

## REFERENCES

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THREE NATURAL HYBRIDS OF *VANESSA ATALANTA RUBRIA*  
× *CYNTHIA ANNABELLA* (NYMPHALIDAE)

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In an effort to better understand the relationship and variation of two local butterflies, *Vanessa atalanta rubria* (Fruhstorfer) and *Cynthia annabella* Field, not only as adults but also as larvae, I have been rearing to maturity all vanessid larvae encountered on their various foodplants. In the vicinity of northeastern Thousand Oaks, California, foodplants for *C. annabella* are *Althaea rosea* (L.) Cav. (Hollyhock), *Malva parviflora* L. (Cheeseweed), both Malvaceae; and *Urtica holosericea* Nutt. (Stinging Nettle), Urticaceae. *Urtica holosericea* grows abundantly along an intermittent creek, which flows through the Lang Ranch property, and is the only local foodplant for *V. a. rubria*. The surrounding floral communities are coastal sage scrub, chaparral, southern oak woodland (Munz, 1968), and annual pasture grassland. The area is but a half mile from city subdivisions.

On 3 April 1972 I collected two second instar larvae on two *Urtica* plants occupying a position further downstream than any other *Urtica*. Several leaves were taken as a food supply. In later instars both larvae appeared at a glance to be *C. annabella*, so when all the *Urtica* leaves were consumed the larvae were given leaves of *Althaea rosea*, which they readily devoured to maturity. At this time one larva hung and pupated, and later emerged as *C. annabella*. The other continued growth and surpassed in size all other *C. annabella* reared to date. Finally it pupated, and when the hardened pupa was observed, characteristics of

both *V. a. rubria* and *C. annabella* were displayed. I then decided it would be wise to take some notes of description in case the specimen proved to be a hybrid, which it was. It is regrettable that closer attention was not given to the larva, but as it fed and simply appeared to be *C. annabella*, it was assumed to be merely a giant individual. Therefore, the following larval description is written from memory and is very general.

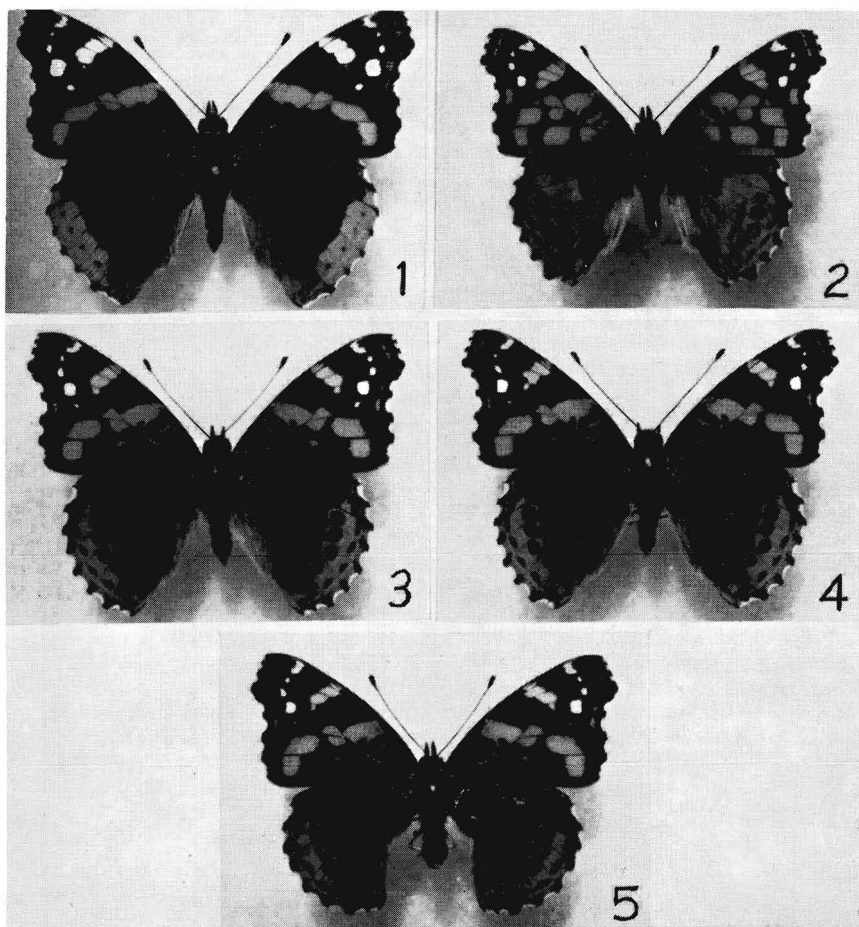
**Hybrid #1. Mature larva.** Coloration within usual range of variation shown by *C. annabella* and *V. a. rubria*. A dark form, ground color dark grey, with a series of indistinct subdorsal black patches (as in some *V. a. rubria*). Supralateral rusty-orange coloration, typical of many *C. annabella*, very reduced. Lateral line dull flesh-colored. Spines black. Shape as in *C. annabella*. **Pupa.** Shape as in *V. a. rubria*, abdominal segments flattened laterally but not to extent shown by *V. a. rubria*. Ground color tan or light brown. Most obvious features are subdorsal pair of white spots on metathorax, first, and second abdominal segments ("saddle spots") (these are bright gold in *V. a. rubria* and white in *C. annabella*). Also a subdorsal pair of smaller white spots on mesothorax, and middorsal point on this segment lighter than ground color. The pair of subdorsal points, and the single row of middorsal points on abdominal segments 3 through 7, dull orange. Supralateral gold spot which occurs on many *V. a. rubria* on the fourth abdominal segment here present only as yellowish spot lighter than ground color. Grey lateral line on the abdominal segments. Only marking on wing case a thin, black vein line on discal cell at base of  $M_3-Cu_1$ . Pupal measurements: length 21 mm, width 8 mm, depths: thorax 8 mm, saddle 6 mm, abdomen 8 mm. (For comparison, pupal measurements of the parent species (average of five specimens each) are: *V. a. rubria*: length 21.7 mm, width 8 mm, depths: thorax 8 mm, saddle 6.3 mm, abdomen 8 mm. *C. annabella*: length 19 mm, width 7 mm, depths: thorax 6.25 mm, saddle 5.25 mm, abdomen 7.25 mm.) Pupal duration, 9 days at room temperature. *V. a. rubria* and *C. annabella* both have pupal durations of 8 to 9 days at room temperature.

