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A NEW SPECIES OF *COLIAS* FROM UTAH (Pieridae: Coliadinae)[1]

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INTRODUCTION

Bulletin of the Allyn Museum No. 122 (Ferris, 1988b) was originally to have been the penultimate monograph in my revisionary series on the North American *Colias* species. Field studies conducted during the summer of 1988, however, led to additional information about these butterflies, and form the basis for the present paper. A second paper revising the *alexandra* group of the legume-feeding species, including a cladistic analysis, is in preparation. Consequently there will be at least one more article prior to the summary publication.

For fifty-five years, a *Colias* has been known from Utah in which the dorsal surface of the males is heavily orange-flushed and that of the females is pale yellow or creamy white with occasional orange over-scaling. It has been variously labeled in museum collections as *Colias gigantea harroweri* Klots, *Colias occidentalis chrysomelas* Hy. Edwards, *Colias alexandra christina* W. H. Edwards, and *Colias alexandra astraea* W. H. Edwards. This butterfly may also be what Gillette (1983) called *Colias occidentalis* Scudder, although he described no new taxa. It was briefly mentioned in two early *Colias* papers by Ferris (1972, 1973), and a somewhat more detailed discussion appeared recently (Ferris, 1988a, p. 18). It is now known positively to occur in very local colonies in Utah, Idaho, and extreme eastern Washington.

Ferris, in the four papers cited above, assigned this butterfly to the *astraea* group of *Colias alexandra* W. H. Edwards, but with some reservations. A reasonable study series of 95 specimens now has been obtained. This series in conjunction with field observations conducted during the summer of 1988 has led me to conclude that it is a separate species, closely allied to, but distinct from, *Colias alexandra*. This conclusion has been reached based upon the butterfly's flight pattern, habitat preference, time of emergence, and UV-reflectance pattern in the males. In many respects, the new species relates to *Colias alexandra* much as does *Colias canadensis* Ferris to *Colias hecla* Lefèbvre. The new species is described herein.

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Unless otherwise noted, all specimens illustrated are from the author's collection.

