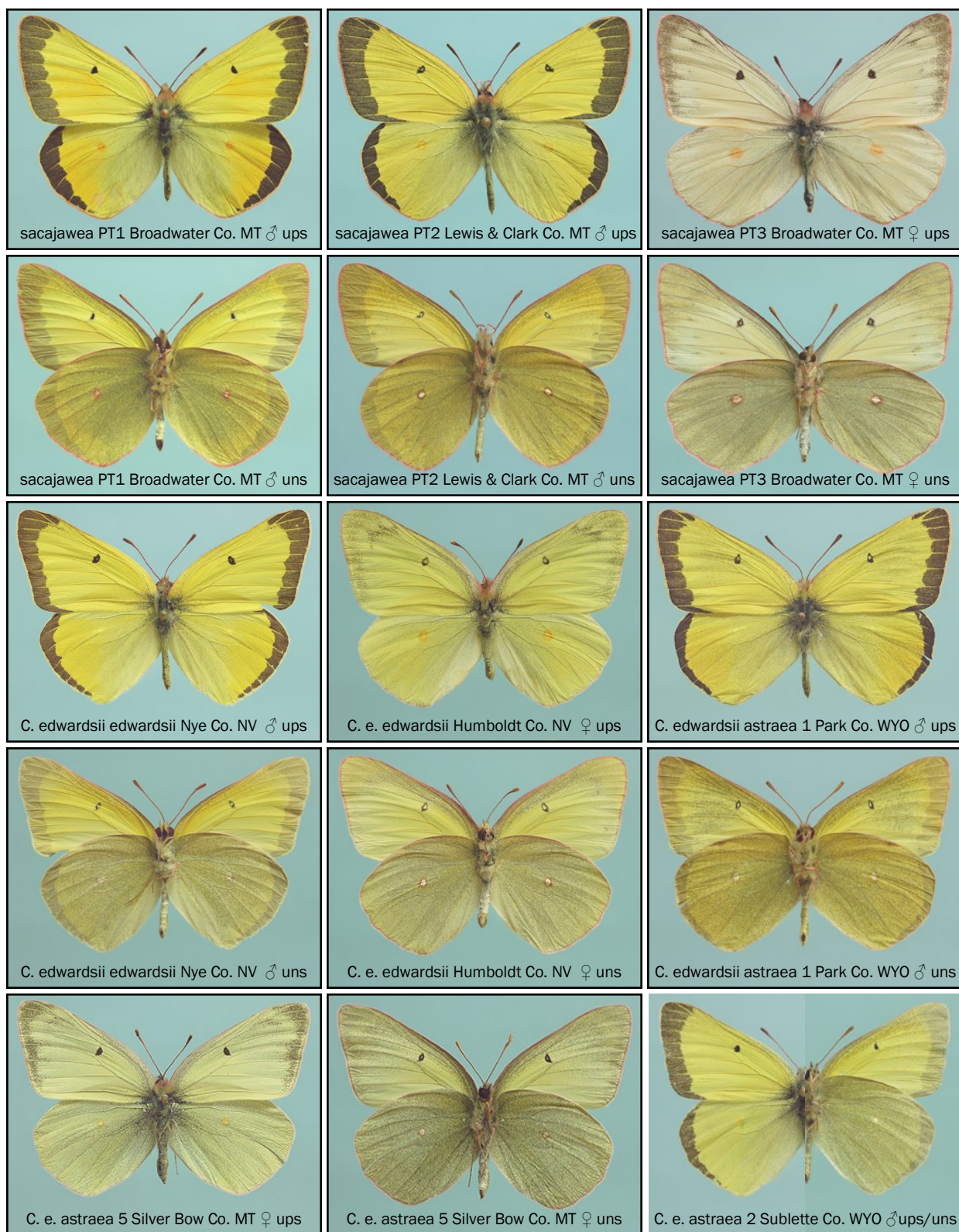
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Papilio Bonus