Following the pupation of this first individual, with the realization that it was a hybrid, I returned to the foodplant locality and collected all remaining larvae. Eleven were found: two hybrids and nine *V. a. rubria*. Again, however, the hybrids were not suspected until after the final moult. These two individuals differed from the previous hybrid, so brief descriptions are given for both.

**Hybrid #2. Mature larva.** Ground color black as in some *V. a. rubria*. Lateral line pale yellow. Head entirely black. Spines black. Otherwise like *V. a. rubria*. **Pupa.** As in hybrid #1. Pupal measurements: length 21.3 mm, width 7.5 mm, depth: thorax 7.5 mm, saddle 6 mm, abdomen 7.5 mm. Pupal duration 8 days.

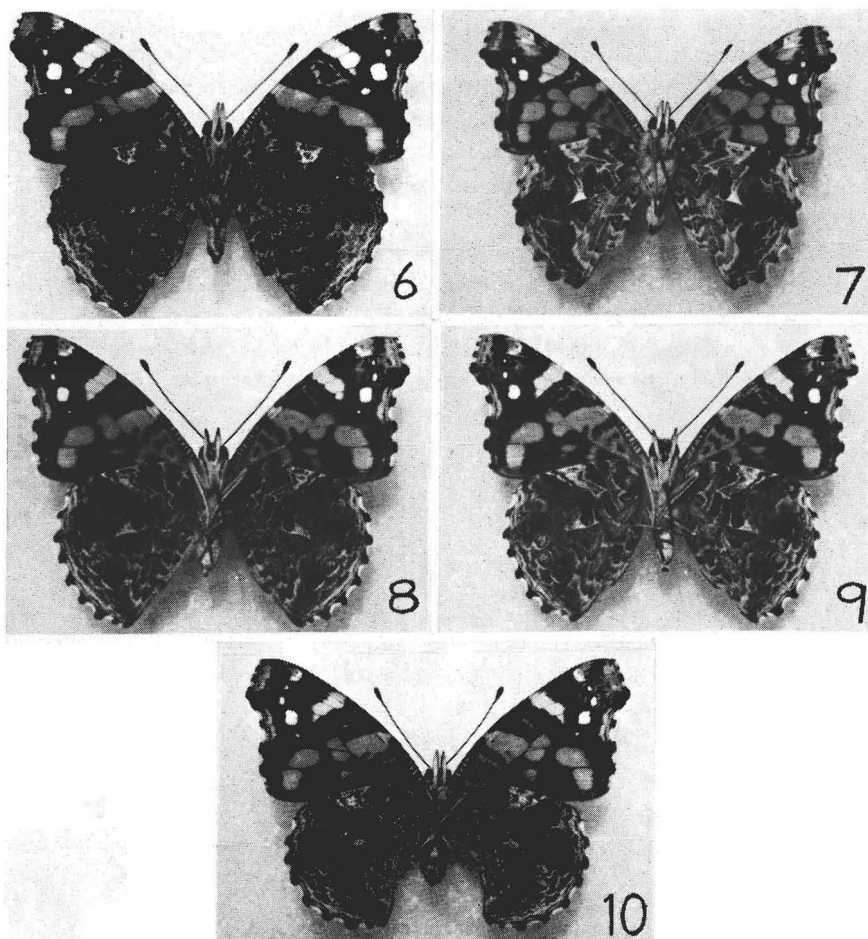
**Hybrid #3. Mature larva.** Ground color dark brown with numerous tiny yellow spots laterally and dorsally except for narrow middorsal line of solid ground color. A rusty-orange spot on each abdominal segment between subdorsal and supralateral spines. Lateral line large and yellow, interrupted at each segment by a lateral spine base of the ground color. Head entirely black. Spines black. Shape as in *C. annabella*. **Pupa.** As in hybrid #1. Pupal measurements: length 20 mm, width 7 mm, depths: thorax 7 mm, saddle 5.5 mm, abdomen 7 mm. Pupal duration 8 days.

