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FIXATION OF TYPE LOCALITY FOR *LYCAENA ACMON* WESTWOOD AND CHARACTERIZATION OF THE SPECIES AND ITS DISTRIBUTION

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ABSTRACT. *Lycaena acmon* Westwood, 1852 is based on a painting and plate legend in Westwood and Hewitson's *Genera of Diurnal Lepidoptera.* The specimen illustrated was located in the British Museum Natural History and is the holotype by monotypy. The accompanying plate legend gives "California" as the type locality. Because the butterfly is a member of a complex of species, now considered in the genus *Plebejus* (Opler and Warren, 2003), that requires much systematic study, and some confusion exists on the identity of *L. acmon*, it is necessary to fix a more specific type locality, to characterize the species, and to present its synonymy. In addition, a number of taxa described or cited as *P. acmon* are listed, but which likely represent other species.

Additional key words: *Plebejus*.

THE "*ACMON* COMPLEX"

Lycaena acmon Westwood, 1852, was the first of a number of names that refer to a cluster of described taxa that occur in western North America. Several of these names have been associated as infraspecific taxa with *acmon* by various authors, including Downey, 1951, Goodpasture, 1973a, Tilden, 1973, Scott, 1998, and Emmel et al., 1998b. In recent decades, the complex has been treated as being comprised of three species —*acmon* Westwood, *lupini* Boisduval, and *neurona* Skinner (Goodpasture, 1973a, Tilden, 1973, Scott, 1998) with attendant subspecies. Previously, authors treated the non-*neurona* members of the complex as ranging from one species —*acmon* (Downey, 1961) to as many as five species (McDunnough, 1938).

Goodpasture (1973a) considered the genitalia of the complex members to be "bafflingly complex," but settled on a narrow definition of *"lupini"* as being comprised of a set of California *Eriogonum* obligates, and *"acmon"* as being comprised of a widespread set of populations in western North America which feed on both legumes and *Eriogonum.* More recently, Scott (1998) reinterpreted Goodpasture's findings about the group's genitalia and applied *"lupini"* more broadly in the West, and *"acmon"* more narrowly.

In the last few years, several workers, e.g. Davenport (2003) and Opler (unpublished data), have observed as many as three "non-*neurona*" entities of the complex occurring in sympatry or parapatry without hints of intermediacy. Furthermore, as hinted at by Shields (1975), the many populations in the "acmon" complex have evolved together with those of *Euphilotes*, and it seems that many *acmon* complex populations are almost as closely associated with their *Eriogonum* hosts as are their convergently evolved ecological brethren, the genus *Euphilotes* (Opler, unpublished). It is possible, when research has been

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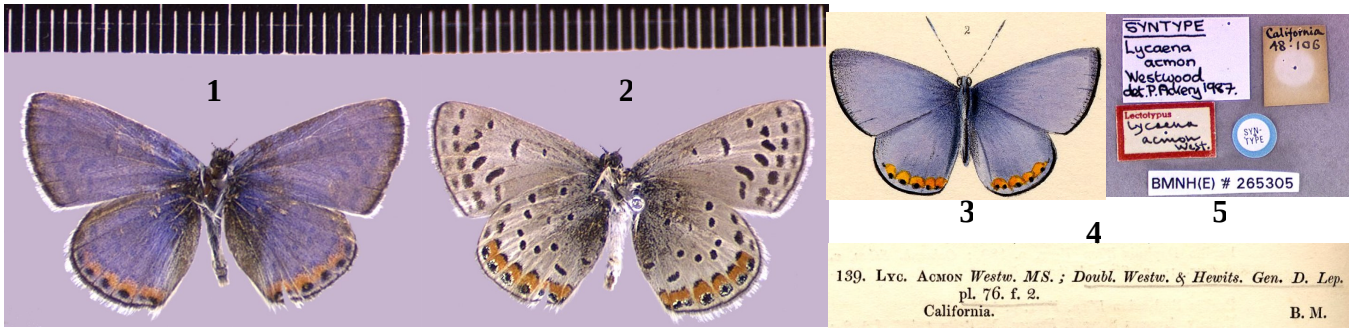
completed, that the *acmon* complex will turn out to be composed of a cluster of species, some currently without names. In order to make the research more orderly it is necessary to fix the type locality of *Lycaena acmon* Westwood, a pivotal species to the understanding of the complex.