Colias pseudochristina, new species

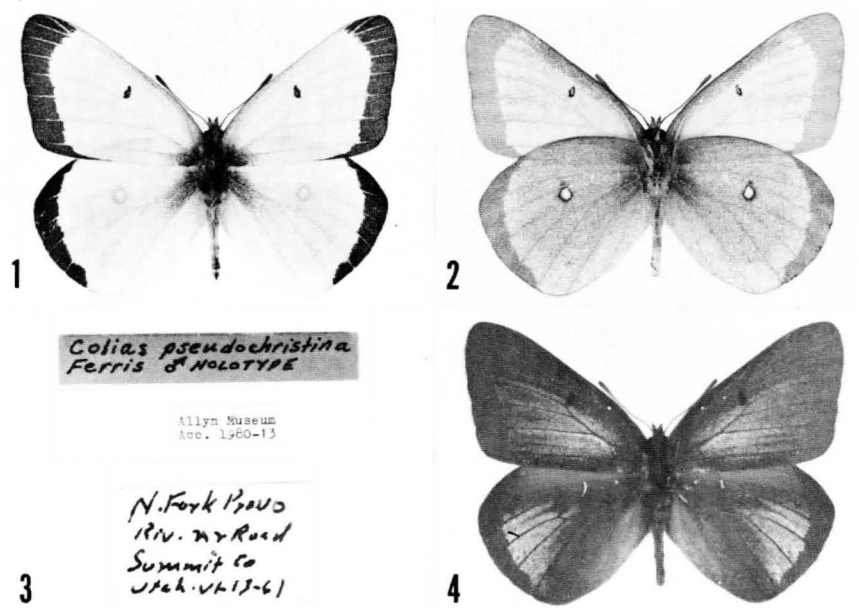
Types and Location: This species is described from 71 ♂♂ and 24 ♀♀ collected in Utah and Idaho. The male holotype (Figures 1 - 4) was collected in Summit Co., Utah along the North Fork of the Provo River on 13 June, 1961, and is placed in the Allyn Museum of Entomology/Florida Museum of Natural History, Sarasota, Florida. A female paratype from the same locality collected on 14 June, 1961 is illustrated in Figures 5 - 7. This specimen is also in the Allyn Museum of Entomology collection. Other paratypes are as follows: Allyn Museum of Entomology/Florida Museum of Natural History: **Utah.** Summit Co.: N. Fk. Provo River, 14.vi.61, 1 ♂; 7500', 13.vii.65, leg. Justice, 1 pr.; 14.vii.65, 1 pr.; 19.vii.65, 1 ♂; Mill Hollow, 29.vi.68, 1 ♂, leg. C. Callaghan; Shingle Creek, 12.vi.65, 1 ♂, leg. C. Callaghan; 30.vi.65, 1 ♂, leg. C. Callaghan; 12.vii.65, 1 ♂; 21.vii.65, leg. Tidwell, 1 ♀; Yellow Pine, Kamas, 11.vi.66, leg. C. Callaghan, 1 ♂. Utah Co.: Payson Canyon, 11.vi.62, leg. C. Callaghan, 1 ♂. Wasatch Co.: S. Fk. Provo River, 19.vi.60, leg. K. B. Tidwell, 1 ♂; 19.vi.66, 1 ♂; 20.vi.66, 1 ♂; Mill Hollow, S. Fk. Provo River, 22.vi.61, 1 ♂; Dry Hollow, Soapstone Mt., 23.vi.61, 1 ♀; Whiskey Spgs., Daniel's Canyon, 5.vii.61, 1 ♀. American Museum of Natural History: **Utah,** Summit Co.: N. Fk. Provo River, 7000-8000', 29.vi.67, leg. K. B. Tidwell, 1 ♂, Utah Co.: Payson Canyon vic. Payson, 29.vi.33, leg. H. Spalding, 1 pr. Wasatch Co.: Wolf Ck. Camp, 14 mi. W. Hanna, 9500', 12.viii.58, leg. F., P. & J Rindge, 1 ♂ (very worn). C. D. Ferris Collection: **Utah.** Summit Co.: N. Fk. Provo River, 16.vi.61, 1 ♂; 14.vii.65, 1 ♀; Forest Trail 8075, N. Fk. Provo River, 7000-7100', 21.vi.88, 6 ♂♂, 2 ♀♀. Wasatch Co.: Uintah Mts., S. Fk. Provo River, 19.vi.66, leg. K. B. Tidwell, 2 ♀♀. **Idaho.** Boise Co.: 5 mi. W. of Lowman, 2.vi.80, leg. N. S. Curtis, 3 ♀♀. Elmore Co.: Above Arrowrock Reservoir W. of Paradise, 5.vi.79, leg. N. S. Curtis, 22 ♂♂; 6.vi.79, leg. N.S. Curtis, 12 ♂♂; W. of Bell Mare Creek, Boise Nat. For., 4200', 7.vi.88, 1 ♀. Franklin Co.: Williams Creek Trail, Cache Nat. For., 5300', 6.vi.88, 12 ♂♂, 6 ♀♀; 21.vi.88, 2 ♀♀. Nez Perce Co.: Lower end of Mission Creek Rd., Craig Mts., 24.vi.81, 1 ♀.

Diagnosis and Description: This species is generally characterized by the color of both the males and females, the characteristic UV-reflectance pattern of the males, its coniferous-forest-association habitat, rapid and erratic flight pattern of the males, and the sedentary and somewhat semicrepuscular behavior of the females. These characteristics are amplified in the sections that follow.

Male holotype: FW length (measured from the base of the wing to the end of vein R_5 at the margin) = 27 mm. WINGS. Dorsal ground color orange (approximately Smithe no. 18 Orange Yellow, but less saturated), blending to yellow toward the FW costal margin, at the wing bases, and toward the outer and inner margins of the HW. Dark melanic scales are concentrated at the wing bases as shown in Fig. 1. Borders black but heavily dusted in the cell spaces with whitish scales, and with the veins outlined by orange scales. Width of border measured at vein Cu_1 = 3.0 mm (= 13% of wing width at that point). DFW cell-end spot prominent, black and crescentic or D-shaped with slight pupil. The bow of the D or crescent is basad. The DHW discal spot reflects through from the ventral surface and is orange (concolorous with the background color). Fig. 2 depicts the ventral surface of the holotype. The ventral ground color is pale yellow-orange, but the light dusting of the wings with melanic scales produces an overall yellow-greenish aspect, especially to the HW. This dusting is generally restricted to the post-discal region on the VFW. The dorsal dark margins "print through"ventrally. Both the FW and HW cell spots are prominent. The pupil of the VHW discal spot is pearly-white and heavily ringed with dusty-rose scales. This spot is slightly oval and the horizontal width is 1 mm. Above the VHW discal spot is a small superior satellite spot of the same rose color. The wing borders and cilia are pink except at the tornus and along the inner margin of the FW where they are pale yellow. HEAD. Antenna 10 mm (= 37% of FW wing length); shaft uniformly pink; tip and underside of club pale yellow-orange; club squared-off. Dorsal vestiture pink to dusty-rose; palpi dusty-rose with dark hairs toward the tips, and pale hairs basad

ventrally. Eyes smooth and brown. THORAX. Black and adorned with long pale-yellow hairs dorsally and ventrally; some pinkish hairs toward the head. ABDOMEN. Black covered with pale-yellow hairs LEGS. Pale and generally covered with pink hairs or spines blending to yellow on the inner surfaces. UV REFLECTANCE. The UV-reflectance pattern characteristic of this species is shown in Fig. 4. A photograph of a different specimen (labeled *C. alexandra* nr. *astraea* from Idaho) appears in Ferris 1988a, Fig. 28.