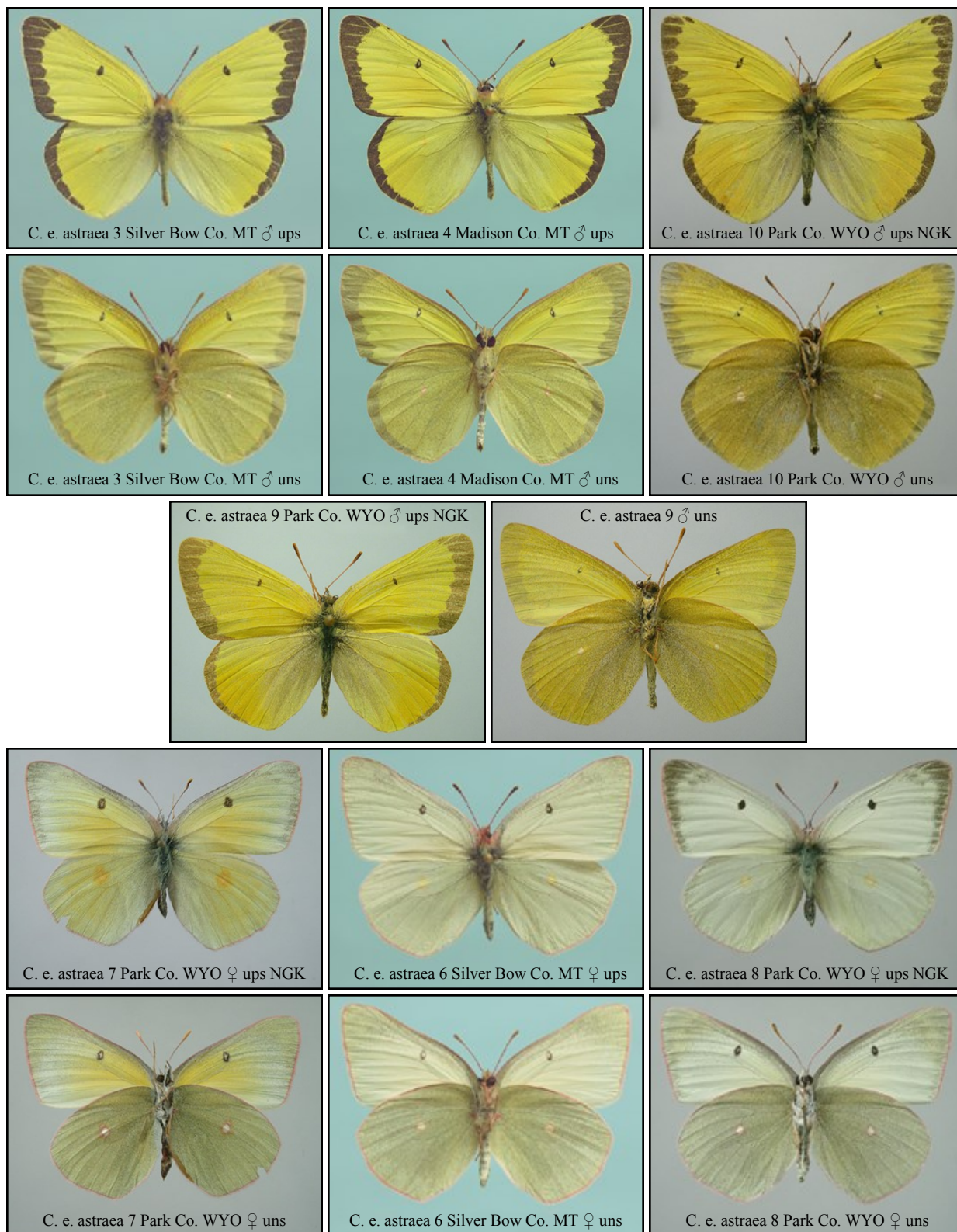




PAPILIO #12 PLATE I - *COLIAS* - TYPES OF NEW SUBSPECIES - All illustrations are larger than 1X.