THE TYPE OF *LYCAENA ACMON* WESTWOOD

The "description" of *Lycaena acmon* Westwood appears in the work *Genera of Diurnal Lepidoptera* by Westwood and Hewitson (1852). Westwood is the author of the name and Hewitson painted the representation of the specimen that appears in volume 2 on Plate 76 (Figure 3), dated 5th December 1851. The legend for the plate was published later in volume 1 (1852) (Figure 4). The specimen figured on the plate was located in the Natural History Museum (London) (Figures 1 & 2) by Phillip Ackery and bears several labels (Figure 5). In correspondence, Dr. Ackery indicates that his current judgment is that the specimen in the collection is likely the specimen that was illustrated. Accordingly, I have sent a red label which reads: "holotype, *Lycaena acmon*, det. Paul Opler 2003" to be placed on this specimen.[2]



Figures 1-5. **Fig. 1.** Holotype, *Lycaena acmon*, dorsal. **Fig. 2.** Holotype, *Lycaena acmon*, ventral. **Fig. 3.** *Lycaena acmon* fig. 2, Plate 76, Volume 2, Westwood & Hewitson, 1852. **Fig. 4.** Text from Volume 1, Westwood and Hewitson, 1852. **Fig. 5.** Labels from Fig. 1 holotype in British Museum Natural History.

The holotype is a male and an individual of the generations seen in late spring, summer, and fall, clearly that which is considered to be typical lowland Californian *Plebejus acmon* (Goodpasture, 1973a; Tilden, 1973). Males of the first generation that fly as early as February represent overwintered individuals, and are characterized by a more grayish appearance below, more blackish scaling above, and a deeper shade of blue. Dorsally, the illustrated individual is a pale lilac blue above with a submarginal salmon-pink aurora with what appear to be 6 contained black spots on the hindwing. Both wings have a thin continuous solid black terminal line and white fringes. Ventrally, the wings have a pale whitish gray ground with the black terminal line and white fringes repeated. There is a comma-shaped black mark at the end of the forewing discal cell and a tiny black point at the inner edge of the forewing discal cell. Additionally, the outer half of the forewing has two rows of black spots. The postmedial is an outwardly curved row of six spots; the 3rd, 4th, and 5th from the costal margin are elongate and tilted more or less along the long axis of the wing. The row lying between the submarginal row and a submarginal line of smudged black dashes also contains six spots, but they follow the curvature of the wing, are somewhat squarish and become gradually larger proceeding toward the inner margin. On the hindwing, there are a

[2] Editor's note. The editor submitted this situation to the advise of the ICZN Commissioners and other taxonomists via the ICZN's official internet list-serve. The consensus of that group was that this specimen is best viewed as the holotype by monotypy and not a syntype. The Vol. 4 Code is more explicit and restrictive on typification. Holotypes are not to be assumed (Rec. 73F) and when previous instances where this has occurred is detected, the inferred holotype automatically becomes a lectotype (§ 74.6). In this case, the sole specimen illustrated is captioned as deposited in the British Museum and is thus designated by monotypy as the holotype.

number of more or less equally sized roundish black spots as follows: (1) a postbasal costal spot, (2) a medial postbasal spot, (3) an outwardly curved postmedial row of seven spots, the most inner of which is a black dash, and (4) a dash on the inner margin and at right angles to it. The aurora is a bright reddish-orange with four barely touching marks capped with black inwardly arching triangular or rounded marks. The outward portion of each orange mark contains a black spot surrounded or almost completely surrounded by iridescent silvery scintillant scales. Toward the anal angle is a contiguous patch of apparently three merged orange spots sparsely capped inwardly with black and marginal outwardly by black bars surrounded by scintillant scaling. Toward the anal angle lie two additional black spots with no subtending orange spots. The dorsal surface of the thorax and abdomen appear blackish, and legs as well as the ventral surface of abdomen are black covered with white scales. The genitalia of the figured specimen have not been dissected. Genitalic drawings that probably represent typical *P. acmon*, but which are not topotypical, are illustrated by Goodpasture (1973) and Tilden (1973).