Variation in the males: Figures **8 - 10** illustrate the ventral surfaces of 3 male paratypes. This species is remarkably uniform as *Colias* go. The FW length (measured from the base of the wing to the end of vein R_5 at the margin) is 25.86 mm ± 4.56% (mean value ± coefficient of variation [CV]; N = 70); the range is 23.0 — 29.0 mm. The width of the dark DFW marginal border (measured at vein Cu_1) is 3.3 mm ± 16.6% (mean ± CV; N = 70), with the range 2.0 - 4.5 mm. There appears to be no correlation between the FW length and the width of the dark border. These measurements were based upon 70 specimens, because two specimens were damaged such that the wing length could not be measured in one, and the border width could not be measured in the other. The data that follow are based upon 71 specimens. The dorsal ground color of one specimen (1.4%) is yellow, 4 (5.6%) are pale yellow-orange, the remaining 66 (93%) are colored like the holotype. The DFW crescentic spot is absent in one specimen (1.4%), nearly obsolete (open) in 9 (12.7%), partially scaled in 7 (9.9%), and distinct in 54 (76.0%). The VHW discal spot is single in 39 specimens (54.9%), weakly double on right side only in 3 specimens (4.2%), weakly double on both sides in 25 specimens (35.2%), and strongly double (both spots nearly equal in size) in 4 specimens (5.6%). This spot varies in horizontal width from 1.0 to 2.0 mm. One specimen has this spot produced distally as in *C. hecla* and *C. nastes* Boisduval. Eighteen specimens exhibit "eurytheme" spots on the VHW. These are submarginal spots, one each in spaces Cu_2, Cu_1, and M_3. These spots are absent in 53 specimens (74.6%), 4 specimens (5.6%) have single spots in space Cu_2 only, 3 specimens (4.2%) have spots on the right wing only, and 11 specimens (15.5%) have these spots on both DHW. In those specimens in which the full complement of "eurytheme" spots is

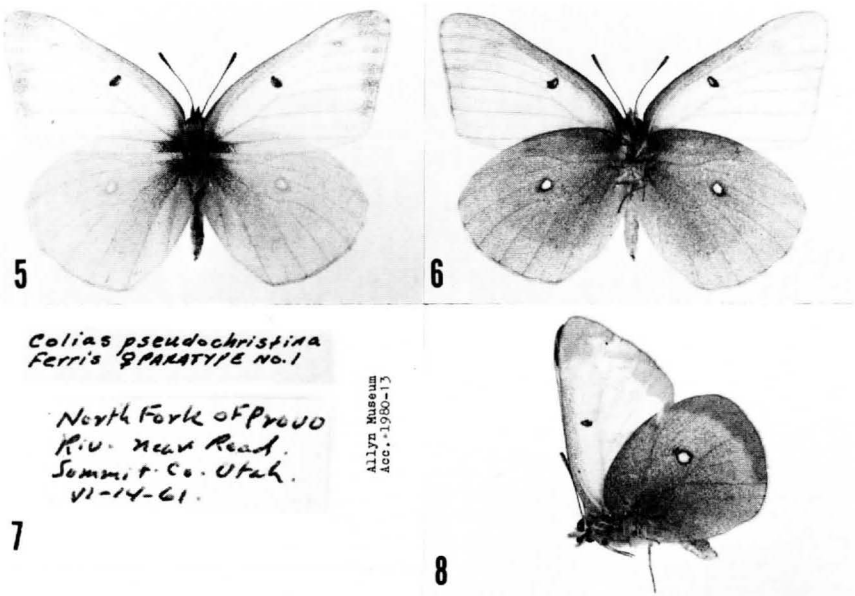


Figures 1 - 4. *Colias pseudochristina* Ferris, new species. Holotype ♂ D (1), V (2), specimen labels (3) [type label is red inscribed with black ink], D UV-reflectance (4). Specimen in AME.

present, there is also a vertically-elongated spot located just basad of the point at which vein Sc + R_1 merges with the costal margin. The asymmetry observed in the ventral markings (discal spot configuration and "eurytheme" spots) is peculiar and no explanation is offered.