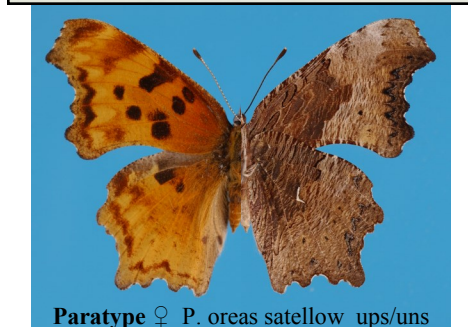
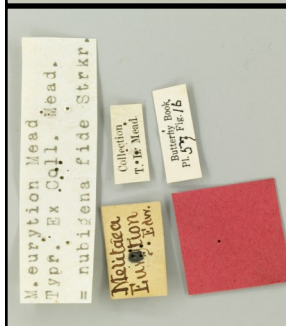
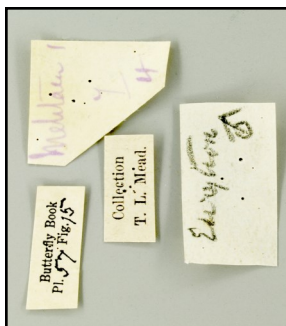
PAPILIO #12 - PLATE II - *COLIAS* Sacajawea variation, *Edwardsii* and *Astraea*. Illustrations are larger than 1X.



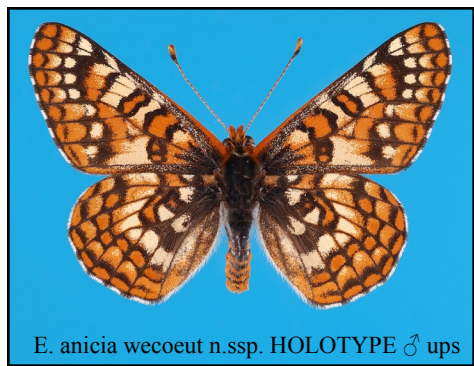
PAPILIO #12 - PLATE III - *COLIAS* - *Edwardsii* *Astraea* variation. Illustrations are larger than 1X.



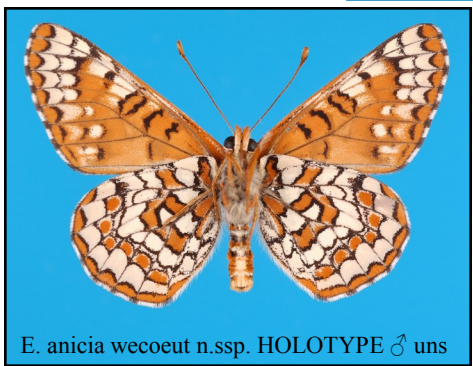
PAPILIO #12 - PLATE IV - TYPES - NEW SUBSPECIES.
(All illustrations are larger than 1X)



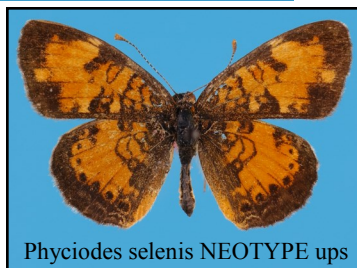
Paratype ♀ *P. oreas satellow ups/uns*



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E. anicia wecoeut n.ssp. HOLOTYPE ♂ uns



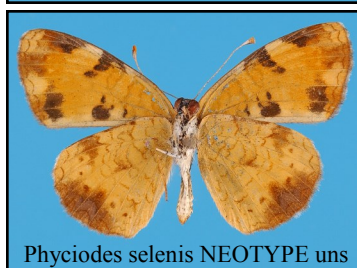
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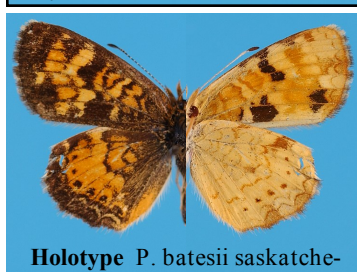
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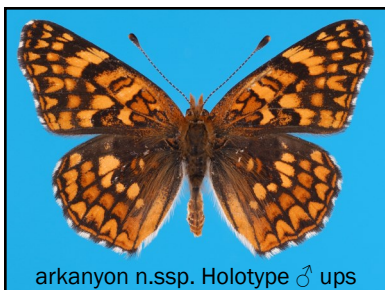
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Phyciodes selenis NEOTYPE uns



Holotype *P. batesii saskatche-*



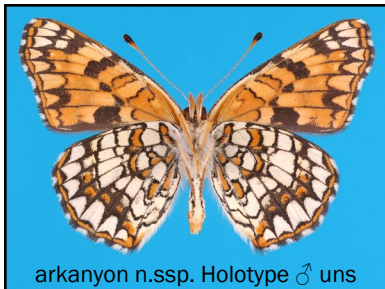
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arkanyon n.ssp. Allotype ♀ ups