FIXATION OF TYPE LOCALITY

At this point, it appears that typical *P. acmon* is relatively geographically invariable throughout cismontane (west slope) California. The species is seasonally dimorphic with smaller, darker early spring individuals, and sexually dimorphic with blue males and dark brown females (early spring females have some blue scaling above basally). There is no indication where in California the holotype may have been collected. It is possible that the specimen was collected in central or northern California by Lorquin, although there is no direct evidence. I feel it will be useful to select a type locality in central California where no related species occur. Furthermore, since the type localities of two subjective junior synonyms of *P. acmon* Westwood (*Lycaena antaegon* Boisduval, 1852 [the type of which may be part of the same lot from which *Lycaena acmon* was described (Emmel et al., 1998a)] and *Rusticus acmon cottlei* Grinnell, 1916) are located at San Francisco, San Francisco County, California, it will leave little doubt as to the taxonomic identity of *acmon* and its junior synonyms if the type locality were to be fixed at San Francisco. Therefore the type locality of *L. acmon* Westwood is fixed here at San Francisco, San Francisco County, California.

SYNONYMY OF *PLEBEJUS ACMON* WESTWOOD

The type locality of both junior synonyms is San Francisco. The type locality of *Lycaena antaegon* was fixed by Emmel et al., 1998a. *Rusticus acmon cottlei* was described as a subspecies, but its phenotype represents the spring form of the species in which the female has extensive blue scaling and both sexes are small and have wings with wide black borders. These individuals occur at the same sites where later generations have the typical *P. acmon* phenotype. Note that here and below, infrasubspecific names are not included.

Plebejus acmon **(Westwood, 1852), Genera of Diurnal Lepidoptera. Vol. 2, page 494.**

> ***Lycaena antaegon*** **Jean Alphonse Boisduval, 1852. Lepidoptéres de la Californie. Annales de la Société Entomologique de France 12: 295-296. [junior synonym]**
>
> ***Rusticus acmon cottlei*** **Jordyce Grinnell jr., 1916. An unnamed butterfly from San Francisco. Pomona Journal of Entomology and Zoology 8: 83. [junior synonym]**

CHARACTERIZATION OF *PLEBEJUS ACMON* WESTWOOD

The concept of this species and its relatives have received a different treatment by almost every author who has studied them (Clemence, 1909; Comstock, 1922; Downey, 1951; Goodpasture, 1973a; Tilden, 1973; Scott, 1998; and Emmel et al., 1998b). All authors seem to agree on the identity of nominotypical *Plebejus acmon*, but many have widely discordant concepts of related taxa. Goodpasture (1973a) and subsequent authors have included at least one other entity as conspecific with *P. acmon*. Goodpasture (1973a) thought that *P. acmon* was a widespread, variable western butterfly, but this conclusion was suggested by Scott (1998) as incorrect, and I agree with his conclusion. Three additional taxa have been described as conspecific with *P. acmon*, but their authors did not present any species-level characters supporting this association (i.e. dos Passos, 1938; Goodpasture, 1973b; Emmel et al., 1998b). In several cases these concepts were further confused by the authors themselves who applied the names widely beyond their type localities and may have confused them with other taxa, at least some of which are likely undescribed (Opler, unpublished).

Extensive sampling and observations of *Plebejus acmon* and its relatives in the field have yielded much information of the butterflies' behavior, host plants, and distributions. In California, *Plebejus acmon* occurs sympatrically with a number of other taxa, e.g. Goodpasture, 1973a, page 481; Opler, unpublished. In California, these include *Lycaena chlorina* (Skinner, 1902), *Lycaena lupini* (Boisduval, 1869), *Rusticus monticola* (Clemence, 1909), and *Lycaena neurona* (Skinner, 1902). In some instances as in Kern County, California, *P. acmon, P. monticola,* and *P. neurona* may be found flying together at the same site with no apparent intermediates. In cismontane California, all other taxa in the "*Plebejus acmon* complex" utilize perennial species of *Eriogonum* (Polygonaceae) as their larval hosts and all but the bivoltine *Plebejus neurona* are strictly single-brooded. Elsewhere, if the butterfly that seems to represent *texanus* is truly widespread in the Southwest, then it is also multivoltine and appears to feed on both *Eriogonum* species as well as legumes (e.g. Goodpasture, 1973a, 1973b; Bailowitz and Brock, 1991).