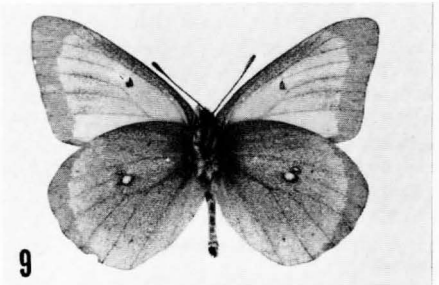
Variation of the UV-reflectance pattern in the males. The reflectance pattern shown in Fig. 4 for the holotype is typical. The DFW pattern always originates basally and radiates distally in a diffuse manner. In some specimens, it may occupy the full wing surface excepting the dark marginal border and along the costal and inner margins. The wing veins appear as fine black lines, and the cell spot as a black spot. These features are non-reflective. Overall, the UV reflectance pattern has a subdued or diffuse aspect.

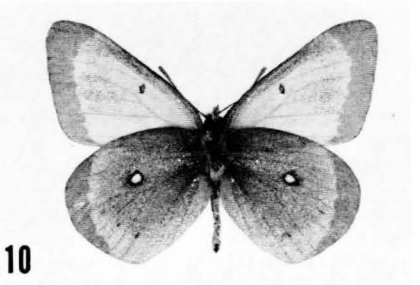
Description of and Variation in the Females: Paratype No. 1 shown in Figs. 5 and 6, with specimen labels in Fig. 7, is creamy-white (with a very slight yellowish flush) with a prominent FW border. The FW length (measured from the base of the wing to the end of vein R_5 at the margin) is 29 mm. The DFW cell-end spot is pupiled, the VHW discal spot is single and is 1 mm in horizontal width. The latter is centrally silvery and ringed by dusty-rose scales. One specimen has this spot produced distally as in *C. hecla* and *C. nastes*. Dorsally this spot is pale yellow-orange, which is the case in all of the females examined. The wings are bordered by pink cilia, except at the tornus and along the inner margin of the FW where the color washes out. The ventral ground color is very pale yellow overlaid by melanic scales. The frons, the ends of the palpi, and the head end of the thorax are pink, otherwise the body vestiture is composed of pale yellow hairs. The legs are covered by pink hairs or spines. The eyes are medium brown. The antennae are 10 mm long, or 34.5% of the FW length. They are covered with pink scales, both dorsally and ventrally to the clubs. The clubs are dark dusty-rose dorsally, except for the last segment which is an orange-ochraceous hue. Ventrally the club is orange-ochraceous with a pit in each segment. The club is squared-off as in the ♂ ♂. Additional female paratypes are shown in Figs. 11 - 14.



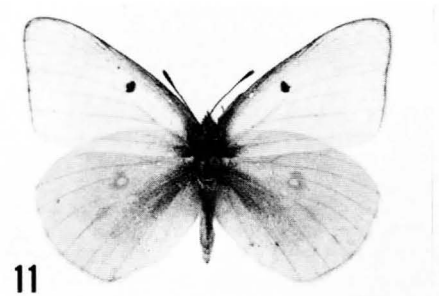
Figures 5 - 8. *Colias pseudochristina.* ♀ paratype No. 1 D (5), V (6), specimen labels (7) [paratype label is blue inscribed with black ink]; specimen in AME. ♂ paratype V (8), N. Fk. Provo R., Wasatch N.F., Summit Co., UT, 21.vi.88.

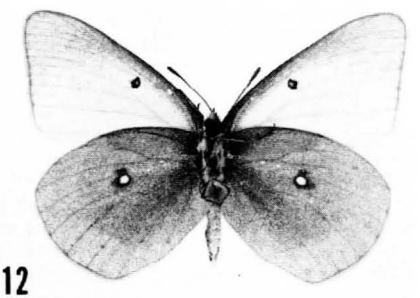
In the females, the FW length (measured from the base of the wing to the end of vein R_5 at the margin) is 28.67 mm ± 3.75% (mean ± CV; N = 24); the range is 26.0 — 31.0 mm. The DFW border is absent in 11 (45.8%), faint in 8 (33.3%), and prominent in 5 (20.8%). The DFW cell-end spot is always present and varies from an open circle to a closed spot. Dorsal ground color varies from strongly orange-flushed in 2 (8.3%), to yellow in 5 (20.8%), to creamy (some with very faint orange flush) in 17 (70.8%). One of the yellow specimens is a melanic aberrant with the dorsal surface heavily dusted by dark scales. The VHW cell spot is double in 2 specimens (8.3%), partially double in 8 (33.3%), double on one side and single on the other in 1 (4.2%), and single in 13 (54.2%). Antennal color varies to