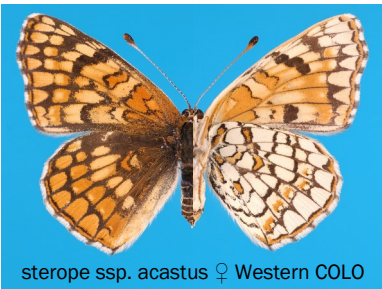
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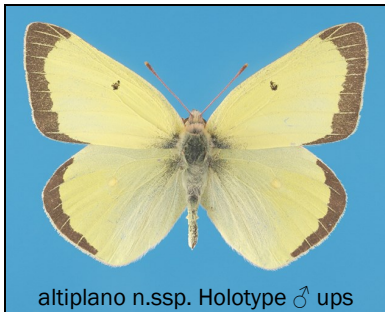
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arkanyon n.ssp. Allotype ♀ uns



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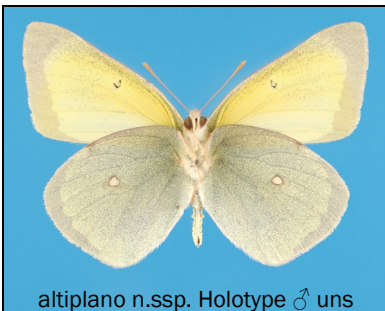
altiplano n.ssp. Holotype ♂ ups



altiplano n.ssp. Allotype ♀ ups



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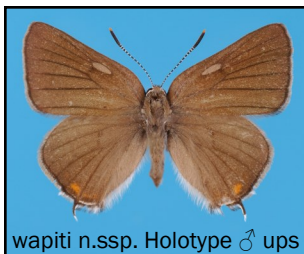
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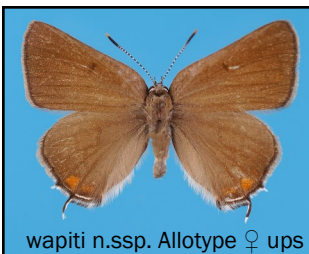
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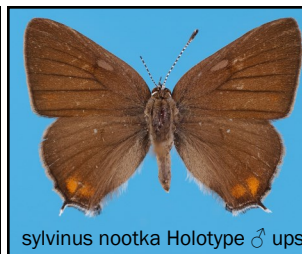
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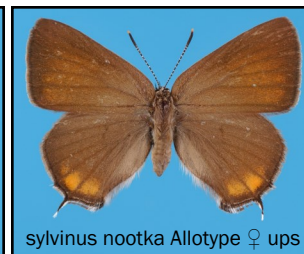
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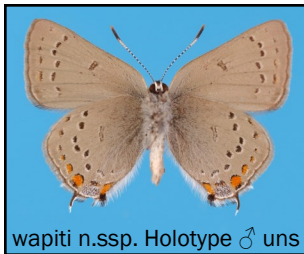
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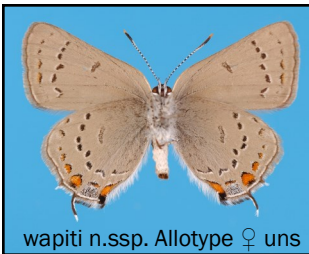
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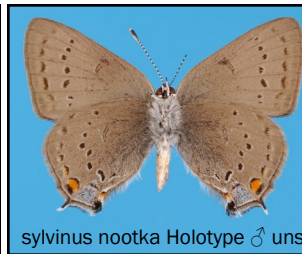
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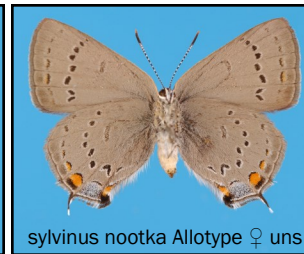
wapiti n.ssp. Holotype ♂ uns



wapiti n.ssp. Allotype ♀ uns



sylvinus nootka Holotype ♂ uns



sylvinus nootka Allotype ♀ uns