In cismontane California, the populations of butterflies here considered to belong to nominotypic *Plebejus acmon* are multivoltine and seem to be continuously brooded where host plant availability and climate are amenable. In the lowlands, there are certainly at least three broods and possibly as many as five or six. The butterflies are found everywhere where suitable hosts occur from sea level to as high as 8,000' (2438 m). There are numerous observations of this butterfly's use of both species of *Eriogonum* and certain genera of legumes (*Lotus* species, especially annual species such as *L. heermani* (G. Pratt, in litt.), but also *L. scoparius* (Nutt.) Ottley) (Goodpasture, 1973a, and many others).

Populations of multivoltine butterflies with the nominotypic phenotype and which use either *Eriogonum* species or legumes as larval hosts range from along the Pacific coast from as far south as the Sierra San Pedro Martir of Baja California, Mexico north through cismontane California, through western Oregon to at least as far as southwestern Washington. Additionally, butterflies which seem to fit this general description have been seen in the Carson Range of western Nevada, possibly elsewhere in northern Nevada, and on the east side of the Sierra Nevada in the Owens Valley and perhaps other sites of transmontane eastern California (Opler, unpublished).

As discussed by Goodpasture (1973a) most populations of the *P. acmon* complex outside of this distribution are single-brooded and limited to species of *Eriogonum* as their larval hosts. The phenotypes of the butterflies in these populations differ in a number of characters from that of nominotypic *P. acmon*. In addition, there are populations of the complex that occur in the Southwest, high plains, and northern mainland Mexico that are likely multivoltine, and some are reported to utilize legumes as larval hosts. Most of these latter populations fit the general concept of *P. acmon texanus* Goodpasture (1973b), but many of these populations may or may not be conspecific with *P. a. texanus* itself, and *texanus* is not herein considered as conspecific with *P. acmon.*

In accord with the above discussion, I limit application of the species *P. acmon* to the nominotypic populations that occur within the above described geographic distribution. I conclude that all other populations and the names applied to them are not conspecific with *P. acmon*. If populations of any other

description than given above are conspecific with *P. acmon*, their placement must await the results of further morphological, behavioral, and genetic research, some of which is in its initial phases (Opler and others, unpublished).

EXCLUDED *ACMON* COMPLEX TAXA

The following taxa [given in their original combinations], listed in chronological order by year of description, are excluded from the concept of *P. acmon*. They represent both species-level and infraspecific taxa. In agreement with previous authors, *P. neurona* is considered distinct at the species-level, but the taxonomic status and level of the remaining names is not evaluated here. The recent practice of considering "*acmon* complex" taxa, except *P. neurona*, to be subspecies of either *P. acmon* or *P. lupini* is flawed because in several instances more than one non-*P. acmon* entity have been found sympatrically or parapatrically without indication of intermediacy. Further research is necessary to clarify just how many additional species-level taxa are represented in western North America.

Lycaena lupini Boisduval, 1869

Lycaena neurona Skinner, 1902

Lycaena chlorina Skinner, 1902

Rusticus monticola Clemence, 1909

Plebeius carolyna J.A. Comstock, 1922

Plebejus acmon lutzi dos Passos, 1938

Plebeius lupini spangelatus Burdick, 1942

Plebejus acmon texanus Goodpasture, 1973

Icaricia acmon dedeckera J.F. Emmel, T.C. Emmel, and Mattoon, 1998

Icaricia lupini argentata J.F. Emmel, T.C. Emmel, and Mattoon, 1998

Icaricia lupini alpicola J.F. Emmel, T.C. Emmel, and Mattoon, 1998

Icaricia lupini goodpasturei Austin, 1998

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