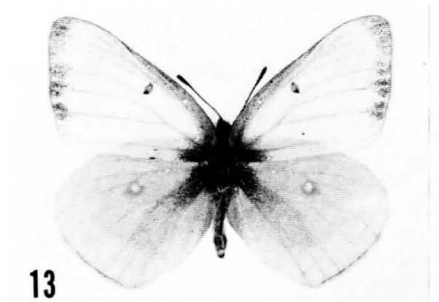


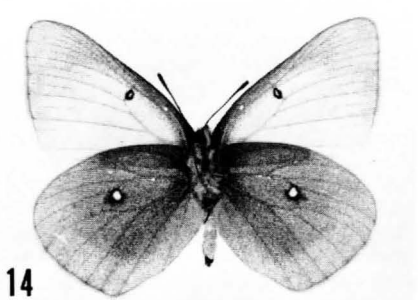
Figures 9 - 10. *Colias pseudochristina* ♂ paratypes: V (9), N. Fk. Provo R., Summit Co., UT, 21.vi.88; V (10), Williams Ck. Trail, Cache N. F., Franklin Co., ID, 6.vii.88.





Figures 11 - 12. *Colias pseudochristina* ♀ paratype yellow form, Williams Ck. Trail, Cache N. F., Franklin Co., ID, 6.vii.88, D (11), V (12).





Figures 13 - 14. *Colias pseudochristina* ♀ paratype creamy-white form, Williams Ck. Trail, Cache N. F., Franklin Co., ID, 6.vii.88, D (13), V (14).

some extent with wing ground color and the length of time from emergence. It is more subdued in "alba" ♀♀, and aged specimens, and the pink scales slough off exposing a gray-ochraceous under surface.

Flight Period: Late May to mid-June in Idaho and Washington, depending upon local weather conditions, elevation, and rate of desiccation of the habitat. In Utah, flight records exist from 11 June to 21 July, with one record for a very worn male at 9500' on 12 August. The Utah localities are generally at higher elevation with a cooler climate than those in Idaho and Washington, which accounts for the later flight period. The specimens that I collected in Summit Co., Utah on 21 June, 1988 were already showing wear.

Distribution: Figure **15** is a distribution map for this species. Confirmed records exist for the following states and associated counties: **Idaho**: Adams, Boise, Elmore, Franklin, Idaho, Lemhi, Nez Perce. The additional Idaho county records not listed above are *fide* N. S. Curtis. **Utah**: Summit, Utah, Wasatch, Weber. **Washington**: Asotin. I collected two worn males of what may be *pseudochristina* in Grant Co., Oregon on July 1, 1988. A mixed *Colias* population occurred in the locality visited and it will be discussed in a subsequent article. Based upon the known distribution of this species, one might expect its occurrence in extreme eastern Oregon, SW Uinta Co. in Wyoming, and NE Elko Co. in Nevada. Elko Co., Nevada, however, has been extensively collected and nothing resembling *pseudochristina* has been found. Appropriate habitat appears to be lacking in Uinta Co., Wyoming. The same may be true of eastern Oregon owing to the apparent specificity of the environment required by *pseudochristina*.

Biology: This butterfly occurs in openings in coniferous forest, including open meadows and along roads. The males normally fly relatively unidirectionally at high speed and in a somewhat erratic manner from one to six feet above the ground. When startled, they veer into a wide arcing flight of increasing altitude to perhaps twenty or thirty feet above the ground and take cover in the trees. Males of *C. alexandra* do not normally behave in this manner. In my experience, the females are rather sedentary and tend to fly relatively slowly close to the ground. They are generally found near the forest edge, and may be seen flying among the branches of shrubbry.

Seven localities were visited in 1988 from which this species has been collected. In every case, *Vicia americana* Muhl. (Leguminosae) was present, and this is assumed to be the principal larval host plant. Oviposition behavior was observed, and in general the females were always close to this plant. No ova, however, were recovered. In Elmore Co., Idaho, a female was noted late in the day fluttering about a clump of *Astragalus miser* Dougl. *ex* Hook. (Leguminosae), but again no ova were located; *Vicia americana* was also present.

The habitats are invariably areas in which the non-arboreal vegetation reaches a climax early in the summer and then desiccates rapidly, which undoubtedly accounts for the early flight season of this butterfly. In all of the colonies that I visited, the principal plant in bloom was Mules-Ears (*Wyethia* sp., Composite family). Most of the sites visited were located on south-facing slopes with dense *Wyethia* cover. The principal conifer at the Franklin Co., Idaho locality was *Juniperus* sp. At other sites, either Ponderosa Pine or Douglas Fir was found.