Adult hybrids #1 and #2 emerged without problems. Hybrid #3 had



Figs. 1-5. *Vanessa atalanta rubria*, *Cynthia annabella*, and three natural hybrids: (1) *V. a. rubria*, male, ex-larva on *Urtica holosericea*, northeast Thousand Oaks, Ventura Co., Calif., elev. 980 ft., 17 April 1972; (2) *C. annabella*, male, ex-larva on *U. holosericea* plus *Althaea rosea*, northeast Thousand Oaks, Ventura Co., Calif., 3 April 1972; (3) hybrid #1, male, same data as *C. annabella*; (4) hybrid #2, male, same data as *V. a. rubria*; (5) hybrid #3, male, same data as *V. a. rubria*.

to be assisted by the author, at the expense of the pupal shell, from the terminal four pupal shell segments, as these failed to separate from the body of the adult. During the last day of pupal duration the abdomen failed to darken while coloring developed normally over the remainder of the pupa. Probably as a result of this trouble, the butterfly, after extraction from the pupal shell, failed to expand its hindwings to their full extent.



Figs. 6-10. Undersides of corresponding specimens in Figs. 1-5.

Figs. 1-10 depict the parent species and the three hybrid specimens. The color of the subapical bar on the forewing upperside is white in *V. a. rubria* and orange in *C. annabella*. In the hybrids this bar is only slightly lighter orange than in *C. annabella*. An interesting feature on the underside of the left forewing of hybrid #3 is a streak of orange in the apical area. All three hybrids are males.

It is remarkable that hybrids of *V. a. rubria* and *C. annabella* occur in nature, and I can only speculate on the circumstances responsible for their production. Both species are hilltoppers, and it has been shown by Shields (1967) that fertilization of the females takes place on hilltops.

It seems safe to assume that when males of both species are on a given hilltop they court and fertilize females of their own species. If, however, a virgin female of one species hilltopped and found the summit occupied only by one or more males of the other species, interspecific courtship, copulation, and fertilization *might* then occur. There must certainly be many behavioral and environmental factors opposing this process, otherwise one might expect hybrids to be more common.

Field (1971) has removed *annabella* from the genus *Vanessa* and placed it in *Cynthia*. In view of the natural hybridization of *V. atalanta rubria* and *C. annabella*, it would seem that the validity of such a separation is doubtful. Until further studies of the hybrids can be made, including laboratory crosses and backcrosses, together with comparative morphological studies of the early stages, it seems best to respect for the present Field's revision.

The adult hybrid specimens, their mature larval cast skins, and the pupal shells of hybrids #1 and #2 are retained in the collection of the author.

#### ACKNOWLEDGMENTS

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#### NOTES AND NEWS

##### *Erratum*

In my paper, "Observations on some Phycitinae (Pyralidae) of Texas with descriptions of two new species," (J. Lepid. Soc. 24: 249-255, 1970), the species *Dioryctria Auranticella* (Grote) is reported in error. Dr. E. G. Munroe, who saw the three specimens, when he examined my collection in early 1973, identified them as *Dioryctria rossi* Munroe.

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