No in *copulo* specimens were taken, but a courtship flight was observed in mid-morning at the N. Fk. of the Provo River site. It was of the typical vertical spiral pattern associated with this genus.

Population densities of *pseudochristina* appear to fluctuate widely on an annual basis. For example, the species has been collected in the Copenhagen Basin area of Franklin Co., Idaho (*fide* N. S. Curtis), and although I visited this region several times in 1988, I did not find the butterfly. It was, however, locally common a few miles away along Williams Creek Trail in the Cache National Forest. Similar observations were made in Elmore Co., Idaho, where many specimens were taken by N. S. Curtis in 1979. Although I visited the same collection locality at the appropriate time in 1988, the butterfly was extremely scarce. Based upon the observed sedentary behavior of the females, this does not appear to be a vagile species. Thus it must be concluded that population densities fluctuate in response to seasonal conditions, parasite levels, or some other unrecognized factor. This situation may be another reason for the limited numbers of specimens of

pseudochristina found in museum collections.

Comparison with Other Species: On the wing, the males resemble *Colias eurytheme* Boisduval, and this may also account for the rarity of *pseudochristina* in museum collections. Many collectors may simply have ignored this butterfly in the field thinking that the males were early migrants of *eurytheme*. The sedentary nature of the females promotes overlooking them. Dorsally, the males superficially resemble *eurytheme*, but ventrally they are distinct. They lack the double border about the VHW discal spot that occurs in both *eurytheme* and *philodice* Godart, and they generally lack the prominent VHW post-discal spots found in both of these species. The females of *pseudochristina* bear no resemblance to the females of *eurytheme*, and only a slight resemblance to the females of *Colias philodice vitabunda* Hovanitz. The geographic range of *vitabunda* does not overlap nor does it come close to the range of *pseudochristina*.

The species with which *pseudochristina* is most likely to be confused, based upon phenotype, are *Colias alexandra astraea* and *C. alexandra christina*. Based upon present

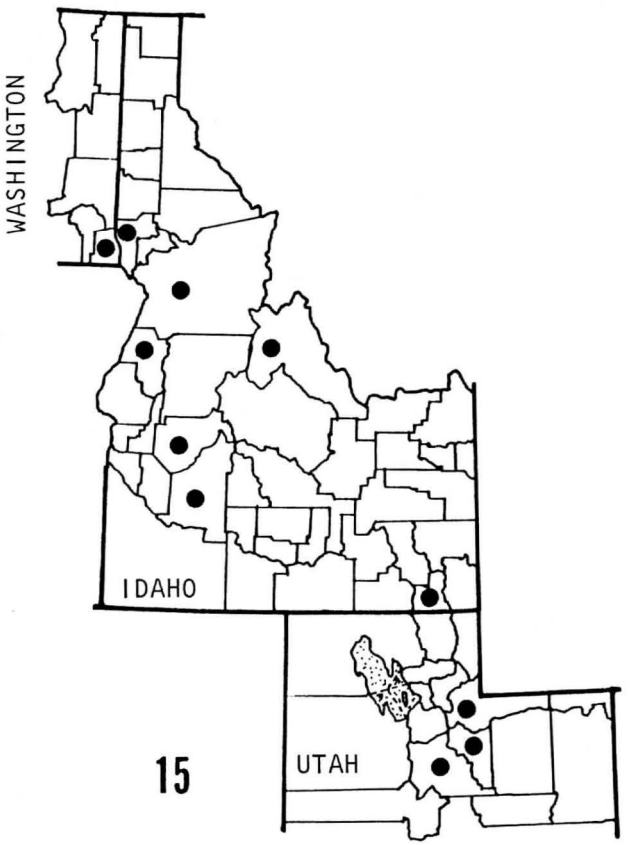


Figure 15. Map showing presently known distribution of *Colias pseudochristina*.

knowledge of the geographic distributions of *christina* and *pseudochristina*, no overlap in range occurs, and thus separation may be made based upon geography alone. A tension zone between *astraea* and *christina* occurs in Glacier National Park in northern Montana. Typical *christina* occurs well to the north of the distribution of *pseudochristina*. The females of *pseudochristina* are easily separated from those of *christina* and *astraea*. Although albinic individuals do occur, the dorsal ground color of the females of *christina* is normally yellow-orange. Color saturation varies widely from pallid individuals to strongly-colored individuals that approach typical females of *C. eurytheme* Boisduval. Normally the DFW dark fenestrated border pattern associated with the females of most North American *Colias* species is present to some degree in the females of *christina*, although it may be obsolete in some albinic examples. Dorsally the females of *astraea* manifest a dead-white ground color (occasionally there may occur a yellowish or orange flush), and there is always some suggestion on the DFW of the dark fenestrated border pattern mentioned above. The dorsal ground color of the wings of *pseudochristina* (excepting very worn examples) is always creamy-white or pale yellow, and if there is dark scaling along the DFW margin, it appears as a narrow and weak band without windows. Often there is some orange over-scaling.

Males of these species are more difficult to separate based upon normal visual phenotype alone. The UV-reflectance patterns produced by *alexandra* sspp. and *pseudochristina*, however, clearly separate these two species. The typical dorsal UV-reflectance patterns produced by several *alexandra* subspecies are shown in Ferris 1988a (Figs. 11 - 13); Ferris 1981 (Figs. 39 - 41); Ferris 1973 (Figs. 3 - 6). The DHW luminous pattern in *pseudochristina* is smaller in area than in those taxa currently associated with *alexandra*. In *alexandra*, the DFW reflectance (when present) emenates from the inner edge of the dark marginal border and radiates inward toward the wing base. FW reflectance is bright and crisp, not diffuse. When the FW is reflective and the reflectance does not cover the major portion of the FW (as it does in *christina*, *kluanensis*, and *krauthii* Klots), there is always a bright reflective line adjacent to the dark FW border, as shown in Figure **16**. In such specimens, the luminous pattern radiates inward in a linear manner along the wing veins, and the central portions of the cell spaces may not reflect, as shown in Figure **17**. When the FW is generally reflective (*christina* and *krauthii*), the reflectance pattern extends to include the costal and inner margins (Ferris, 1981, Figs. 39 - 41, *kluanensis*; 1988a, Fig. 13, *krauthii*). If the luminous FW pattern is not fully developed, there will be a broad non-reflective region basally (Ferris, 1988a, Fig. 12, *christina*). In *pseudochristina*, the bright

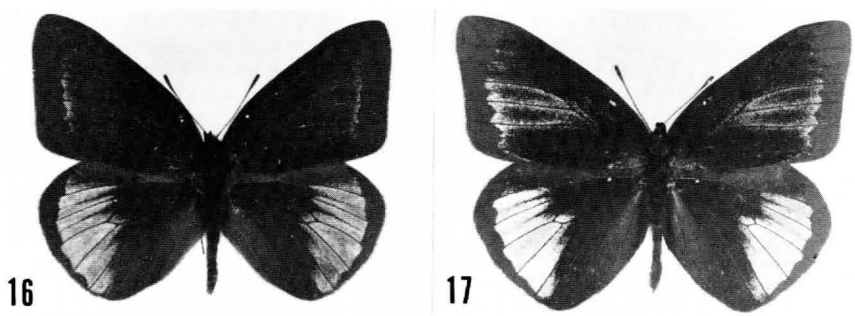


Figure **16**. Dorsal UV photograph of typical ♂ *Colias alexandra apache* Ferris from Ditch Camp, Apache Co., AZ, 9.vii.76. Note the FW reflective vertical bar. (Same as Fig. 11, p. 10 in Ferris, 1988a). Figure **17**. Dorsal UV photograph of a ♂ *Colias alexandra* nr. *columbiensis* Ferris from vic. Moyie Spgs., Boundary Co., ID, 18-19.vii.86. Note the FW reflective vertical bar, the inward radiation of the reflective pattern toward the central area of the FW, and the dark central regions of the cell spaces. (Same as Fig. 3, p. 7 in Ferris, 1988a).

pattern associated with *alexandra* is absent, and a diffuse luminous DFW pattern originates basally and radiates distally filling the cell spaces as it expands, which is just the opposite of the taxa associated with *alexandra*. In some specimens, it may occupy the full wing surface excepting the dark marginal border and along the costal and inner margins. The wing veins appear as fine black lines, and the cell spot as a black spot. These features are non-reflective. Overall, the UV reflectance pattern has a subdued or diffuse aspect. Additionally, FW reflectance is always present in *pseudochristina*. In this respect, *pseudochristina* is similar to *canadensis*, Ferris 1988a (Figs. 16, 18, 20, 22). In other respects, including the flight pattern and coloration of the males, *pseudochristina* is similar to *canadensis*.

Based upon the male specimens examined during this study, the VFW cell-end spot in *pseudochristina* is always cresentic, while in *alexandra* sspp. it is usually oval or round. Occasional specimens of *christina* may manifest cresentic spots; very rarely does this shape occur in *astraea*. Generally the VHW discal spot is larger in *pseudochristina* than in *astraea*. Geography and time of emergence are reasonably reliable factors that permit differentiation of the males without resorting to UV photography. In light of present knowledge, it appears that *astraea* occurs only in Wyoming, Montana, and in various clinal forms with *christina* in contiguous southern Canada. This situation will be reviewed in a subsequent article. *C. alexandra astraea* does not normally appear on the wing until late July and August, while *pseudochristina* (except for stragglers) is an early species that appears from late May into July. *Colias alexandra* sspp. occur in the same general areas from which *pseudochristina* has been collected, but only in the male yellow phenotype. In the region over which *pseudochristina* occurs, *alexandra* normally emerges three or more weeks after the appearance of *pseudochristina*. In the few areas in which *alexandra* appears to be bivoltine and adults are on the wing synchronic with *pseudochristina* (Lemhi Range, Lemhi Co., Idaho for example), both the sexes are yellow, and the females exhibit a weak fenestrated DFW border. Thus based upon present information, male orange phenotypes of *C. alexandra* do not occur in the same geographic areas as *pseudochristina*. Usually the VHW color in the males of the orange subspecies of *Colias alexandra* is a mossy gray-green. This aspect is produced by melanic scales which overlie yellow-orange pigmented scales. In males of *psuedochristina*, the melanic scales are less dense, and the VHW color appears as yellow-orange with a slight dark dusting.

Etymology: The name *psuedochristina* is a noun in apposition that is used to emphasize the superficial similarity of this butterfly to *christina*. Although Recommendation 31A of the I.C.Z.N. Code recommends the avoidance of personal names as nouns in apposition to prevent confusion between species-group names and author names, such confusion is unlikely in the case at hand. More confusion would have been promoted by the use of the recommended genitive form "pseudochristinae". W. H. Edwards (1863) named *Colias christina* for its first collector, Mrs. Bernard C. [Christina] Ross.

CONCLUSION

The new species *Colias pseudochristina* has been established based upon this butterfly's geographic distribution, dates of emergence, adult behavior, phenotype including the UV-reflectance pattern of the males, and distinctive color and maculation of the females. It appears to be a sibling species of the *Colias alexandra* complex based upon its overall appearance and UV reflectance pattern. One can only speculate about its origin and restricted habitat requirements. It is perhaps a relict of a former savanna-association species.

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Nelson S. Curtis (Moscow, ID) kindly provided information regarding localities in Idaho from which *Colias pseudochristina* has been collected, and permitted my access to his collection for examination of material housed therein. He and his wife Ann have also been gracious hosts during my visits to northern Idaho.

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APPENDIX — Material Studied

The type series consists of 71 males and 24 females with data as noted in the "Types and Location" section, and there is no need to repeat this information here. Approximately 40 additional specimens were examined in the N. S. Curtis collection from Asotin Co., Washington, and Boise, Elmore, Nez Perce Cos., Idaho. There is one ♂ in the P. and S. Savage collection taken in Weber Co., UT at Wolf Creek, N. of Eden, 20.vi.82.

Note about Spelling

In Bulletin Nos. 112, 116, and 122, emendations in spelling were made from *-ii* to *-i* based upon an interpretation of the I.C.Z.N. Code [Arts. 31a (ii), 32c (i)]. Dr. F. H. Rindge was the first person (among several) to suggest that this emendation may not be correct and that original spelling (unless shown to be incorrect) should be preserved [Art. 32b]. There are two ways in which species-group names can be formed from personal names. If the latinized form is used (not currently recommended in the Code), then the ending becomes *-ii* [Art. 31a(i)]. This situation was brought to the attention of Dr. Curtis W. Sabrosky who was President of the International Commission on Zoological Nomenclature (1977-83) during the period when the current edition of the Code was prepared. Since there is some ambiguity regarding the interpretation of the articles cited above, Dr. Sabrosky has referred

this problem to the current President, Dr. W. D. L. Ride. While certain changes in spelling are mandated by the present edition of the Code [Art. 31(c)], this does not appear to be the case regarding *-ii* and *-i*. Over the years, various authors have emended this spelling of *Colias* species names. While Reakirt described the species as *C. scudderii*, a year later in a subsequent publication [1866. Proc. Ent. Soc Phila., 5:136] he emended the spelling to *C. scudderi*. The original spellings of the emended names are: *scudderii* Reakirt, 1965; *edwardsii* W. H. Edwards, 1870; *harfordii* Hy. Edwards, 1877; *krauthii* Klots, 1935; *meadii* W. H. Edwards, 1871; *behrii* W. H. Edwards, 1966.

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